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Health Sciences Quarterly (Health Sci. Q.) journal as known by the name of "Journal of Scientific Perspectives" until April 2021 which has been published since 2017 is an international peer-reviewed journal of HOLISTENCE ACADEMY. It is published quarterly in January, April, July, and October. All manuscripts submitted for publication are evaluated by the editor-in-chief, section editor, editorial board, and referees. In addition, the journal provides a medium for highlighting selected articles reporting highly significant original findings, as Editor's Choice Manuscripts.

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Researchers in health sciences will find much of great use and interest in the Health Sci. Q.

HSQ aims to supply scientists of health with resources in order to provide the scientific knowledge through the publication of peer-reviewed, high quality, scientific papers and other material on all topics related to Medicine, Pharmacy and pharmaceutical sciences, Dentistry, Nursing, Bioethics, History of medicine, Health economics, Pharmacoeconomics, Medical education, Public health, and Epidemiology.

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ORIGINAL ARTICLE

# Evaluation of the impact of trained pediatric intensivists on patient management in intensive care unit: An uncontrolled before-after study

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**Abstract**

It is known that the presence of a pediatric intensivist in the pediatric intensive care unit (PICU) improves the quality of patient care and treatment. In this study, it was aimed to determine the differences in the quality of patient care between the period when a pediatric intensivist is actively working and the period when he/she is not actively working. This is a retrospective cohort observational study conducted in Batman Training and Research Hospital. Children aged 1 month to 18 years old admitted to the PICU between October 2020 and March 2021 were enrolled in the study. The 6-month period without an intensivist was compared with the period when the patients were treated by a pediatric intensivist. Demographic data and mortality of the group were recorded and compared between groups. There was no statistically significant difference between the groups in terms of number, gender, and age. The mean Pediatric Risk of Mortality (PRISM) score and Pediatric Death Rate (PDR) were higher in group 2, and these differentiations were statistically significant (0.39 ± 0.18vs 4.57 ± 2.36, $p$<0.001; 1.08 ± 0.15 vs 2,05 ± 1.25, $p$<0.001). Although mortality was statistically higher in group 2, there were no invasive procedures like mechanical ventilatory support, dialysis, and central venous catheter applications in group 1. The ratio of patient acceptance from other hospitals was higher in group 2 ($p$<0.001). In intensive care units under the management of intensivists, clinical follow-up of critical and risky patients can be performed on-site. This protects from transfer difficulties. Invasive interventions can be performed on patients with less risk, and yet mortality is below average. Pediatric intensive care units should be managed by pediatric intensivists and their numbers should be increased.

**Keywords:** Pediatrics, intensivist, intensive care unit, patient care

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## Introduction

Research has shown that having a pediatric intensivist present in a pediatric intensive care unit (PICU) leads to better quality of care and treatment [1]. This approach has been implemented in developed countries for many years, with pediatric intensivists working around the clock in PICUs [2]. With pediatric intensivists working in hospitals, there has been a significant reduction in mortality rates, duration of mechanical ventilation, and length of stay in the PICU [3].

In this study, the objective was to compare patient care quality, PICU modalities, and patient outcomes during periods of active and inactive pediatric intensivist presence.

## Materials and Methods

This study observed a retrospective cohort in a 16-bed pediatric intensive care unit (PICU) at the Batman Training and Research Hospital. Before March 2021, the patients were treated by pediatricians in the PICU. After a pediatric intensivist was hired, the pediatricians worked alongside the intensivist to manage patient care. The pediatricians worked exclusively during night shifts in the PICU.

The study included patients aged 1 month to 18 years who were admitted to the PICU between October 2020 and September 2021. The patients were divided into two groups based on whether they received care from a pediatric intensivist for 6 months. Group I did not receive care from a pediatric intensivist, while Group II did. The pediatric intensivist visited patients twice daily, made decisions regarding new patient admissions, was present during emergencies, and utilized telemedicine outside of working hours for patient care.

In this study, the researchers compared data between groups on several factors. This included age, gender, length of stay in the PICU, number of patients requiring mechanical ventilatory support or tracheostomy, Pediatric Risk of Mortality (PRISM) scores, Pediatric Death Rate (PDR), number of central venous catheter procedures, instances of thoracostomy tubes and gastrostomy applications, cases of nosocomial infection, and number of patients requiring dialysis. The study received ethical approval from Batman Education and Training Hospital Non-Interventional Clinical Research Ethics Committee (approval no. 2022/312).

### Statistical Analysis

The statistical analysis was carried out using the SPSS package program (IBM SPSS Statistics 27). Frequency tables and descriptive statistics were used to interpret the results. Non-parametric methods were used for measurement values that did not follow a normal distribution. The *Mann-Whitney U* test (Z-table value) was used to compare the measurement values of two independent groups by non-parametric methods. To examine the relationships between two qualitative variables, *Pearson-*$\chi 2$ cross-tabulations were used. A $p$-value below 0.05 was considered statistically significant.

## Results

In the pre-intensivist period, Group I consisted of 260 patients, with 156 (60%) males and 104 (40%) females. Group II in the post-intensivist period had 264 patients, with 163 (61.7%) males and 101 (38.3%) females. The mean age for Group I was 67.01 ± 62.63, and for Group II it was 60.69 ± 59.77 months. There was no significant difference between the two groups in terms of their number, gender, and age, as shown in Table 1.

While 27 patients (10.4%) in Group I were transferred to another hospital after PICU admission, this rate was lower in Group II, with only 17 patients (6.4%) being transferred ($p$=0.104). No patients were adopted from another hospital in Group I, but 12 patients (4.5%) in Group II were admitted to the PICU from other hospitals due to intensive care unit requirements ($p$<0.001).

In the study, Group I had a significantly lower Pediatric Risk of Mortality score (PRISM score) of 0.39 ± 0.18 compared to Group II, which had a score of 4.57 ± 2.36 ($p$<0.001). Additionally, group I had a lower mean Pediatric Death Rate (PDR) of 1.08 ± 0.15 compared to Group II with a rate of 2.05 ± 1.25 ($p$<0.001).

There were no reported infections in Group I, while 3 patients (1.1%) in Group 2 tested positive for blood culture ($p$=0.085). The mean length of stay in the intensive care unit was significantly shorter in Group I with 1.7 ± 1.58 days compared to Group II with 5.5 ± 4.76 days ($p$<0.001).

Central venous catheters were not inserted in any patients in Group I, but 47 patients (17.8%) in Group II received them ($p$<0.001). In Group II, 45 patients (17%) required invasive mechanical ventilation, while none were used in Group I ($p$<0.001). Tracheostomy was performed on 7 patients (2.7%) and gastrostomy was performed on 3 patients (1.1%) in group II, but not in Group I ($p$<0.001).

Chest tubes were not inserted in Group I, but 4 patients in Group II received them ($p$<0.001). None of the patients in Group I required hemodialysis, but 3 patients received it in Group II ($p$<0.001).

**Table 1.** Descriptive data of patients.

| | **Group I (n=260) Pre-intensivist** | **Group II (n=264) Post-intensivist** | ***p* value** |
|---|---|---|---|
| Male gender, n (%) | 156 (60) | 163 (61) | 0,683 |
| Age, months, mean ± SD | 67.01 ± 62.63 | 60.69 ± 59.77 | 0,198 |
| LOS-PICU[a] day, mean ± SD | 1.7 ± 1.58 | 5.5 ± 4.76 | **<0,001** |
| PRISM[b] score, mean | 0.39 ± 0.18 | 4.57 ±2.36 | **<0,001** |
| PDR[c] mean | 1.08 ± 0.15 | 2.05 ± 1.25 | **<0,001** |
| Acceptance from another center, n (%) | 0 (0) | 12 (4) | **<0,001** |
| Transfer to advanced center, n (%) | 27 (10) | 17 (6) | 0,104 |
| Infection, n (%) | 0 (0) | 3 (1.1) | 0,085 |
| Mortality rate, % | 0 | 0.7 | **<0,001** |

[a] Length of stay Pediatric intensive care unit, [b] Pediatric Risk of Mortality, [c] Predictive Death Rate

**Table 2.** PICU modalities.

| | **Group I Pre-intensivist** | **Group II Post-intensivist** | ***p* value** |
|---|---|---|---|
| Intubation, n | 0 | 42 | **<0,001** |
| Invasive MV, n | 0 | 45 | **<0,001** |
| Central venous catheter, n | 0 | 47 | **<0,001** |
| Chest tube, n | 0 | 4 | **<0,001** |
| Dialysis, n | 0 | 4 | **<0,001** |
| Tracheostomy, n | 0 | 7 | **<0,001** |
| Gastrostomy, n | 0 | 3 | **<0,001** |
| Cardiopulmonary Resuscitation, n | 0 | 31 | **<0,001** |

**MV:** Mechanical Ventilator

Cardio-pulmonary resuscitation (CPR) was not administered in Group I, and there were no reported deaths. However, in Group II, CPR was performed on 31 patients, and 15 of them (5.7%) died ($p$<0.001).

The mortality rate was 0% in Group I and 0.7% in Group II ($p$<0.001).

## Discussion

The research conducted shows that the management of patients by pediatric intensivists has a positive impact in various ways. The number of children receiving mechanical ventilation in the PICU increased, and many were admitted from other hospitals. The two groups showed significant differences in terms of the procedures performed in the intensive care unit. Overall, the study highlights the positive effects of pediatric intensivists in patient management. During both periods, the patient's count, gender, and age were comparable. A previous study investigated the impact of a trained intensivist's leadership on the treatment of patients in a pediatric intensive care unit and discovered that the number of mechanically ventilated children increased twofold in the post-intensivist period [4]. In this current study, no patient required mechanical ventilation before the presence of a pediatric intensivist, whereas 45 patients required invasive mechanical ventilation after the intensivist's arrival. This difference indicates that patients with more severe respiratory failure were managed by the intensivist, which may have contributed to the higher mortality rate observed in the intensivist-treated group.

In cases where extubation fails, tracheostomy may be necessary, according to research [5]. The study found that during the pre-pediatric intensivist period, there were no children who required a tracheotomy due to mechanical ventilation, but during the post-pediatric intensivist period, 2.65% of children required this procedure. Pollack et al. also found an increase in invasive procedures during the post-intensivist period [6]. Before the arrival of the pediatric intensivist, none of the patients received any renal replacement therapy. However, after the intensivist's arrival, hemodialysis was performed on four patients. In addition, chest tube insertion and gastrostomy were commonly used procedures during the pediatric intensivist's working period. None of the patients received chest tube insertion during the pre-pediatric intensivist period, but four patients needed this procedure during the post-intensivist period. Gastrostomy was performed on three patients during the post-intensivist period.

Inserting a central venous catheter is often necessary for extracorporeal treatments like therapeutic plasma exchange and continuous veno-venous hemodiafiltration [7]. It is believed that providing patient treatment using this approach is a safer option. In the post-intensivist era, 17.8% of patients received central venous catheters, while no catheterization was observed in the pre-intensivist era. This may be due to the difficulty of inserting peripheral vascular access in patients with poor circulation, which untrained physicians are unable to maintain for an extended period.

Studies have shown that antimicrobial stewardship and infection rates decrease when led by intensivists compared to the opposite scenario [8]. After the post-intensivist period, there was an increase in nosocomial infections from zero to three cases, which is not consistent with the literature. The infection rate correspondingly increased from zero percent to 1.1 percent. This increase could be due to the growing number of critically ill children who needed mechanical ventilation support, invasive procedures, and extracorporeal treatment methods.

During the post-intensivist period, patients with higher disease severity, as indicated by their PRISM scores, are more likely to receive treatment. This results in a higher occurrence of invasive procedures and complications. Kesici S. et al. conducted a study that revealed the mean PRISM score of patients admitted during the intensivist period was higher than those admitted during the non-intensivist period [4]. Despite the presence of critically ill patients, the mortality rate was lower during the intensivist period. Our research suggests that the high mortality rate after the intensivist period may be due to the admission of patients with higher PRISM

scores. Although the mortality rate was higher compared to Group I, only a small percentage of patients (5.7%) passed away. Other studies have reported mortality rates ranging from 7% to 19.6% [4, 9].

Studies have shown a decrease in length of stay (LOS) in ICU in the post-intensivist period [6]. Our study found that the average length of stay in the Pediatric Intensive Care Unit (PICU) was longer during the post-intensivist period. We believe this may be due to the fact that, in the pre-intensivist era, only low-risk patients were treated in the PICU and were quickly discharged or transferred to other medical facilities. Conversely, seriously ill patients were transferred to specialized facilities. However, during the post-intensivist era, patients were primarily referred from other medical centers, resulting in a significant increase in admissions. Kesici et al.'s research on this subject also resulted in similar findings [4].

## Conclusion

Under the leadership of pediatric intensivists, patients are referred to other centers less frequently. By doing so, it becomes possible to handle a greater number of seriously ill patients in the same location. This approach allows for the transfer of critically ill patients from facilities that do not have intensive care capabilities. Intensivists ensure the safe and effective use of intensive care modalities and invasive procedures. It is crucial to have more pediatric intensivists available to save the lives of children.

### Limitations

Retrospective access to data from previous patients was not available in the pre-intensivist period of the study, which had a negative impact on the number of patients during the post-intensivist period.

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### *Conflict of interest*

There is no conflict of interest between the authors.

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REVIEW

# The impact of disaster on cognition in geriatric population

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**Abstract**

Aging has become one of the predominant demographic issues of the 21st century both in Türkiye and globally. All countries face major challenges to ensure that the health and social systems are ready for the present development. Disasters are natural, technological, or human-induced events that cause physical, economic and social losses. Türkiye is one of the countries frequently face to the catastrophic natural disasters. During the disasters, geriatric population should be considered as being a particular vulnerable group of society. Geriatric individuals are usually more severely injured, have prolonged hospital stay, lower quality of life and have higher mortality during disaster and in post-disaster periods. However, studies on the cognitive effects of disasters are limited. It is clear that the data to be obtained from studies to be conducted in this field will be of even greater importance, if the increasing geriatric population is considered. Age, living alone, being less educated, having chronic diseases, and not working are known as being the the most related factors with cognitive decline due to the disasters. Stressful events such as disasters have short and long-term effects on different brain structures. In the literature, it can clearly be seen that the popular area for researches is the affected locations in brain due to disasters The impotance of better preparedness and community empowerenment that can improve the vulnerable populations, particularly the geriatric people with dementia, is known and more researches are needed.

**Keywords:** Disaster, cognition, aging, elderly, disaster gerontology

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## Introduction

Disasters are natural, technological, or human-induced events that cause physical, economic and social losses for all or certain segments of a society, interrupting and sometimes even stopping the normal flow of life. Natural disasters are ecological events that disrupt daily life and require assistance to eliminate their negative consequences; earthquakes, floods and storms are the most common examples of natural disasters. In terms of increasing technological developments, economic problems in large geographies, wars, disasters, increasing migration movements due to economic and social reasons, and disasters triggered by climate changes brought about by global warming, it is seen that the whole world is moving step by step towards an unstoppable crisis.

Türkiye frequently faces to the natural disasters, as floods in the Black Sea region, forest fires in the southern Aegean and Mediterranean regions, and earthquakes in different regions of the country. In Türkiye, which is defined as an 'earthquake country', all those disasters have had many physical, psychosocial, and economic impacts, both individual and societal, and these impacts will continue to occur.

Cognitive health issues caused by any disasters are even more neglected area. In the present article, the aim is to reveal what changes due to disasters and is known about the cognitive impairment after the different types of disasters all over the world.

## Relationship Between Disaster and Cognition

### *Adaptation to Stress During Disaster*

Despite the negative effects of natural disasters on communities, there are disaster survivors who can go through a natural recovery process without experiencing any psychopathological consequences. Stress is necessary for building and shaping the responses to environmental changes in progress throughout life, particularly between second pregnancy trimester and first two years of life, during the development of brain. However, prolonged or excessive activation of the stress response might have negative effects on brain structure and functions. According to the stress-adaptation model, the effects of a traumatic stressor may diminish over time as people are exposed to stress [1]. Although chronic exposure to stress can lead to negative outcomes such as cognitive dysfunction and depression, it is important to note that adaptation to low or moderate levels of acute stress can be developed and social behaviors can increase as a contribution of a properly managed post-disaster process. Many variables such as individual-specific personality, gender, age and genetic factors have an impact on cognitive and behavioral responses to disaster [2].

## Risk Factors for Cognitive Impairment After Disasters

Some risk factors for dementia without an experience of disaster are seen as current risk factors for cognitive decline following a disaster. The most important risk factors for cognitive loss after a disaster are old age, living alone, being less educated, not working and having chronic diseases. These are the well-known main risk factors for geriatric population regardless of disasters. Apart from these, low-income level is also known to be an important risk factor, and it is also known that cognitive loss may occur in individuals with low education level but high-income level due to easy access to bad habits, such as alcohol misuse and drugs [3].

It is possible to reduce cognitive loss by maintaining the pre-disaster social support after disasters. It is emphasized that those living in a community with strong ties defined as social capital will be less exposed to social isolation after a disaster and thus cognitive loss can be prevented easily. The relationship between experiences of disaster and the deterioration of dementia symptomatology is demostrated with comparing geriatric populations who lost their homes after disaster to those didn't lose or experienced less severe damage. Those who lost their homes are seen as more suffered from cognitive and social support losses than the ones who had able to have their own houses [4].

The impact of social connections on both health and social resilience appears to be critical to sustaining the wellbeing of older people affected

by disasters. Older people living in south-eastern Australia have experienced bushfires and COVID-19 in speedy succession, and living in rural areas means they face limited access to support services and the risk of social isolation. Women living in this region, with chronic diseases and the geriatric population who interpreted their own health status as worse experienced the effects of both bushfires and the pandemic at an increased rate compared to the others [5].

In another study conducted after the flood disaster in Japan in 2018 demonstrated that geriatric victims who continued to live in their own homes independently in most of their daily living activities, with or without any care support, were at risk of cognitive decline due to the disaster. They presented two hypotheses to explain that result; one is that there would be a cognitive dysfunction did not surface before the disaster and the second is negative effects of the disaster as a result of severe depression, social isolation and lack of physical activity on cognitive functions [6].

## The Most Impaired Cognitive Domains After Disasters

Neuropsychological studies have documented that the significant impairments in cognitive functioning after acute stress reaction are attention, working memory, and verbal memory functions [4,7]. Recurrent memory thoughts related to disaster period and increased arousal levels in post-disaster period have been hypothesized to interfere with ongoing cognitive processing. It is assumed that these interventions cause memory impairments in working memory and attention in cognitive functions. Although working memory impairment within the first 4 weeks following the disaster appears to greatly increase the likelihood of positive identification of Post-traumatic Stress Disorder (PTSD), it does not appear to contribute to verbal memory [7].

Disaster-related traumatic experiences are linked to exacerbation in dementia and to working memory loss in geriatric population without dementia. Predicted mechanisms include post-traumatic stress disorder, depression, reduced social participation and social isolation accompanying loss of place of residence [8]. The level of cognitive functioning of the elderly living in temporary apartments after the Great East Japan Earthquake was monitored and found that 36% of the elderly living in the disaster area had lower cognitive functioning. This rate is higher than the prevalence of dementia in Japan, which is 14%, and they stated that this increase is due to rapid changes in living conditions, loss of families, relatives and friends, loss of daily activities such as farming and fishing, and separation from families and neighbors. A more pronounced deterioration in cognitive and behavioral symptoms is observed in people with dementia living in temporary housing. It is emphasized that ischemic stroke, post-traumatic stress disorder (PTSD) and depression, which increase in frequency after disasters, more frequently in men, may contribute to this deterioration [9].

## Which Brain Areas Are Significantly Affected Due to Disasters?

Stressful events such as disasters have both short and long-term effects on the brain. In experimental animal studies, acute and chronic stress-induced microstructural brain changes were observed in prefrontal regions and microstructural changes occurred in white matter density, especially in the cingulum and uncinate fasciculus, was revealed in a human study [10]. It was reported as the effect of chronic stress in posttraumatic stress disorder in the long term and the effect of acute stress in survivors of a disaster in the short term. In neuroimaging studies conducted to evaluate the “early-term” effects 3 months after the disaster and “long-term” effects 1 year after the disaster, significant changes were observed in the right anterior cingulum, both uncinate fascicles, left superior longitudinal fascicle and left thalamus [11].

The uncinate fasciculus, which plays a role in emotional processing, is a major white matter system connecting limbic regions, including the orbitofrontal cortex and amygdala, and anterior temporal cortices. Through this pathway, neural responses of the orbitofrontal cortex are preferentially amplified during extinction, together with those of the amygdala, and

voluntary regulation of emotions is achieved. As a result of the secretion of corticosteroids as an acute stress reaction, it is observed that the white matter density, which increased in the early period in the left uncinate fascicle, regressed at the end of the first year [12]. This change indicates that there is a need for a new emotional regulation for disasters that cause an intense stress factor such as earthquakes. When individuals with post-traumatic stress disorder are compared with individuals who have been exposed to disasters but are psychiatrically well, it is emphasized that exposure to disaster itself has a detrimental effect on neuropsychological performance, as there is data showing that both groups have memory impairment but there is no significant difference [13]. With this idea, concepts such as 'earthquake brain' or 'flood brain' have been put forward due to the effect of disaster exposure [14]. Within the framework of this concept, the interest in examining the effects of disaster exposure on neuropsychological functions by comparing them with unexposed controls is increasing day by day. The most important information obtained from the studies is that there was no difference in verbal or visuospatial memory in individuals with PTSD compared to controls exposed to earthquake [15]. Compared to controls who were not exposed to the earthquake, both groups were found to have lower performance in visuospatial memory tests. These results are presented as preliminary evidence suggesting that the factor affecting neuropsychological functioning is the exposure to the disaster itself rather than the presence of PTSD [16].

## Emotional Changes Following Disasters and Effects on Cognition

### *Acute Effects of Post-Traumatic Stress Disorder on Cognition*

The processing of facial emotions reflects a specialized aspect of cognitive functioning related to trauma exposure that has received less attention. A systematic review of social cognition studies in PTSD has reported mixed findings in the processing of threatening expressions such as anger, fear, and sadness [17]. Accuracy and sensitivity in the interpretation of facial expressions of fear, sadness and anger were found to be reduced in people with PTSD compared to war-exposed controls [18]. Compared to non-earthquake-exposed controls, it was suggested that earthquake-exposed individuals, including those with and without PTSD, rapidly develop emotional facial expressions that express increased sensitivity to potentially harmful situations, and thus may be able to generate an adaptive response to the disaster in a short time [19].

Earthquake survivors with current PTSD symptoms had worse scores in attention, verbal memory and verbal fluency performance in the animal naming test compared to those with a history of PTSD and healthy controls [20]. When the demographic characteristics of these three groups were analyzed, it was noteworthy that there was a significant difference in terms of lack of preschool education in the PTSD group and the level of parental education was also lower in this group, although the duration of education was similar [21]. It seems possible to prevent possible cognitive loss that may be encountered in case of disaster by increasing the level of education in individuals and their parents, contribution to cognitive reserve and positive contribution to the development of the prefrontal lobe through education starting in early childhood.

## Chronical Effects of Post-Traumatic Stress Disorder on Cognition

Decreased hippocampal volume and progressive cortical thinning as a result of chronic PTSD and changes in dopaminergic pathways resulting from long-term exposure to airborne pollutants have been associated with Alzheimer's disease [22,23]. Neuroimaging studies have shown that disaster victims with chronic PTSD face an increased risk of Alzheimer's disease as a result of faster hippocampal volume loss, decreased cortical thickness and increased beta-amyloid accumulation [24]. In studies conducted on September 11th World Trade Center attack survivors, it was shown that the risk of dementia increased as an effect of PTSD and long-term exposure to airborne pollutants. In early period examinations, it was revealed that there was a limited relationship between the duration of

being in the debris field and the level of cognitive loss in relation to the high neurotoxin contained in the debris [25]. In addition, when these individuals were evaluated in terms of APOE-ε4 allele carriage, which is an important risk factor for Alzheimer's disease, it was observed that there was a weak association between the long-term presence of allele carriers in the debris field and Alzheimer's disease [26]. This association supports the increased negative effects of increased exposure to neurotoxins in dust on the development of Alzheimer's disease with the contribution of increased blood-brain barrier permeability for APOE-ε4 carriers [27].

PTSD has a common network that spreads from parietal to frontal cortex and includes limbic structures, different specific networks can be activated according to the type of stress and suggested that para-hippocampal gyrus, superior temporal gyrus, medial and superior frontal gyrus are effective for natural disasters. The fact that these structures play a key role in navigation suggests that there may be problems in the perception of familiar places damaged by the disaster and the perception of a new environment [28]. In addition, it was suggested that there may be problems in learning new spatial sequences in the peripheral field as a result of cerebral network changes caused by PTSD due to natural disasters, especially in the insula, lingual gyrus and frontal gyrus in the right hemisphere. These cerebral areas are related to different spatial abilities; the insula and lingual gyrus are involved in learning sequences in the navigation domain with specific and complementary contributions, the inferior frontal gyrus plays a role in the 3D perception of objects and letters, and the superior frontal gyrus plays a role in maintaining spatial orientation in working memory [29]. Bilateral hippocampus activation is required during the creation and use of a cognitive map, and the demonstration of the problem experienced by individuals with PTSD resulting from the L'Aquila earthquake in creating a cognitive map of a virtual environment is accepted as a result of hippocampal changes caused by PTSD [30].

## Do Disasters Only Have Negative Effects or Do They Also Have Good Effects on Cognition?

In a navigation study investigating the topographic memory skills of disaster survivors and post-disaster residents, disaster survivors scored higher on the ability to learn a new path and needed fewer repetitions, and topographic memory was shown to selectively improve over visuospatial memory. However, once a path had been learned, there was good recall of the learned path information by both groups, and especially within the disaster survivor group [31]. This result suggests that exposure to environmental changes after a natural disaster may promote the acquisition of new topographic knowledge, but repeated topographic practice has no effect on the enhancement of topographic memory if pre-disaster familiarity is absent [32]. In the light of this information, considering the widespread cognitive and psychological effects of disasters throughout the population, the importance of close and careful follow-up of the cognitive functions of healthy geriatric individuals in addition to individuals with cognitive loss, who are known to have high vulnerability after disasters, has been clearly demonstrated.

Disaster preparedness is the most significant digit to reduce damages. However, disaster preparedness is predicted to be difficult for geriatric population with cognitive impairment. In disaster preparedness, there tends to be an emphasis on building shelters and supplies such as food, water and medicine, but studies demonstrated the importance of social networking. Building resilience to disasters depends not only on supporting the physical infrastructure, but also on strengthening social connections [33]. Social capital is defined as the resources that individuals and groups can access through their own social connections and it plays a critical role in the emergency response phase of disasters [34].

Studies to assess the cognitive status of individuals who are not able to maintain pre-disaster social capital against the effects of residential relocation on cognitive decline have found that moving to trailer-type housing, which

is vulnerable to frequent relocation, is also a risk factor for rapid cognitive decline, especially when random relocation leads to distance from neighbors and close family members. The hypothesis that low social participation, less frequent social contact and loneliness are associated with dementia is based on the 'use it or lose it' theory of brain plasticity. This theory suggests that daily participation in intellectual and social activities regularly stimulates the brain and, conversely, that inactivation of these functions leads to loss of cognitive abilities [35].

## Discussion and Conclusion

Disasters are unexpected events that affect many people and cause many problems in addition to their devastating effects. Physical, emotional, and psychological health of individuals are significantly affected due to the disasters and they are resulted in high numbers of deaths, injuries, and economic losses. The vulnerability of geriatric population in disasters is revealed by many researches in the literature. Geriatric population, particularly the individuals with dementia, is of great importance during a disaster period being one of the most vulnerable groups in society due to the physical, psychological and cognitive negative effects besides the increased assistance needs that will occur as a result of the disaster. Awareness about the importance of post-intervention techniques and their easy applicable capacity in affected geriatric population is the main step for victims' recovery periods. Disaster-management strategies, as a multidisciplinary and multidimensional process, cover disaster preparedness, interventions during disasters and for post-disaster period, and follow-up activities for long-time period after disasters. It is important to understand not only the needs of geriatric people with dementia but also the caregivers' needs from their own perspectives. This information would help healthcare professionals assist in the development of intervention models of care to ensure both patients and caregivers' perceived needs are met. The present review has limitations on significant points for developing disaster-management strategies. Governments, healthcare professionals, epidemiologists, geriatricians and gerontologists must make efforts to diminish all negative impacts of disasters. For that reason, it is of great importance for all responsible to improve disaster management strategies with the contributions of multiple post-disaster studies.

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REVIEW

# Forensic, medical and legal problems and solutions on passenger and cargo ships

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**Abstract**

Marine vehicles have an important place in international trade and tourism. There are various directives and studies on the prevention of health problems in marine vessels and injuries and deaths due to occupational accidents. In the literature, not enough studies have been found in which the issues to be considered in cases of injuries, sexual assaults, accidents, suicides and murders that are common in forensic medicine practice, and there are no guidelines or recommendations of internationally accepted organizations. It is important to determine the seafarer who is responsible for intervening in health emergencies on cargo ships, and to detect faulty ones, if any, in work accidents that result in serious injury and death. In addition, injuries, suicides and murders are encountered among the crew, and crime scene findings are lost until they are evaluated by the judicial authorities. Although rare, sexual assaults on cargo ships are also reported, but there are not enough scientific studies that indicate what should be done in terms of evidence evaluation. Our study emphasizes the issues to be considered, that one of the crew should be held responsible and necessary training should be given in order to make a forensic medical evaluation in forensic events that will be encountered on cargo ships, and that physicians and health workers should be competent in the first forensic medical evaluation in case of emergency on passenger ships. It is thought that the launch of the telemedicine application, which provides uninterrupted service for forensic medical emergencies in maritime vessels, under the leadership of organizations such as the *"International Maritime Organization"* (IMO), will make a significant contribution. In addition, suggestions are made for legal impasses in such cases that take place in high seas.

**Keywords:** Telemedicine, ships, sexual offenses, criminology, forensic medicine

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## Introduction

There are many different types of vehicles at sea. These can be classified as cargo ships engaged in cargo transportation, cruise ships used in maritime tourism and long-distance passenger transportation, ferries used for short-distance passenger transportation, warships used in war and military operations, and boats, vessels and medium-sized commercial vessels that are used for fishing activities [1]. Ship size and number of seafarers can be independent of the type of ship. However, cruise type passenger ships have doctors, nurses and health officers on board due to the number of passengers and the time spent away from the shore [2,3]. Nurses or health officers are considered sufficient for cargo-freight carrying ships since the number of employees does not warrant the employment of a physician [4].

Health care on board ships varies according to the size and type of ship. Large ships, such as cruise ships or military vessels can be equipped with a medical center with trained medical personnel on board [5]. Smaller vessels have more limited medical facilities and personnel, or crew members with basic first aid training are assigned to provide medical care [6]. This person is usually a paramedic, nurse or doctor with specialized training in emergency and maritime medicine. They are also responsible for maintaining medical equipment and supplies, coordinating with other health professionals ashore and ensuring medical evacuation in serious emergencies [7].

According to the "Seafarers and Pilots Regulation" [8] which entered into force in Türkiye on February 10, 2018, all seafarers must receive basic first aid training, and first officers and masters must receive medical care training. In addition, a free of charge health hotline service for seafarers and passengers is available under the structure of the General Directorate of Health of Turkish Borders and Coasts under the Ministry of Health. Uninterrupted telehealth consultancy services provided by physicians and other specialized health teams are among the leading services offered. This service is provided to Turkish and foreign-flagged vessels both on the Turkish coastline and in international waters [9]. The provided services are mainly within the scope of preventive health services and information about immunization [10]. If a death has occurred after a forensic incident or if the cause of death has not been determined, judicial institutions are informed and the judicial process is initiated. In the European Union, works are carried out to develop preventive health systems with pilot applications in maritime transportation [11,12]. Occupational health and safety measures are at the heart of preventive health measures [13].

### *Health Practices on Passenger and Cargo Ships*

The practice of medicine on board cruise ships is designed to ensure that passengers and crew members have timely access to quality medical services in the event of illness and injury so that they can continue with the rest of their voyage. Each cruise ship should have a medical center as well as medical staff according to the size of the ship. The intended purpose of medical personnel on board is to provide "reasonable" emergency medical care. In practice, this "reasonable" emergency care means stabilizing the sick or injured passenger until treatment on land is possible [14].

Passenger injuries significantly increase the workload of the medical team on board. A well-equipped, competent medical staff will effectively treat the majority of injuries on board, thereby reducing the number of costly and inconvenient helicopter evacuations, route diversions, port transfers and disembarkations [15]. In a study examining the medical practice of cruise ships, the data generated by one doctor and two nurses with an average of 464 passengers (51% female) and 615 crew members (22% female) during a 106-day cruise from Los Angeles to New York was recorded continuously and reviewed after the cruise [15]. The results turned out to be quite striking. There were 4,244 registered patient contacts (40 per/day), of which 2,866 directly involved the physician (27 per day). 59% of physician's examinations were performed on passengers, and 59% of nurse examinations were performed on crew members. The most common reason for consultation was respiratory illness

in passengers (19%) and skin diseases in crew (27%). Various injuries were the most common type (passengers 41% and crew 40%) among 101 reported cases (56 passengers, 45 crew). The most common accident sites for passengers were ashore (27%) and on crew galleys (31%). Seven passengers and 13 crew members were referred to dentists ashore, five passengers and two crew members were referred to medical specialists ashore and returned to the ship while seven passengers and one crew member were hospitalized in a port. The following conclusion was reached: health personnel have a heavy workload during long voyages. According to the findings of the Dahl's study in 2005; experience in emergency and general medicine, good communication skills and cruise experience are useful qualifications for medical personnel [2].

While various standards are determined for the medical facilities and personnel of many passenger ships, the standards set for cargo ships and tankers is more limited [16]. Although there is an international medical guide for ships, no international guide has been found regarding forensic medical issues. There is also no standardized training for cruise ship doctors [17]. The "*Health Care Guidelines for Cruise Ship Medical Facilities*" [18] issued by the *"American College of Emergency Physicians*" (ACEP) recommends that cruise ships be equipped with oxygen, cardiac defibrillators, external pacemakers, ECGs, x-ray machines, stretchers, wheelchairs, immobilization equipment, sutures, medications and bandages. There should be at least one inpatient bed and intensive care unit for 1000 passengers and crew, and at least one isolation room or the means to isolate patients. In the case of more serious cases, such as heart attacks and strokes, ACEP guidelines recommend that the ship should either proceed to the nearest port or the patient be airlifted from the ship.

Medical assistance to the sick or injured on the high seas is always a problem. However, means of communication with the shore have improved considerably. Simultaneous information can be shared with doctors ashore, but in the event of a serious medical situation, the crew is helpless as they are not competent to follow instructions. In such cases, evacuation vehicles and the distance from the port with medical facilities plays an important role [19].

### *Approach to Forensic Medical Cases on Passenger and Cargo Ships*

#### *a. From a Forensic Medical Perspective*

Sea voyages have a high level of risk compared to land activities [20]. The extended time spent on the sea causes difficulties in accessing health services. The evacuation process itself when necessary also carries significant risks [21]. The incidence and frequency of some health problems, especially cardiovascular diseases, have been found to be higher in seafarers compared to the normal population as a result of less than perfect living standards, working conditions and stress [22,23]. The risk of occupational accidents encountered at sea was found to be 11 times higher than on land [24]. Injuries and fatalities are encountered on board ships for different reasons. A study carried out between 2000 and 2019 on passenger and crew fatalities on board cruise ships, falling from the deck or onto the lower deck, cardiac events, suicides and homicide were reported as the main causes of death [25]. Similar to cruise ships, main causes of fatal work-related injuries on cargo ships are cited as poor weather conditions, inadequate safety awareness, failure to use personal protective equipment and inexperience. Most fatal occupational accidents occur among deckhands and deck officers and similar types of accidents such as falling into cargo holds and falling overboard. Fatal injuries during off-duty hours are often associated with alcohol consumption. International Maritime Organization (IMO) statistics reveal that 80% of accidents on cargo ships are caused by human factors [26]. Injuries to ship workers are reported as occupational accidents due to the working environment. One study reported that 5% of occupational accidents resulted in death and permanent disability [27]. Work accidents occur at different rates in different occupational groups, and foreign workers are more likely to be injured than local workers [27,28]. Accidents among passengers vary depending on factors such as travel time, passenger gender, age and the number of passengers, and the rate of serious injuries in reported accidents is revealed to be

around 12% [15]. A 25-year study reported that fatalities occurred in 1.3% of treated patients with circulatory system disorders topping the list [21,29]. Another study revealed that fatalities were more common on passenger ships than on cargo ships and that the age and number of passengers were effective in this result and that fatal accidents increased in adverse weather conditions and at night [30]. Studies on homicide and suicide rates in death cases in the literature are insufficient. Apart from accidents and occupational accidents, forensic cases on ships can also be classified as injury, killing, poisoning and sexual abuse. All of these cases are evaluated within the scope of offences against physical integrity. One study reported that 33% of deaths on board were due to poisoning, one quarter of which were self-inflicted, while 24% were homicides. Another study from 2014 revealed that 74% of the 66 cases of death on board ships were classified as accidents, 1% as suicide and 11% as disappearing in water [31]. The rate of suicide in seafarers is higher than in other segments of society. A study on the mental health of seafarers emphasized that 11% of total seafarer deaths were due to suicide, and that this rate could be higher when the possibility of suicide is considered in cases of falling into the water or being lost in the water [32]. Social opportunities, working and living conditions increase the rate of drug and alcohol use among workers, which in turn increases the likelihood of criminal incidents. The rate of alcohol intake involved in on-deck accidents is considered to be one of the important factors that increase the risk of accidents. Although women are working in many areas of life at similar rates to men, seafaring is still considered a male profession. Studies indicate that 2% of ship employees are women, and that female employees are often employed in the entertainment sector of cruise ships [33]. Although the number of women is low, the incidence of sexual harassment is reported to be higher than such harassment on land. One study reported that 17% of female seafarers were exposed to sexual harassment while another study reported that half of them were exposed to such harassment [33,34]. In one study, the incidence of sexual harassment on board ships was reported to be 50% higher than the average incidence of sexual harassment in the USA [35]. The reason for the lack of sufficient studies on sexual harassment on cargo ships is explained as the low number of female seafarers on such ships. However, considering that sexual harassment des not only target the opposite sex, sexual assault by male workers against each other on cargo ships emerge as another issue to be considered. The available protection and prevention efforts regarding sexual assaults are not enough to prevent such assaults. Sexual assault cases are frequently reported incidents. Sexual assault cases need to be managed quickly and correctly to identify the perpetrator. In sexual assault cases, it is important to carry out an examination as soon as possible and obtain material evidence from the victim. This evidence can be listed as body fluids, hair tissue of the suspect as well as ecchymosis, abrasion, bleeding, vaginal or anal trauma findings on the victim's body which are considered as sexual assault findings. After these findings are collected, they should be evidenced by taking photographs and video recordings in the correct light and from the right angle to enable experts to make the correct assessment [36]. The first thing to be done to determine a crime and the perpetrator in forensic incidents encountered on board a ship is to inform the captain in charge and to report the incident in the early period [28]. Crime scene investigation teams and forensic officers can be called to collect and analyze evidence from the ship and the scene. Many physical, chemical and biological evidences are collected from the scene. DNA samples and fingerprints are commonly used among these evidences. With the reflection of technology in recent years, video recordings also make an important contribution to incident or crime scene investigation [37]. The most important step in crime scene investigation is the prevention of deterioration-contamination that can have an adverse impact on the evaluation. Therefore, the presence of untrained persons at the crime scene can prevent the collection of evidence and also cause false positive findings belonging to people who are not involved in the incident. The fact that the crime scene in question is a ship is an obstacle to a fast, effective and accurate crime scene investigation. When all these facts are taken into consideration, the

necessity of trained personnel in charge of crime scene investigation and evidence collection, as well as responsible for first aid and health intervention on board to deal with forensic incidents emerges. It is not only important to obtain evidence from the right sources in the right way, but also to store it in the right way.

***b. From a Legal Perspective***

***1. Jurisdiction over maritime zones***

Treaties and generally accepted principles of international law establish the right of a State to assert jurisdiction over crimes committed at sea. The United Nations Convention on the Law of the Sea (UNCLOS) [38,39] constitutes the main source of international law determining jurisdiction over maritime zones. In this context, it is not possible for a coastal state to establish rules that include rights and powers that are not defined in the UNCLOS [40].

Different powers are exercised in different maritime zones. The territorial sea is regulated in Article 2/1 of UNCLOS as a maritime zone under the sovereignty of the coastal state. The coastal state has the authority to make all the regulations required by its territorial sovereignty in its territorial waters. When a passenger ship navigates in the territorial waters of a coastal State, the coastal and flag States have concurrent jurisdiction over the ship. However, when foreign flagged ships are in the territorial waters of a coastal State, they must comply with the laws of the coastal State [19]. Although a passenger ship is subject to the laws of the coastal state when it is in the territorial waters of another state, the coastal state's jurisdiction to exercise criminal jurisdiction over the passenger ship is limited (Article 27 UNCLOS). Nor does the coastal State have the right to stop a foreign ship passing through its territorial waters to exercise civil jurisdiction over a person on board. A coastal state can exercise jurisdiction over ships in certain circumstances in the exclusive economic zone (EEZ) and the contiguous zone. The EEZ grants a coastal state sovereign rights to explore, exploit, protect and manage living and non-living resources. A coastal state has jurisdiction only over artificial structures, marine scientific research and matters relating to the marine environment (Article 56 UNCLOS). A coastal State has the authority to prevent and punish violations of its customs, fiscal, immigration or health laws and regulations within its territory or territorial waters in a contiguous zone (Article 33 UNCLOS). Furthermore, the adopted international legal framework does not support the introduction of mandatory reporting requirements by coastal States for illegal acts committed by foreign-flagged vessels outside their territorial jurisdiction [41]. The high seas are open to all states, coastal and non-coastal. No state can claim sovereignty over any part of the high seas. However, the absence of sovereignty does not mean the absence of authority. As stated in Article 92 of UNCLOS, a passenger ship is subject to the exclusive jurisdiction of the flag State on the high seas. Therefore, in the territorial waters of other states, the flag state's jurisdiction over the ship is concurrent with the coastal state's jurisdiction, but on the high seas the flag state has traditionally been recognized as having exclusive jurisdiction [42]. When a crime occurs on the high seas, i.e. on ships sailing in international waters, the regulations applicable to these crimes are complex and applicable sanctions can be limited. For example, the International Maritime Organization (IMO) [43] which is the leading regulator of the maritime sector, does not directly monitor the compliance of member states with safety, pollution, search and survey standards. Likewise, jurisdictions in the criminal context are complex and as a result, a criminal act committed on board a cruise ship often results in competing jurisdictional claims. Under UNCLOS, the flag State in which a ship is registered has the primary responsibility to report, investigate and prosecute crimes committed on board (Article 94 UNCLOS). However, a state can invoke criminal jurisdiction if the offense is committed in its territorial waters, has a detrimental effect on national security, involves one of its nationals, or the criminal conduct is widely condemned (e.g., genocide or hostage-taking) [44]. In the event of a collision on the high seas which gives rise to criminal or disciplinary liability of the master or any other person in the service of the ship, or in any other incident relating to the sea navigation, criminal or disciplinary proceedings can be instituted

against such persons only under the auspices of the judicial or administrative authorities of either the State whose flag the ship flies or the State of nationality of such persons (Article 97 UNCLOS).For example, if a ship is attacked on the high seas, which state can assert jurisdiction over the perpetrator? As regulated in UNCLOS, the state whose flag the ship flies can assert jurisdiction. The flag is commensurate with the sovereignty of that state. However, let us assume that the flag State has no interest in participating in an investigation or prosecuting the incident. The offense will not be investigated if there is no bilateral agreement with the victim's state of nationality or if the victim's state of nationality does not deal with the incident or insisted that it is handled by the flag state. In fact, there have even been some cases where the cruise ship company has removed the perpetrator from the ship to avoid any investigation by the passenger's state of nationality [14].

***2. Various liability situations on passenger ships***

Traveling by ship (cruise tourism) is an important and growing sector of international tourism. Around 30 million passengers travel each year with the global cruise industry [45]. The special relationship between a carrier and its passengers involves a person entrusting themselves to the protection and care of another. Passenger ships have a duty to provide safe transport and protect passengers from harm at the hands of the ship's crew. The relationship between the passenger and the cruise ship is contractual through the sale of the ticket and establishes an implicit obligation on the part of the carrier to protect passengers against attacks or mistreatment by its officers. The rape, indecent assault or harassment of a passenger by the crew is a breach of the carrier's duty to carry the passenger safely and protect the passenger from harm. While it is clear that the carrier has breached its duty in the occurrence of situations such as rape, there is uncertainty as to whether the legal standard of care for the shipowner's duty in the proceedings is strict liability or negligence (fault-based liability) [46]. Carriers have an obligation to control the behavior of third parties that can harm passengers. In relation to such actions, carriers are held liable for the tortious acts of their employees against passengers under the super addressee theory [46]. The passenger ticket contains a number of almost invisible clauses, most of which remove liability for various problems that can arise during the cruise [47]. Examples from publicly available official documents used by cruise lines shed little light on the duty of care owed to victims of crime. For example, the Royal Caribbean International Passenger Ticket Contract absolves the company of liability by stating that *"The passenger understands and agrees that the carrier has a zero tolerance policy towards illegal activities and will report such activities to the appropriate authorities"*. Likewise, Royal Caribbean's "liability" clauses do not mention crime, illegal activities or victims. While there are differences in the content of passenger contracts between different cruise lines, they are full of legalese and written in a way that can confuse the average person. The situation is so complex that a passenger booking a cruise can quite understandably have little or no idea what the terms of travel actually are or even with whom they are making a contract. However, by purchasing a ticket and boarding a cruise ship, passengers agree to the terms, conditions and obligations (or lack thereof) set out in these documents [44]. When a crime occurs on board cruise ships, there are a number of significant obstacles to reporting the crime, including the gravity of the crime, liability and complex government discretion arising from international legislation, the existence of profit-oriented regulations in the cruise industry, and lack of research [44]. Cruise lines offer a range of shore excursions for their passengers to enjoy various ports and generate revenue for the cruise lines. Some shore excursions are organized by the cruise lines themselves or by companies set up by the cruise lines to operate them. More often, however, external companies contract with cruise lines to offer their excursions to passengers, with the cruise lines receiving a portion of the cost of each excursion. The relationship between cruise ships and these external companies can be presented through verbal material provided to passengers, with the excursion ticket and the contract of passage ticket. The way in which the relationship is presented to passengers is crucial in determining

liability for personal injury to the passenger [48]. The negligence of employees and/or agents of an independent contractor does not impose liability on the shipowner. Therefore, the passenger has to prove the negligence claim. This requires the existence of a duty owed by the shipowner or operator, a breach of duty and negligence and a close causal link, injury and damage. Courts have generally accepted disclaimers that the operator of a passenger ship is immune from the negligence of an independent contractor. It is easy to see from the contracts that the cruise line is exempt from claims for personal injury/death, loss or delay, as well as any property loss or damage caused by the negligence or breach of any person. It can be assumed that the aim of this general clause is to discourage passengers who have been victimized from filing a lawsuit [14]. Most cruise ships today employ a doctor, a nurse or both. In the absence of medical personnel, a ship would have to divert to the nearest port in the event of a medical emergency. But what about the shipowner's liability to the passenger if something goes wrong in the medical treatment of a passenger on board or if malpractice by the ship's doctor or medical staff occurs? It is generally accepted that the shipowner will not be vicariously liable for the negligence of a ship's doctor hired after a reasonable inquiry into his qualifications and competence. It does not matter if the doctor is considered a member of the crew. This rule is extended to the ship's medical staff working under the supervision of a doctor [48].

***3. Crimes committed on cruise ships***

According to compilations of reported crime statistics, the most common incidents include homicide, suspicious death, missing citizens, kidnapping, serious bodily harm, assault, theft over $10,000, and sexual assault [14]. Sexual assault is more frequently reported than any other crime on board ships. Sexual assaults on board can occur between passengers and crew as well as between the passengers themselves [40,49]. The cruise ship setup facilitates the occurrence of sexual assault. As is true for almost all types of tourism venues, passengers are in a more relaxed state of mind and less aware of their surroundings. With cameras on board, passengers have higher expectations of safety than on land. Alcohol is plentiful and since driving is not a problem, safe drinking limits are often exceeded. Drug use is also often a facilitating factor in sexual offenses [48,49]. Room attendants, waiters, waitresses, bartenders, musicians, security guards, casino workers, galley workers and others on board are reported to have committed these crimes. The most common places where these crimes occur include the crew cabin/crew area, bars, dining rooms, spas, corridors, decks, public areas, disco, public bathrooms, elevators, pools, beach, and often passenger cabins [14]. These crimes are largely unreported by the cruise industry to avoid losing potential customers [14]. It seems that serious crimes are committed on board cruise ships, or that truly accurate records of criminal incidents are not disseminated by cruise ships, or that initial post-incident investigations are often conducted by cruise ships. As these investigations are conducted through onboard security personnel, risk management personnel and often through the cruise ships' lawyers, they are more interested in saving the cruise line from legal liability than in preserving or finding evidence of a crime. They therefore do not have an impartial relationship with the cruise ship and the fear of litigation against their employer can lead to a compromised investigation [41]. It is also noted that those seeking information from cruise ships face significant difficulties. Even in cases where victims file a lawsuit, cruise ships are not forthcoming in sharing the necessary information until ordered to do so by the court [41]. It is important that the victims of any crime take action themselves to preserve and collect evidence from the crime scene as much as possible. There are a number of recommendations to combat crimes on board ships. First, personnel tasked with responding to a crime and interacting with victims should receive more specialized training to understand the experiences and needs of victims and minimize secondary victimization. In addition, all staff should receive training to be able to assist the victim in some capacity. Secondly, the inclusion of independent staff on board cruise ships to act in the capacity of an ombudsman outside the hierarchical structure of the cruise industry would help to improve the initial

response to crime. The presence of a "stranger" on board during the voyage will reduce the possibility of distorting the true nature and occurrence of the crime. Finally, a revamped reporting system should be implemented, including reporting of all crimes (not just those that meet arbitrary thresholds), making data publicly available, and clarity on reporting and recording responsibilities. This will enable comprehensive quantitative research that should be complemented by qualitative research on experiences of crime and victimization that can be tracked over time to promote crime prevention and reduction [44]. When a ship navigates in the territorial waters of a coastal state, the coastal and flag states have concurrent jurisdiction over the ship, but as stated in Article 27 of UNCLOS, when a ship is navigating through the territorial waters of another state, it is subject to the laws of the coastal state, but the coastal state's ability to exercise criminal jurisdiction over the ship remains limited. There is no generally accepted legal text or directive on how to conduct an assessment in the event of a death associated with a forensic cause. When a judicial incident occurs on the high seas, i.e. on board ships sailing in international waters, the procedure to be applied to these incidents and the procedure to be followed in cases of death is not clearly known. Criminal or disciplinary proceedings against the master or any other person in the service of a ship in an incident giving rise to criminal or disciplinary liability in international waters can be instituted against such persons only before the judicial or administrative authorities of either the State whose flag the ship flies or the State of nationality of such persons (Article 97 UNCLOS).

### *c. Solutions to Medical and Legal Problems Encountered on Ships*

#### *1. What to do in Injury Cases*

Injuries on marine vessels can occur from many different origins. Occupational accidents, interpersonal violation of physical integrity or in-vehicle accidents are some of them. In cases where physical integrity is violated, the injury can be caused by a blunt instrument or with the help of tools such as knives, guns, etc. After first aid has been administered to the injured person, the shape of the wound shape, its dimensions (width, length and depth) should be photographed and videotaped, if possible with the help of a scale (such as a coin or ruler). In addition, security camera footage, which is material evidence for a criminal case, should also be recorded and stored. Injuries can also occur due to in-vehicle accidents. In such injuries, considering the severity of the injury and the possibility of legal problems regarding fault, the findings of the injury should be photographed and videotaped with the help of a scale (such as a coin or ruler), if possible, and the security camera records of the incident should be kept, if any. Another cause of injuries on board a vessel are occupational accidents. Although IMO guidelines are available for these accidents, injury findings should also be documented for legal liability afterwards, witness statements and video recordings, if any, should be kept.

#### *2. What to do in Death Cases*

In the case of death on board a seagoing vessel, it is very important to distinguish whether the death was a natural death or a forced death. In cruise-type passenger ships where a physician works on board, the diagnosis of death can be made by a classical examination of the deceased by the physician. However, in suspicious cases where the cause of death cannot be determined, in cases of death due to forensic reasons and allegations such as possible differences in the cause of death, it would be more appropriate that a forensic death examination is performed on the deceased by forensic medicine specialists. In such cases, in addition to body evacuation, forensic necropsy at the scene by the judiciary, law enforcement and experts will make an important contribution to the forensic process. In case a physician is not available, the body should be evacuated to land as soon as possible. However, if a death occurs on a ship that cannot interrupt its route and in international waters, such as dry cargo ships, the death examination of the corpse and crime scene investigation cannot be performed immediately. In such cases, detailed photographs and video recordings of the corpse should be taken as a whole and as described in the topic "What to Do in Injury Cases", and if there are traumatic

findings, a scale (such as a coin or ruler) should be used to assess the size of the injury. Security camera records of the time and place of death should be kept. The clothes of the deceased should be removed without damaging them and stored in a cardboard box. If the clothes are wet, they should be dried in the sun and then stored. If the body cannot be evacuated, it is important to keep the body in a refrigerated section until disembarkation, considering that all findings will be lost as a result of decomposition.

***3. What to do in Case of Sexual Assault***

In cases of sexual assault, the first thing to do is to take the victim to a safe environment and fulfill their needs. This means addressing the physical and psychological needs of the victim, which requires professional assistance.

Due to the duration and means of sea voyages, ships do not have the possibility to change their routes. Therefore, waiting for a physical evaluation by an expert after an allegation of sexual assault on board has been made means the loss of evidence that could be detected after the incident. The steps to be taken to protect the evidence after the first aid in sexual assaults with the guidance of experts can be listed as follows;

- The clothes of the victim of sexual assault worn at the time of the incident should be taken and kept in a cardboard box in a non-humid environment, if wet, they should be kept after drying in the sun.

- Numerous photographs should be taken in a brightly lit environment of the body parts where contact is alleged to have taken place in the sexual assault as a whole and in detail and from different angles, and video recordings should be taken as far as possible, and internationally recognizable materials (coins, rulers, etc.) should be used for scaling general body photographs.

- Samples should be taken with a swab from areas where the suspect's body fluids (such as saliva, ejaculate) can be transmitted.

- The swabs should be taken separately and the relevant areas where they are taken from must be written down.

- The specimens should be stored in a cold and non-humid protected place.

***4. Expanding the Use of Tele-Health***

One of the solution proposals for forensic medical situations that are likely to occur at sea is to have a Forensic Medical Telehealth Application that can receive help and support in forensic medical situations, even if there is a physician or other healthcare professionals on board. Telemedicine, also known as telehealth, is called the arranging treatment from a ship to a hospital anywhere in the world through satellite connections, which has been used more and more with the COVID-19 Pandemic [17]. It is considered to be a very necessary practice for ship passengers and employees due to the time away from the shore and the limited access to quality health services. The advanced development of current technology and the availability of internet connections and technical infrastructure on every ship is the most important issue that will facilitate the implementation. The number of studies on forensic medical events encountered in marine vessels in the literature is insufficient. Considering the increase in international trade and costs, the use of ships, which are the most frequently used means of transfer, is increasing. In addition to the increase in cargo ships, there is also an increase in the number of passenger ships and passengers. When all these issues are evaluated together, scientific studies on forensic medical and legal problems encountered on board ships will provide guidance to responsible institutions.

***5. Recommendations from a Legal Perspective***

Although there is no uniform international standard of medical care on passenger ships and no standard training requirement for passenger ship doctors, the preparation of a guideline, for example, under the leadership of the IMO, would play an important role in complying with the accepted standards. The guidelines issued by the American Board of Emergency Physicians are an important example in this context. There are certain directives on first aid and the occupational health of employees in marine vessels issued by IMO. These guidelines are updated from time to time and meet the needs to a certain extent. However, there are not enough guidelines or training on medical issues other than first aid and especially forensic medical issues. The fact

that the ship's flag belongs to different states, the ship's location on the coast of different states or the lack of a standard approach to be followed in forensic cases in international waters causes legal deadlocks. The relevant regulations need to be updated to provide solutions to such legal problems. Coastal States are not obliged to report illegal acts committed by foreign flagged vessels outside their territorial jurisdiction. Bilateral or multilateral agreements can be concluded to increase cooperation between states on this issue. However, coastal states have rescue obligations. According to Article 98 of the UNCLOS; every coastal State shall promote the establishment, operation and maintenance of an adequate and effective search and rescue service regarding safety on and over the sea and, where circumstances so require, by way of mutual regional arrangements cooperate with neighbouring States for this purpose. Another legal suggestion is to eliminate the legal confusion in cases of injury, murder or sexual assault in international waters. To illustrate the issue with an example; if a Filipino worker on a Turkish-flagged ship is killed by another worker of Egyptian nationality while the ship is sailing in international waters, it is not clear which country's legal system will prevail over the trial. In such cases, internationally recognized decisions in the field of the Law of the Sea should be taken and uncertainties should be eliminated. In terms of telehealth practice, it will be important to establish guidelines that will be generally accepted by organizations such as IMO and to provide a standard telehealth service to ships both in international waters and within the coastlines of states. In terms of telehealth practice, it will be important to establish guidelines that will be generally accepted by organizations such as IMO and to provide a standard telehealth service to ships both in international waters and within the coastlines of states.

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ORIGINAL ARTICLE

# Evaluating the effectiveness of video training for health professionals on the use of personal protective equipment

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**Abstract**

The study aimed to evaluate the effectiveness of video training for health workers on the use of personal protective equipment. A training video was prepared on the use of personal protective equipment against Covid-19. The effectiveness of the training was evaluated by comparing the pre-post-training scores obtained from the online application, questionnaire form, and self-assessment knowledge level form developed by the researchers. Video training and collection of research data were carried out through the online joint training module used in the relevant hospitals. The study was completed with 558 health workers. The findings showed that the participants' questionnaire form, self-assessment of knowledge level form, and the online application scores increased statistically significantly after the video training ($p$<0.001). The majority of the health workers (71.3% n=398) completed the application in a shorter time after the video training ($p$<0.001). A significant relationship was found between online application and questionnaire scores ($p$<0.05). The study showed that video training led to an increase in health workers' scores on the questionnaire form, online application and self-assessment forms. Video training can be used as an effective training method in pandemic periods when face-to-face training is undesirable due to the risk of transmission.

**Keywords:** COVID-19, educational activities, employee safety, healthcare workers, personal protective equipment

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## Introduction

The novel coronavirus [COVID-19] infection that appeared in Wuhan, China has turned into a pandemic, resulting in 489.779.062 infected people and 6.152.095 deaths worldwide since December 2019 [1,2]. It has been determined that the COVID-19 virus is primarily transmitted from infected people to others that are in close contact via respiratory droplets [3,4]. The rapid spread of the virus has required isolation to prevent contact with the virus in almost all countries [2]. In this process, health workers have taken on a heavy responsibility for struggling with the pandemic by providing treatment and care for infected patients at high risk of contact [5]. While fulfilling this responsibility, health workers have to prevent the spread of the virus and ensure both their safety and patient safety [6]. However, it has been reported that there are health workers who have got infected and died while performing their duties worldwide [7]. According to the Chinese National Health Commission figures, more than 3300 health workers have been infected since the beginning of March 2019, and at least 22 health workers died by the end of February. In Italy, 20% of health workers have been reported to be infected [5]. In Türkiye, the number of infected health workers was recorded as 7428 by April 30, 2020 [8]. In this process, health workers must use personal protective equipment (PPE) appropriately to reduce the virus load they are exposed to, thus protecting themselves and the patients they care for from infection [9]. It was detected that many health workers become infected as a result of not using PPE or not donning and doffing this equipment appropriately[10]. However, the rapid increase in the number of cases caused health professionals to face difficulties in accessing information about the use of PPE [5]. Personal protective equipment is routinely used during medical interventions. However, contamination can occur easily if the necessary procedures for the use of this equipment are not followed [10,11]. Therefore, health workers should be trained about the correct use of PPE, and their competence should be improved [12,13]. However, the rapid spread of the virus during the COVID-19 pandemic made group training risky for the spread of infection. On the other hand, the high number of cases has made it an essential need for health workers to access information in a short time, and the time issue has been a limiting factor for planning training events. The study aimed to evaluate the effectiveness of video training for health workers on the use of PPE(Personal Protective Equipment) against COVID-19. While the level of knowledge in video and internet-based training can be measured with questionnaires, new tools are required to determine skill development. In line with this requirement, the effectiveness of video training was evaluated with the pre-test post-test application and the online application created within the scope of the research.

## Materials and Methods

### Ethical Approval

Ethics committee approval (24237859-280) from the Scientific Research Ethics Committee of a public university and institutional permission (No: 2020-04-30T15 03 46) from the Provincial Health Directorate for hospitals affiliated to the Ministry of Health was obtained to carry out the research. Health workers were informed about the purpose and content of the study before replying to the research questions (Table 1). Prior to their inclusion in the study, all the participants gave their informed consent by clicking the consent button, which is compulsory to proceed to other questions.

### Participants

The population of the study was health workers (physician, nurse, anesthesia technician, midwife, and emergency medical technician) working in eight hospitals affiliated to the Provincial Health Directorate and providing health services to COVID-19 patients /suspected cases. It was aimed to reach the whole population without using a sampling method.

### Video Training

The training video used in the study was recorded in a fully equipped simulation center by a team of emergency medicine specialists, intensive care specialists, and academic research nurses. The video was prepared by reviewing the national and international guidelines on

**Table 1.** Study Questions.

| |
|---|
| 1. Which of the following options is incorrect about maintaining hand antisepsis during PPE donning? |
| 2. Which of the following options is the correct order of PPE donning? |
| 3. Which of the following options is correct about the use of PPE? |
| 4. Which of the following options is the correct order of PPE doffing? |
| 5. Which of the following options is correct about the PPE doffing areas (dirty, semi-dirty, clean area). |
| 6. Which of the following options is incorrect about maintaining hand antisepsis during PPE doffing? |

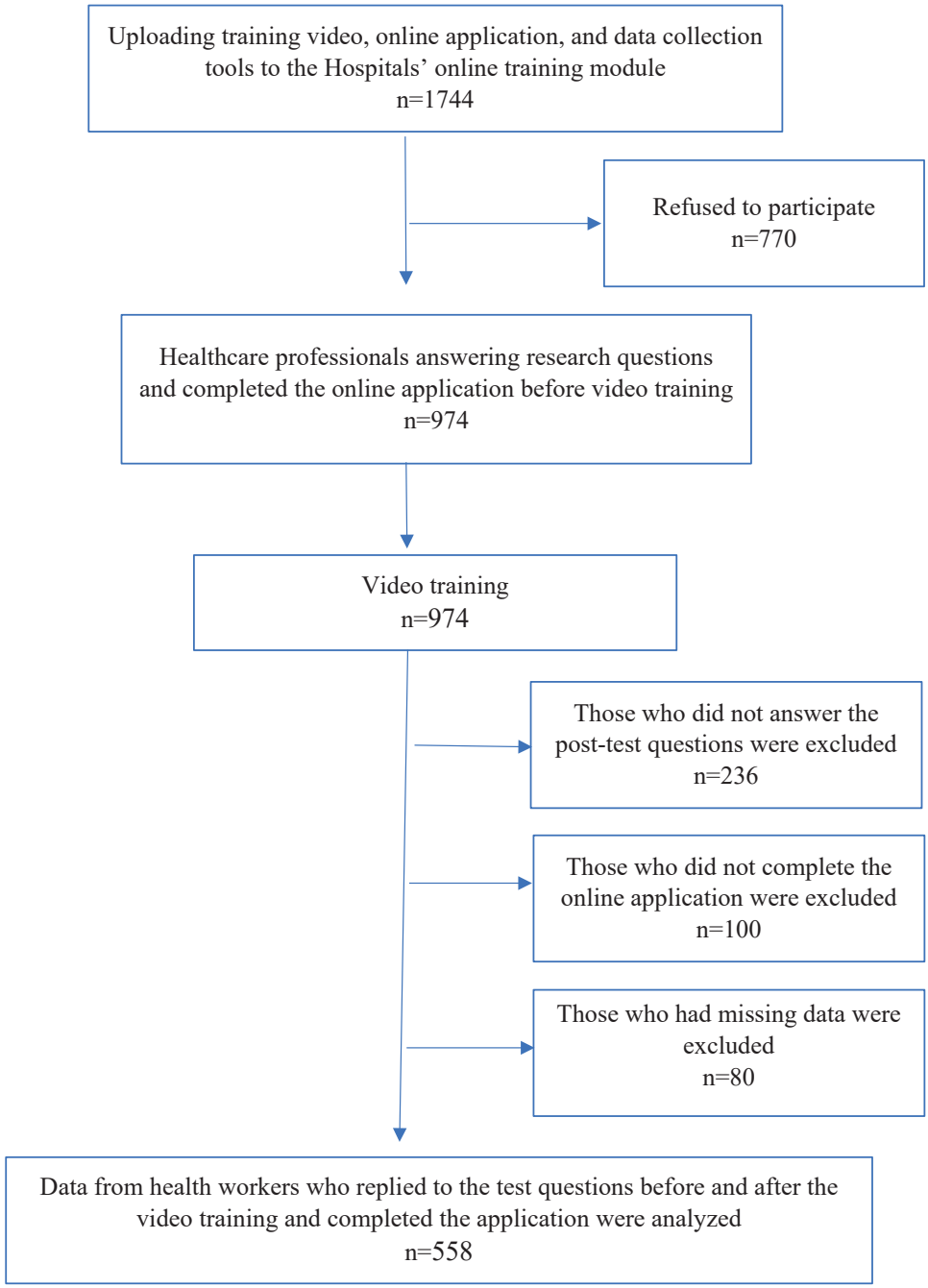


**Figure 1.** Flow diagram.

the use of PPE for protection from COVID-19 infection [14-16]. The video includes the order of PPE donning and doffing, the things to pay attention, and the presentation of educational information on where each piece of equipment should be removed (dirty, semi-dirty, clean area) (to access to the video, the responsible author can be contacted).

**Online Application**

For the study, an online application was developed covering the order of PPE donning and doffing and which equipment should be removed in which area. The application was prepared through the ClassMarker (https://www.classmarker.com) application. The online application includes 10 applications for the order of PPE donning (hand disinfection included), 14 applications for the order of PPE doffing (hand disinfection included), and 14 applications for PPE doffing areas (clean area, dirty area, and semi-dirty area) and matching applications. Health workers got one point for each PPE donning and doffing activity in the correct order and area. The total score that health professionals can get from the applications is a minimum of 0 and a maximum of 38 points.

The online application was evaluated with a pilot application with 10 volunteer health workers who were not included in the sampling. It was observed the disinfectant image could not be understood in the application, so it was replaced with a different one. In the pilot application, it was also determined that health workers completed the application in an average of 10 minutes. Considering this data, the maximum time to be given to health workers to complete the application was determined as 10:35 seconds. The online application link has been uploaded to the online joint training module of the hospitals affiliated to the Provincial Health Directorate.

**Survey Administration**

In the city where the study was carried out, an online training module service is provided by the hospital directorate affiliated to the Provincial Health Directorate. Health workers can access this module with their passwords on corporate personnel pages. The training module is used for health workers to access up-to-date information, to follow announcements regarding training activities. The training video, online application, and data collection tools were uploaded to this training module. Health workers were informed about the study by the responsible person of their unit. Within the scope of the research, health workers first replied to the questionnaire, then completed the online application and then watched the training video. After the video, the research questions were replied again, and the application was completed (Figure 1).

**Statistical Analysis**

The data were analyzed using the IBM Statistical Package for Social Sciences (IBM SPSS; Armonk, NY, USA) program. Categorical data were presented with numbers and percentages. Normal distribution was evaluated with the *Kolmogorov Smirnov* test. Categorical variables of dependent groups were analyzed using the *McNemar* test. In quantitative data analysis, the *Wilcoxon* test was used for dependent group comparison, and the *Mann Witney U* test and *Kruskal Wallis* analysis of variance tests were used for independent group comparison. The application scores of those who were successful in the pre and post-test were evaluated by ROC analysis. The relationship between pre-test, post-test, application, and self-assessment scores of knowledge level was analyzed using *Spearman* correlation analysis. In the correlation analysis, the correlation coefficient values were accepted as follows, 0.00-0.10 no relationship; 0.10-0.39 a weak relationship; 0.40-0.69 a moderate relationship; 0.70-0.89 strong relationship; and 0.90-1.00 a very strong relationship [18]. Statistical alpha significance level was accepted as $p<0.05$.

## Results

For the study, the training video, online application, and data collection tools were uploaded to the corporate personnel page of 1744 health workers. 974 of the health workers agreed to participate in the research. 236 of them did not respond to the post-test, 100 did not complete the online application before and after the training, and data from 80 of the health professionals were missing, so they were excluded from the study. The results of the research were reported

in line with the analysis of the data of 558 health workers who replied the test questions before and after the video training and completed the application. The descriptive characteristics of the health workers participating in the study are presented in Table 2.

The median age of the health workers was 40 (min: 20, max: 64), and the median years of professional experience was 16.5 (min: 1, max: 44). 76.7% of the health professionals were female, 70.6% were nurses, 57.9% had undergraduate education, and 54.5% were employed in state hospitals in districts (Table 2).

**Table 2.** Descriptive characteristics of health workers (n=558).

| | n | % |
|---|---|---|
| **Age** | | |
| 18-40 | 291 | 52.2 |
| ≥41 | 267 | 47.8 |
| **Years of professional experience** | | |
| 1-5 | 75 | 13.4 |
| 6-10 | 98 | 17.6 |
| 11-15 | 86 | 15.4 |
| 16-20 | 91 | 16.3 |
| ≥20 | 208 | 37.3 |
| **Gender** | | |
| Female | 428 | 76.7 |
| Male | 130 | 23.3 |
| **Marital Status** | | |
| Married | 426 | 76.3 |
| Single | 132 | 23.7 |
| **Educational Level** | | |
| High School/ Associate Degree | 155 | 27.8 |
| Undergraduate Degree | 323 | 57.9 |
| Post graduate degree | 80 | 14.3 |
| **Occupation** | | |
| Physicians | 68 | 12.2 |
| Nurse | 394 | 70.6 |
| Midwife | 60 | 10.8 |
| AT* | 25 | 4.5 |
| EMT** | 11 | 2.0 |
| **Location of the hospital** | | |
| Center | 254 | 45.5 |
| District | 304 | 54.5 |

* Anesthesia Technician ** Emergency Medical Technician

**Table 3.** Distribution of correct responses in pre-test and post-test (n=558).

| Questions | Pre-test | | Post-test | | *p* |
|---|---|---|---|---|---|
| | n | % | n | % | |
| Maintaining hand antisepsis during PPE donning | 440 | 78.9 | 481 | 86.2 | <0.001 |
| The order of PPE donning | 255 | 45.7 | 482 | 86.4 | <0.001 |
| The use of PPE | 255 | 45.7 | 482 | 86.4 | <0.001 |
| The order of PPE doffing | 284 | 50.9 | 449 | 80.5 | <0.001 |
| PPE doffing areas | 279 | 50.0 | 454 | 81.4 | <0.001 |
| Maintaining hand antisepsis during PPE doffing | 376 | 67.4 | 415 | 74.4 | 0.001 |

*Mc-Nemar* Test

**Table 4.** Comparison of pre-post video training self-assessment of the knowledge level scores, questionnaire scores and online application scores (n=558).

| | n | Mean rank | z | Pre-training Median (IQR) | Post-training Median (IQR) | *p* |
|---|---|---|---|---|---|---|
| **Questionnaire scores** | | | | | | |
| -Ranks | 50 | 123.68 | -15.998 | 30.0 (30.0) | 50.0 (20.0) | <0.001 |
| +Ranks | 390 | 232.91 | | | | |
| Ties | 118 | | | | | |
| Total | 558 | | | | | |
| **Self-assessment of knowledge level scores** | | | | | | |
| -Ranks | 78 | 137.72 | -7.170 | 8.0 (2.0) | 9.0 (2.0) | <0.001 |
| +Ranks | 208 | 145.67 | | | | |
| Ties | 272 | | | | | |
| | Total | 558 | | | | |
| **Application scores** | | | | | | |
| -Ranks | 91 | 147.70 | -16.317 | 10.0 (16.0) | 23.5 (11.0) | <0.001 |
| +Ranks | 445 | 293.20 | | | | |
| Ties | 22 | | | | | |
| | Total | 558 | | | | |
| **The duration of application (min.)** | | | | | | |
| -Ranks | 398 | 281.35 | -12.238 | 583.5 (179) | 414.0 (208) | <0.001 |
| +Ranks | 128 | 207.99 | | | | |
| Ties | 32 | | | | | |
| | Total | 558 | | | | |

*Wilcoxon* Signed Rank Test

**Table 5.** Relationship between online application and questionnaire scores (n=558).

| | Pre-training application score | | | Post-training application score | | | |
|---|---|---|---|---|---|---|---|
| Pre-training application score | Order of PPE donning | Order of PPE doffing | Appropriate areas for PPE donning and doffing | Post-training application score | Order of PPE donning | Order of PPE doffing | Appropriate areas for PPE donning and doffing |
| Order of PPE donning | R 0.294 | - | - | Order of PPE donning | r 0.114 | - | - |
| | *p* 0.000 | - | - | | *p* 0.007 | - | - |
| Order of PPE doffing | R - | 0.147 | - | Order of PPE doffing | *r* - | 0.183 | - |
| | *p* - | 0.01 | - | | *p* - | 0.000 | - |
| Appropriate areas for PPE donning and doffing | R - | - | 0.117 | Appropriate areas for PPE donning and doffing | *r* - | - | 0.111 |
| | *p* - | - | 0.006 | | *p* - | - | 0.009 |

*Spearman* Correlation Analysis

**Table 6.** Distribution of pre and post-training self-assessment of knowledge level, application and questionnaire scores according to the descriptive characteristics (n=558).

| | | **Pre- training** | | **Post-training** | | ***p*** |
|---|---|---|---|---|---|---|
| **Questionnaire scores** | | **Mean rank** | **Median (IQR)** | **Mean rank** | **Median (IQR)** | |
| Age* | 18-40 | 275.04 | 30.0 (30.0) | 286.91 | 50.0 (20.0) | <0.001 |
| | ≥41 | 284.36 | 30.0 (30.0) | 271.43 | 50.0 (20.0) | <0.001 |
| | | *p*=0.487 | | *p*=0.228 | | |
| Professional experience (years)** | 1-5 | 270.23 | 30.0 (30.0) | 272.43 | 50.0 (20.0) | 0.295 |
| | 6-10 | 282.72 | 30.0 (20.0) | 310.05 | 60.0 (12.5) | <0.001 |
| | 11-15 | 278.92 | 30.0 (22.5) | 258.36 | 50.0 (20.0) | 0.186 |
| | 16-20 | 275.90 | 30.0 (30.0) | 278.69 | 50.0 (20.0) | 0.031 |
| | ≥20 | 283.14 | 30.0 (30.0) | 276.75 | 50.0 (20.0) | <0.001 |
| | | *p*=0.978 | | *p*=0.207 | | |

**Table 6.** Distribution of pre and post-training self-assessment of knowledge level, application and questionnaire scores according to the descriptive characteristics (n=558). continue

| | | | | | | |
|---|---|---|---|---|---|---|
| Gender* | Female | 285.63 | 30.0 (30.0) | 284.22 | 50.0 (20.0) | 0.012 |
| | Male | 259.32 | 30.0 (20.0) | 263.97 | 50.0 (20.0) | <0.001 |
| | | *p*=0.097 | | *p*=0.182 | | |
| Education ** | High school/Associate degree | 263.81 | 30.0 (30.0) | 247.53 | 50.0 (20.0) | 0.002 |
| | Undergraduate degree | 288.55 | 30.0 (30.0) | 292.50 | 60.0 (20.0) | <0.001 |
| | Post-graduate degree | 273.36 | 30.0 (20.0) | 288.97 | 55.0 (20.0) | 0.031 |
| | | *p*=0.260 | | *p*=0.008 | | |
| Self-assessment of knowledge level score | | | | | | |
| Age* | 18-40 | 268.59 | 8.0 (2.0) | 266.19 | 9.0 (1.0) | <0.001 |
| | ≥41 | 291.39 | 8.0 (2.0) | 294.01 | 9.0 (2.0) | <0.001 |
| | | *p*=0.089 | | *p*=0.036 | | |
| Professional experience (years)** | 1-5 | 243.43 | 8.0 (2.0) | 272.31 | 9.0 (1.0) | <0.001 |
| | 6-10 | 279.59 | 8.0 (2.0) | 256.86 | 8.5 (2.0) | 0.127 |
| | 11-15 | 277.46 | 8.0 (2.0) | 251.05 | 8.0 (2.0) | 0.166 |
| | 16-20 | 290.85 | 8.0 (1.0) | 297.38 | 9.0 (2.0) | <0.001 |
| | ≥20 | 288.35 | 8.0 (2.0) | 296.70 | 9.0 (2.0) | <0.001 |
| | | *p*=0.283 | | *p*=0.068 | | |
| Gender* | Female | 278.17 | 8.0 (2.0) | 281.23 | 9.0 (2.0) | <0.001 |
| | Male | 283.89 | 8.0 (2.0) | 273.82 | 9.0 (1.0) | 0.001 |
| | | *p*=0.718 | | *p*=0.637 | | |
| Education ** | High school/Associate degree | 290.30 | 8.0 (2.0) | 292.81 | 9.0 (2.0) | <0.001 |
| | Undergraduate degree | 272.63 | 8.0 (2.0) | 273.19 | 9.0 (1.0) | <0.001 |
| | Post-graduate degree | 286.32 | 8.0 (1.8) | 279.18 | 9.0 (1.8) | 0.020 |
| | | *p*=0.476 | | *p*=0.440 | | |

**Table 6.** Distribution of pre and post-training self-assessment of knowledge level, application and questionnaire scores according to the descriptive characteristics (n=558). continue

| Application score | | | | | | |
|---|---|---|---|---|---|---|
| Age* | 18-40 | 297.42 | 11.0 (14.0) | 293.98 | 24.0 (10.0) | <0.001 |
| | ≥41 | 259.97 | 9.0 (16.0) | 263.72 | 23.0 (13.0) | <0.001 |
| | | *p*=0.006 | | *p*=0.027 | | |
| Professional experience (years)** | 1-5 | 278.46 | 10.0 (9.0) | 305.55 | 24.0 (10.0) | <0.001 |
| | 6-10 | 319.31 | 13.0 (11.3) | 321.30 | 25.0 (7.3) | <0.001 |
| | 11-15 | 268.41 | 10.0 (16.3) | 275.94 | 24.0 (11.0) | <0.001 |
| | 16-20 | 301.32 | 11.0 (19.0) | 258.31 | 23.0 (13.0) | <0.001 |
| | ≥20 | 256.16 | 8.0 (16.8) | 261.15 | 22.0 (13.0) | <0.001 |
| | | *p*=0.014 | | *p*=0.012 | | |
| Gender* | Female | 283.50 | 10.0 (15.8) | 287.59 | 24.0 (11.8) | <0.001 |
| | Male | 266.34 | 10.0 (15.0) | 252.86 | 22.0 (8.0) | <0.001 |
| | | *p*=0.287 | | *p*=0.031 | | |
| Education ** | High school/Associate degree | 266.47 | 9.0 (15.0) | 265.80 | 23.0 (13.0) | <0.001 |
| | Undergraduate degree | 286.33 | 10.0 (16.0) | 285.57 | 24.0 (11.0) | <0.001 |
| | Post-graduate degree | 277.16 | 10.0 (11.8) | 281.53 | 24.0 (11.0) | <0.001 |
| | | *p*=0.447 | | *p*=0.451 | | |

* *Mann Witney U* test; ** *Kruskal-Wallis*

In the study, health workers were asked six questions regarding the use of PPE while providing treatment and care for COVID-19 patients/suspected cases (Table 1). The results showed that the post-video training ratio of correct responses increased significantly compared to the pre-training ($p$<0.05) (Table 3). 93.4% (n=521) of the health workers stated that they had received training on the use of PPE. The duration of application before video training of those who had training about the use of personal protective equipment before (median=600sec; min=180sec, max=619sec) was longer than those who had not (median=467sec; min=163sec, max=604sec), and the difference between them was statistically significant ($p$=0.08) No significant difference was found between those who had received training on PPE use and those who had not in terms of pre and post-video training questionnaire score, application scores, self-assessment of the knowledge level scores, and the duration of the application ($p$>0.05).

The study revealed that participants' questionnaire scores, self-assessment of knowledge level scores, and application scores increased statistically significantly after the video training ($p$<0.001). It was also determined that the majority of health workers (71.3% n = 398) completed the application in a shorter time after the video training than before the training ($p$<0.001) (Table 4).

A significant ($p$<0.05) and weak (0.10<$r$<0.39) relationship was found between pre and post-training scores regarding the order of PPE donning and doffing, and the online application scores of the appropriate areas for PPE donning and doffing (Table 5).

Besides, a negative, significant and moderate level relationship was seen between the duration of the application and the scores obtained from the application before training ($p$<0.001, $r$= -0.568), and a negative significant but weak correlation was found after the training ($p$<0.001, $r$= -0.149) (Table 5). Questionnaire, application, and self-assessment of knowledge level scores according to the descriptive characteristics of health professionals are presented in Table 6.

The study demonstrated that the questionnaire scores of those with 1-5 years and 11-15 years of professional experience increased after the video training, but the increase was not significant ($p$>0.05). No significant change was seen after the video training in the self-assessment of knowledge level scores of health workers with 6-15 years of professional experience ($p$>0.05). It was found that questionnaire, application, and knowledge level self-assessment scores significantly increased after video training in all other subgroups created according to the descriptive characteristics ($p$<0.05). The in-group comparisons demonstrated that the post-test scores of those with undergraduate education were significantly higher than those with high school/associate degree education ($p$=0.007). After the training, self-assessment scores of knowledge level were found to be higher in the group above 41 years of age ($p$=0.036). The pre and post-training application scores were higher in the 18-40 age group ($p$<0.05). The pre (p=0.014) and post-training ($p$=0.023) application scores of those with 6-10 years of professional experience were significantly higher than those with more than 20 years of professional experience. It was also seen that the application scores of the female participants women after the training were higher than the males ($p$=0.031).

## Discussion

This study, in which the effectiveness of the video training prepared to inform health professionals responsible for the care of COVID-19 cases on the use of PPE was evaluated, showed that questionnaire, application, and self-assessment of knowledge level scores of the participants increased significantly after the video training. The self-assessment of the knowledge level post-training scores were higher in the group above 41 years old. On the other hand, pre and post-training online application scores were higher in health workers in the 18-40 age group than the others. Besides, a significant but weak correlation was determined between questionnaire scores and the online application scores, created to evaluate the effectiveness of video training. The study revealed that the ratio of correct responses given to questionnaire about the use of PPE while health workers were providing treatment and care for COVID-19 patients/suspected cases

increased significantly after the video training compared to the pre-training. Similarly, Hon et al. reported that online courses prepared for health professionals increased the level of knowledge and improve the appropriate PPE selection and using skills [19]. Christmann et al. suggested that better results can be obtained if video training on PPE use is supported by different training techniques[20]. The results of the study show that video-based training can be used as an effective method for the training of health workers in pandemic periods when face-to-face training poses a risk in terms of infection spread. The results of the study showed that the majority of health workers had an increase in the questionnaire, online application, and self-assessment scores after training; however, there were also health workers whose scores did not change or decreased after video training. This situation may have resulted from inappropriate learning conditions and negligent attitude of health workers due to hospital environment. In this respect, it is thought that if the hospital administrations provide a suitable environment and the necessary time health workers to attend the training through the training module, it will make a significant contribution to the training outcomes. A significant but weak relationship was determined between pre and post-training questionnaire scores and application scores in the study. Hung et al. indicated that the educational simulation application for the use of PPE can be used as an effective tool in increasing and measuring the knowledge level [12]. Prior to this study, health professionals were not informed about how to use the online application. In addition, the time allocated to complete the online application is limited to 10:35 seconds, and if the time goes out of time, the system deactivates the user. It is thought that the weak relationship between questionnaire score and application scores determined in the study may be due to these reasons. The participants who had previously been trained on the use of PPE completed the online application in a shorter time, and the duration of the participants to complete the application was shorter after the training. The use of personal protective equipment is a routine part of health professionals' duties. However, the rapid transmission of COVID-19 infection requires special use of PPE other than routine applications while providing care for COVID-19 cases. Therefore, health professionals should be trained on the subject. The results obtained from this study show that the effectiveness of PPE usage can be increased through repeated training. In the study, the self-assessment scores of the knowledge level were found to be higher in the group over 41 years of age than the others. This situation seems to be related to the fact that the group over the age of 41 has more professional experience and knowledge than other health workers. Besides, online application scores were higher in the 18-41 age group. Prensky (2001) defined the generations familiar with digital technology as digital natives and those who are not as digital immigrants [21]. Those born after 1980, called digital natives, are more likely to use technology products than previous generations, called digital immigrants[22]. The difference seen in the study may have resulted from this difference between generations.

**Limitations**

Training activity could not be evaluated at specific time intervals in the study, which creates a limitation for the research. In addition, the fact that health workers were not given preliminary information about the online application, the video training was watched only once, and the change in the skill level of health professionals could not be evaluated objectively are other limiting features of the study. Another limitation is that the study provided health professionals with only online video training and did not compare it with any other training method.

## Conclusion

Video-based training is an effective and practical method that can provide quick access to the information needed by health professionals in pandemic conditions where group training cannot be carried out due to high contagiousness and rapid spread. However, there is a need to develop valid measurement tools to evaluate the effectiveness of this training in terms of knowledge and skill development.

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There is no conflict of interest between the authors.

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REVIEW

# Contribution of mobile health technologies to public health in rural areas: Accessibility and education methods

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**Abstract**

In today's rapidly advancing world, mobile health services have become influential in various aspects of our lives. It is anticipated that mobile applications, especially in rural areas, can play a significant role in the delivery of healthcare services. In this context, it is essential to examine the applications of mobile health services in rural areas and the education methods employed in these applications. The main objective of this study is to explore the contributions of mobile health services applications in rural areas to public health and to examine the education methods used in these services in light of current literature. The focus of this study is on how mobile health applications can be utilized in rural areas, the impact of this usage on public health, and the effectiveness of the education methods employed. The research was conducted through searches using key terms such as "mobile health" and "public health nursing" or "mobile health technologies" and "nursing" or "telehealth" on important academic databases like Google Scholar, PubMed free fulltext, Science Direct, Ebscohost, Sage, Scopus, and CINAHL. The information obtained from literature searches was analyzed to understand the impact of mobile health applications on public health in rural areas and the education methods employed. The study results indicate that the use of mobile health applications in rural areas can contribute significantly to public health. Advantages such as rapid diagnosis and treatment, effective monitoring of chronic diseases, and quick access to emergency services stand out among the potential impacts of mobile health applications. Mobile health applications can contribute significantly to public health in rural areas and increase their usage, particularly in primary healthcare services.

**Keywords:** Mobile applications, rural areas, public health, nursing

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## Introduction

In today's rapidly evolving world, technology is advancing swiftly and finding its place in every aspect of our lives, including healthcare services. Simultaneously, the increasing use and cost-effectiveness of mobile technologies have made them attractive for use in healthcare services [1]. Mobile applications are programs encompassing software, hardware, and internet connectivity on portable devices such as smartphones and tablets, becoming almost integral to people's lives [2]. Mobile health, in brief, involves the execution of health services through programs installed on devices like phones and tablets [3]. Digital health is defined as the field of knowledge and application related to the development and use of digital technologies to improve health across the spectrum of health technologies and services offered in care, including telehealth, mobile health applications, wearable technologies, and online health [4]. Digital health technologies serve as a significant transformational tool in public health nursing. Technologies such as telehealth, mobile health (mHealth), electronic health records, and artificial intelligence facilitate nurses in providing patient monitoring, health education, and counseling services. For instance, telehealth applications allow nurses to conduct remote patient assessments and provide support for the management of individuals with chronic illnesses [5]. Furthermore, technological innovations enhance the accessibility of health services, especially for individuals residing in rural and hard-to-reach areas. Telehealth and mobile health applications contribute to reducing health inequalities by facilitating access to specialized health services for these individuals [6]. The primary aim of this study is to examine the contributions of the implementation of mobile health services in rural areas to public health and to explore the education methods used in mobile health services, considering the current literature.

## Materials and Methods

Searches were conducted on major academic databases such as Google Scholar, PubMed free fulltext, Science Direct, Ebscohost, Sage, Scopus, and CINAHL using keywords including "mobile health" AND "public health nursing" OR "mobile health technologies" AND "nursing" OR "telehealth" AND "public health nursing" OR "m-health" AND "nursing" and their Turkish translations.

## Literature Review

### *Definition of Mobile Health*

Mobile health is an integrated health service covering a wide range of electronic devices, including smartphones, tablets, web pages, message services, and all wireless portable electronic devices. It aims to expand the capabilities of both healthcare providers and recipients for interactive integration, with the goal of rapid diagnosis, effective treatment, and low cost [7,8]. In other words, it is an innovative application with benefits such as remote disease management, collection of health-related data, and early warning systems related to diseases and symptoms using mobile communication technology and infrastructure [9].

### *Expected Effects of Mobile Health*

The expected effects of mobile health include faster diagnosis and treatment, increased awareness among individuals for better health, strengthening preventive healthcare services, more rigorous monitoring of individuals with chronic diseases, and easier access to general data and statistics, enabling cost-effective planning, implementation, and measures [10]. Prior to the COVID-19 pandemic, numerous studies demonstrated the benefits of telehealth services. In relation to the cardiovascular community, a meta-analysis conducted in 2017 found that heart failure patients treated via telemedicine in addition to standard in-person care visits had lower all-cause mortality rates, lower rates of heart failure admissions, and a reduction in length of hospital stay compared to patients treated solely through face-to-face approaches [11,12]. This has been attributed to the earlier recognition of symptoms and consequently linked to earlier interventions and guided self-management [12]. Similarly, research in primary care settings has shown that levels of glycosylated hemoglobin (HbA1c) were lower in the telemedicine group compared to standard care settings [12,13]. Technological

innovations, particularly telehealth and mobile health services, are increasing the accessibility of healthcare services, especially for individuals residing in rural and hard-to-reach areas. By delivering specialist healthcare services to individuals in these regions, telehealth and mobile health services contribute to reducing disparities in healthcare access. Consequently, public health nurses are able to serve a broader patient population by overcoming geographical barriers [14,15].

***Stakeholders in Mobile Health Services***

Stakeholders in mobile health services include healthcare professionals (nurses, physicians, midwives, laboratory technicians, etc.), healthcare recipients (patients, family members, healthy individuals), healthcare institutions (nursing homes, retirement homes, hospitals, pharmacies), reimbursement institutions (social security institutions, health insurance companies), pharmaceutical and medical device companies, health-related civil society organizations, and medical call centers [16].

***Applications of Mobile Health***

The applications of mobile health include education (training for healthcare students and care education for patients and their families), point-of-care support and diagnosis (supporting healthcare professionals in the diagnosis and diagnostic process), patient monitoring (tracking response to treatment, checking if medications are taken at the right times, monitoring medication dosages), disease and outbreak surveillance (monitoring infectious diseases and taking precautions against epidemic risks), emergency medical response systems (issuing alerts in accidents and disaster situations), and health information systems (storage and management of all health data) [17,18].

***Mobile Health Applications***

Expanding the scope of healthcare to facilitate 'the ease and comfort of receiving medical care anywhere and anytime' should be our main goal. To achieve this, it is necessary to overcome both geographical barriers and facilitate access to technology [19]. According to data from the International Telecommunication Union, the number of mobile phone users worldwide has exceeded 6 billion, equivalent to 75% of the world's population. In Türkiye, this rate is 96% [20]. An environment where high-quality healthcare is provided with low-cost mobile devices has the potential to change the familiar healthcare world. The potential and spreading opportunities of mobile health are promising, ranging from raising awareness about HIV/AIDS in developing countries to calculating the calories in a "cheeseburger" with various applications [16,21].

***Advantages of Mobile Health Applications***

While there are numerous advantages to mobile health applications, a few are listed below:

- Encourages users to engage in physical activity and take their medications regularly and on time.

- Facilitates the monitoring and recording of individuals' vital signs.

- Reduces healthcare expenses, thus lowering costs.

- Enables individuals to monitor their own health, enhancing their knowledge and skills related to health [7,22].

***Disadvantages of Mobile Health Applications***

- May lead to internet and phone dependency.

- Insufficient cognitive levels of the elderly population may lead to misunderstandings [23,24].

- Excessive or abuse of the Service

- Inadvertent overuse of healthcare resources due to unnecessary visits

- Inequalities in internet use and access to technology between rural communities and ethnic minority groups

- Concerns across personal medical devices [12].

***Effects of Mobile Health Technologies on Rural Areas***

The World Health Organization predicts a global shortage of approximately 13 million skilled health workers by 2035. Additionally, while developed countries have a high number of skilled health workers, this ratio is insufficient in developing countries. Mobile health technologies will serve as a strong driving force in addressing

this inadequacy, especially in rural areas of developing countries [25,26].

Mobile technologies offer numerous opportunities to shape the future of primary healthcare services and provide effective public health action. With improved communication of mobile technologies over time, supported by education, it is possible to create and strengthen a healthy community. The humanitarian problems faced by the rural population in accessing health facilities, such as extreme weather conditions, difficult terrain, lack of roads, transportation difficulties, time loss, financial challenges, crowding, and traffic, will no longer be obstacles addressed by mobile health. Therefore, barriers between healthcare providers and recipients will be lifted, and new bridges will be established for a fast, active, accessible interaction [27,28].

***Measures for the Development and Proliferation of Mobile Health Services***

Mobile health applications and service delivery will complement, and in many places, supplement traditional healthcare services where they fall short. The integrated health paradigm with mobile technologies covering all healthcare services is in the development stage and gaining momentum. Country leaders, by acting swiftly and not only educating healthcare professionals but also their citizens in this direction, can avoid the concerns of countries at risk of collapse in the future healthcare sector [25,29]. Recommendations for the development and proliferation of mobile health services include:

- Setting new goals in the field of mobile health, creating a strategic plan and roadmap, and increasing government support.

- Strengthening communication infrastructure and increasing mobile health literacy.

- Implementing joint plans and programs with the education sector for all ages and disciplines.

- Conducting activities to promote mobile health awareness among the public.

- Encouraging entrepreneurs and supporting R&D projects to increase the development and use of smart health applications.

- Never neglecting security and privacy issues [7,25].

Randomized controlled trials conducted in the last five years on mobile health technologies are listed in table 1.

**Recommendations for Public Health and Nursing Regarding the Use of Mobile Health in Rural Areas**Mobile health applications can contribute significantly to public health in rural areas and increase their usage, particularly in primary healthcare services. The following recommendations should be considered:

***Education and awareness***

Prioritize the education of individuals and healthcare professionals in rural areas to enhance the use of mobile health applications. Healthcare service providers should raise awareness among the public about the benefits of mobile health applications and encourage their usage.

***Infrastructure development***

Strengthening internet access and mobile infrastructure in rural areas is crucial. Healthcare service providers should collaborate with local governments and telecommunications companies to establish robust internet infrastructure in these regions.

***Patient monitoring and chronic diseases***

Mobile health applications can serve as effective tools for monitoring chronic diseases in individuals residing in rural areas. Healthcare professionals can facilitate patient monitoring using mobile health applications, allowing for early intervention.

***Emergency services***

Mobile health applications can assist in the effective delivery of emergency services to rural areas. Quick alert and assistance systems can be established through mobile health applications in accidents, natural disasters, and other emergency situations

***Accessibility for the elderly population***

Ensuring that mobile health applications are user-friendly for the elderly population is essential. Applications should feature simple interfaces, large fonts, and user-friendly functionalities to enable the elderly to benefit more from this technology.

**Tablo 1.** Randomized Controlled Studies Conducted in the Last Five Years on Mobile Health Technologies

| General ınformation | Population and sample | Methods | Measured criteria | Results |
|---|---|---|---|---|
| Yuting & Xiaodong, (2023) [30] Effectiveness of a mHealth intervention on hypertension control in a low-resource rural setting: a randomized clinical trial | Participants (n = 134; 66 in the intervention group and 68 controls) | The intervention group participants were instructed to use the Wearable Monitoring Device and download a Smartphone Application, which included reminder alerts, adherence reports, medical instructions, and optional family support, for a period of 12 weeks to complete the study. | Individuals from low-resource rural settings in the Hubei province of China were included in the study from health centers, home visits, and community centers. | Among participants with uncontrolled hypertension, individuals randomized to use a monitoring wearable device with a smartphone application had a significant improvement in self-reported hypertension compliance, self-efficacy, life quality, weight loss and diastolic blood pressure, but no change in systolic blood pressure compared with controls. |
| Alsaqer, & Bebis, (2022) [31] Self-care of hypertension of older adults during COVID-19 lockdown period: a randomized controlled trial | Participants (n=120) | A total of 120 participants were randomly allocated to three groups ($n = 40$); interventional group (public health nursing interventions plus m.Health applications) and two control groups (m.Health applications alone group and standard care group). | Participants were enrolled in the study if they were (1) 55 years and above, (2) have follow-up as out-patients of KAUH, (3) had been diagnosed with HTN, (4) on anti-HTN medication—at least one drug, (5) reported that he/she has a personal smartphone (Android)—internet access is not important, and (6) able to read and understand the Arabic language. | This study supports the adoption of technology with nursing intervention as a method of supporting continuity of self-management of chronic illness during the pandemic, and its potential implications for future delivery of health care, not just in Jordan, but across the world. |
| Ebrahimabadi, Rafiei & Nejat, (2021) [32] Can tele-nursing affect the supportive care needs of patients with cancer undergoing chemotherapy? A randomized controlled trial follow-up study | This study focuses on patients undergoing chemotherapy who have sought treatment at the oncology clinic. The total number of participants in the study is 60. | Experimental Group: For the experimental group, a telephone support service was provided twice a week for 15-30 minutes over a two-month period. Control Group: For the control group, the same service was delivered through face-to-face training. | The effects of tele-nursing on the supportive care needs of cancer patients have been measured. | The support service provided via telephone has been found to particularly enhance access to support services for individuals residing in rural areas and reduce the supportive care needs of oncology patients. The average score of supportive care needs in the intervention group was found to be significantly lower than the control group after the intervention ($p<0.05$). |

**Tablo 1.** Randomized Controlled Studies Conducted in the Last Five Years on Mobile Health Technologies- continue

| General ınformation | Population and sample | Methods | Measured criteria | Results |
|---|---|---|---|---|
| Karagöl,(2021)[33] Çevrimiçi eğitim ve danışmanlık yoluyla yapılan postpartum izlemin postpartum depresyon ve postpartum uyuma etkisi: Randomize kontrollü bir çalışma | 62 Women in the Postpartum Period (Experimental: 31, Control: 31) | Experimental Group: Women in the experimental group underwent three online follow-ups (education and counseling) as follows: First Follow-up: Between Postpartum Days 2-5,Second Follow-up: Between Postpartum Days 13-17,Third Follow-up: Between Postpartum Days 30-42.Control Group: Women in the control group received routine follow-ups. | Measurement of the Impact of Online Education and Counseling on Postpartum Depression and Postpartum Sleep | The study concluded that online postpartum education, counseling, and follow-up were effective in preventing postpartum depression and enhancing postpartum sleep. |
| Cai, Gong, He, Hughes, Simoni, Xiao, & Xu. (2020). [34] Mobile texting and lay health supporters to improve schizophrenia care in a resource-poor community in rural China (LEAN trial): randomized controlled trial extended implementation. | 277 community-dwelling villagers (intervention, n=139; wait-listed control group, n=138) | The intervention group received (1) lay health supporters (medication or care supervisors), (2) e-platform (mobile-texting reminders and education message) access, (3) a token gift for positive behavioral changes, and (4) integration with the existing government community-mental health program (the 686 Program) while the wait-listed control group initially only received the 686 Program. Subsequently (in the extended period), both groups received the LEAN intervention plus the 686 Program. The secondary outcomes were symptoms measured during visits to 686 Program psychiatrists using the Clinical Global Impression scale for schizophrenia and functioning measured by trained student assessors using the World Health Organization Disability Assessment Schedule 2.0. Other outcomes included data routinely collected in the 686 | The patient participants of the program were required to (1) be community-dwelling, (2) be enrollees of the 686 Program, (3) have a primary diagnosis of schizophrenia according to the International Statistical Classification of Diseases, Tenth Revision [19] (diagnosis reconfirmed by the 686 Program psychiatrists while they were enrolled), (4) be on oral psychotropic medication, and (5) be residents of 1 of the 9 rural townships. | In an expanded application, interventions involving mobile messaging and healthcare workers in a resource-constrained community setting were found to be more effective than the 686 Program alone in improving medication adherence, alleviating symptoms, and reducing hospital readmissions. |
| Ghodsbin, Javanmardifard, Kaviani&Jahanbin, (2018)[35]. Effect of tele-nursing in the improving of the ultrasound findings in patients with nonalcoholic fatty liver diseases: A Randomized Clinical Trial study | This study focused on 60 patients with non-alcoholic fatty liver disease (NAFLD) who presented to the Gastroenterology outpatient clinic. | The experimental group underwent a 12-week intervention consisting of diet and physical activity monitoring. During the first month, they received bi-weekly phone calls, followed by weekly calls for the next three weeks. The control group did not receive any intervention. | The impact of physical activity and diet monitoring on patients' ultrasound findings was assessed. | Results revealed that the tele-nursing intervention significantly accelerated the improvement process in both liver size and tissue for patients with NAFLD. The findings emphasize the positive effects of remote nursing care in managing and monitoring non-alcoholic fatty liver disease through dietary and physical activity interventions. |

**Tablo 1.** Randomized Controlled Studies Conducted in the Last Five Years on Mobile Health Technologies- continue

| ***General information*** | ***Population and sample*** | ***Methods*** | ***Measured criteria*** | ***Results*** |
|---|---|---|---|---|
| Zhou, Liao, Feng, Ji, Zhao & Wang (2018) [36] Effects of a nurse-led phone follow-up education program based on the self-efficacy among patients with cardiovascular disease | 403 patients with cardiovascular disease: | During a six-month period, the experimental group received telephone follow-up education, with weekly sessions in the first month, bi-weekly sessions in the second and third months, and monthly sessions in the last three months. The control group, on the other hand, received face-to-face education. The patients' self-efficacy levels were measured for the prevention of cardiovascular risks. | Measurement of Patients' Self-Efficacy Levels for the Prevention of Cardiovascular Risks: | The results indicated that telephone follow-up education positively influenced patients' self-efficacy and healthy lifestyle behaviors. |

### *Privacy and security*

Ensuring the privacy and security of data collected through mobile health applications is of paramount importance. Healthcare service providers should implement strict security protocols and educate users on these measures.

### *Collaboration and stakeholders*

Effective collaboration among healthcare professionals, local governments, telecommunications companies, and other stakeholders is crucial for the successful implementation of mobile health applications in rural areas.

### *Community engagement*

The design and implementation of mobile health applications should focus on the needs of rural communities. Community engagement and feedback can contribute to making applications more effective and user-friendly.

### *Relevant legislation and policies*

Establishing and implementing relevant legislation and policies to support the use of mobile health applications is essential. Healthcare service providers should stay informed about regulations supporting mobile health applications and monitor developments in this field.

These recommendations aim to enable the effective use of mobile health applications in rural areas, making significant contributions to public health.

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There is no conflict of interest.

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ORIGINAL ARTICLE

# Comparison of the microhardness of low-viscosity bulk-fill composite resins

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**Abstract**

The aim of this study is to compare the microhardness of five different low-viscosity bulk-fill composites. The bulk-fill composites used in the study; Estelite Bulk-fill flow (EBF), Filtek Bulk-fill (FBF), SureFil SDR flow (SDR), Tetric EvoFlow Bulk fill (TEFBF), X-tra Base (XBF). Cylindrical molds with a diameter of 5 mm and a height of 4 mm were used for the Vicker's Micro Hardness (VMH) test. Bulk-fill composite resins were placed in these molds at once. The polymerization of the composites was achieved for 20 seconds with the LED light curing. A total of 50 composite discs were prepared (n=10). Then the microhardness of the top and bottom surfaces was measured using MVK-H1 Microhardness Tester (Akashi Co, Tokyo, Japan. Depth of polymerization of each sample was recorded. Data were analyzed by using the *Kruskal Wallis* H and *Mann Whitney-U* tests. The bottom and top surface hardness values of the XBF composite samples (43.82±0.95 MPa, 47.87±0.59 MPa) were statistically significantly higher than the other bulk-fill composite samples ($p$<0.001). The bottom and top surface hardness values of the FBF composite (27.85±0.56 MPa, 22.05±1.40 MPa) were found to be statistically lower than other bulk-fill composite samples ($p$<0.001). Among the low-viscosity bulk-fill composites used in the study, except for FBF, the VMH values of the others were found to be above 0.80, and it was observed that they reached sufficient microhardness.

**Keywords:** Bulk fill composite resin, microhardness test, polymerization, viscosity

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## Introduction

Composite resins with better structure can be obtained by improving the filler morphology in dental composite resins, progress in current dimethacrylate chemistry, and new monomer technologies [1]. In addition, in recent years, further simplification of the use of composite resins has been on the agenda, and clinicians want to perform high-quality clinical applications and shorten the procedure time [2].

The aim of the layering technique, which is the most common method used to place composite resins in the cavity, is to achieve the ideal polymerization conversion degree and sufficient hardness in composite resins [3]. However, this technique is clinically time consuming and has some disadvantages such as risk of contamination, loss of bond between composite resin layers, and formation of voids [4]. To solve these problems, new types of composite resins with the potential to polymerize in increasing thickness up to 4, 5 and 6 mm have been introduced to the dental market as "Bulk-fill" composite resins. In these composite resins, the focus is on transparent structure, alternative organic matrix, different initiators and various filler technologies [4,5]. Therefore, bulk-fill composite resins have potential benefits such as facilitating clinical applications and saving time. In addition, the bulk-fill placement technique prevents the formation of gaps and contamination between composite layers, and thus more compact restorations can be made [6]. By increasing the transparency of bulk-fill composite resins, they have higher light transmittance, which enables successful restorations [7]. Manufacturers have tried to increase the depth of polymerization in bulk-fill composites by various methods such as reducing the amount of filler, increasing the filler particle size, and using additional photoinitiators [8].

Today, bulk-fill composites are available in the market in two different forms: high and low viscosity. In high viscosity bulk-fill composites, the cavity can be completely restored with a single type of bulk-fill composite resin without the need for an additional covering layer. For low-viscosity bulk-fill composite resins, after being placed in the cavity, the restoration is completed by covering it with a 1.5-2 mm thick conventional composite [9]. Although the mentioned advantage of not needing the layering method is limited in this case, low viscosity bulk-fill composites do not require condensation. Thus, the application time is shortened and its compatibility with methacrylate-based composites makes its use widespread [7]. It has also been determined that the polymerization stresses of low-viscosity bulk-fill composites are lower than those of a traditional dimethacrylate composite resin [10]. Smart Dentin Replacement (SDR) composite is the first bulk-fill composite produced. However, since this bulk-fill composite is a material with low mechanical resistance to abrasion, it has been stated that the top layer should be finished with a conventional composite resin during the restoration. However, by adding high molecular weight monomers to the SDR bulk-fill composite, its content was renewed [8]. The polymerization depth determined by the ISO 4049 method for bulk-fill composites was found to be higher than expected. Instead, it is recommended to use Vickers microhardness measurements at the surface and at certain depths to determine the depth of polymerization [11,12]. Additionally, microhardness data for a given material provides information about its wear, polishability, and abrasive effect on antagonist teeth [13]. In addition, surface hardness measurement in composite resins can be used both to indirectly determine the degree of polymerization conversion and to measure the hardening depth of the composite resin [14]. Studies support the clinical use of bulk-fill composites, but further research on the mechanical properties of these composites is required [15,16]. The aim of this study is to compare the microhardness of low viscosity bulk-fill composites. The hypothesis of this study is that there is no difference in the microhardness of the low viscosity bulk-fill composites used.

## Materials and Methods

### Preparation of Samples

In this *in vitro* study, five different low viscosity bulk-fill composites were used: Estelite Bulk-fill flow (EBF, Tokuyama Dental Corp, Ibaraki,

Japan), Filtek Bulk-fill flow (FBF, 3M Espe, St.Paul, USA), SureFil SDR flow (SDR; Dentsply DeTrey, USA), Tetric Evo Flow Bulk-fill (TEFBF, Ivoclar Vivadent Schaan, Liechtenstein), X-tra Base (XTB, Voco, GmbH, Cuxhaven, Germany) were used. The materials used in the study and their contents are given in Table 1. Cylindrical molds with a diameter of 5 mm and a height of 4 mm made of polytetrafluoroethylene were used to prepare the samples [17]. Transparent tapes were placed on the upper and lower surfaces of these molds. Sample size was calculated as 50 with a power of 0.80 (effect size=0.53 and $\alpha$=0.05). A total of 50 samples, 10 in each group, were prepared for the measurements to be made on the VMH device (n = 10). Before the polymerization of the samples, the power of the light device was checked using a radiometer (Bluephase Meter, Ivoclar Vivadent). The samples prepared for the VMH test were polymerized for 20 seconds using an Elipar Freelight (3M-ESPE Seefeld, Germany) LED light source (480 nm wavelength and 1200 mW/cm2). During the polymerization process, the tip of the light device was used perpendicularly and in contact with the samples. They were kept in incubator with 100% humidity at 37 °C for 24 hours.

**Vicker's Microhardness Test**

The samples were polished with SiC sandpaper (#1200) for 5 seconds to remove the outer resin layer and to obtain a standardised and stable surface. Then the VMH measurement of the samples was started.

For the VMH test, a 200 g load was applied to the samples for 10 seconds using a Vickers microhardness tester (MVK-H1, Akashi Co, Tokyo, Japan) [18]. Six measurements were recorded on both sides of each sample and averaged for the statistical analysis. (Figure 1 and 2) Hardness rate of each sample;

VMHmean=VMHbottom surface/VMHtop surface was determined by the formula.

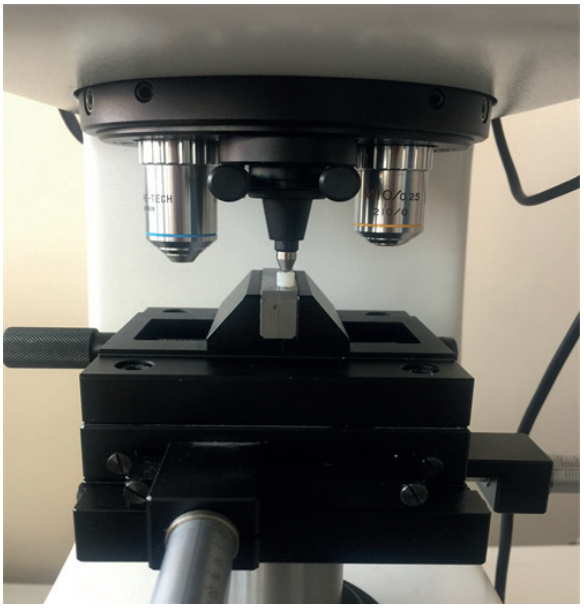

**Figure 1.** Vickers Microhardness Tester.

**Table 1.** Composite resins used in the study, manufacturer companies, matrix and filler types, filler amount.

| Material name | Manufacturer | Organic matrix type | Filler type | Filler ratio (% weight/ % volume) |
|---|---|---|---|---|
| Estelite Bulk-fill Flow (EBF) | Tokuyama Dental Corp, Ibaraki, Japan | Bis-GMA, Bis- MPEPP, TEGDMA, | Suprananospherical filler Silica, Zirconia, Ytterbiumtrifluoride. | % 70/56 |
| Filtek Bulk-fill Flow (FBF) | 3M Espe, St.Paul, USA | UDMA, BISGMA, Bis-EMA, Procrylat resin | 0.01 to 5 µm—based on silica, zirconia and ytterbiumtrifluoride | % 64,5/42,5 |
| SureFil SDR flow (SDR) | Dentsply DeTrey, USA | Modifiye UDMA, TEGDMA,EBPADMA | Ba-B-F-Al silikat cam SiO2, amorföz Sr-Al silikat cam | % 68/44 |
| Tetric EvoFlow Bulk-fill (TEFBF) | Ivoclar Vivadent Schaan, Liechtenstein | Dimethacrylates Copolymers | Barium glass Ytterbium trifluoride | % 68/46 |
| X-tra Base Bulk-fill (XBF) | Voco GmbH Cuxhaven, Germany | MMA, Bis-EMA Aliphatic di-methacrylate (UDMA | Barium glass ceramic, fumed silica | % 75/58 |

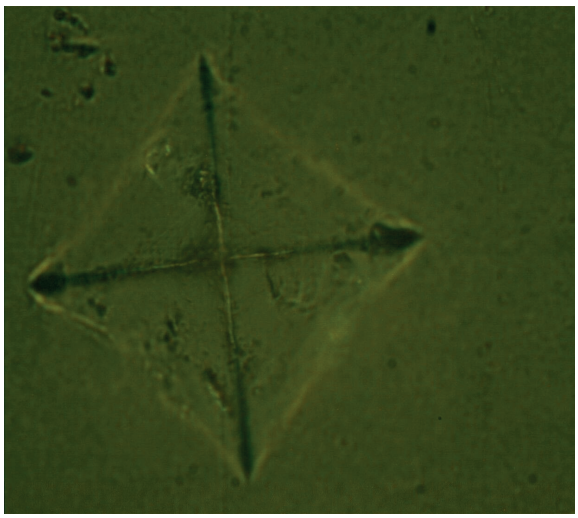

**Figure 2.** The image formed in the vickers hardness test.

### Ethics Committee Approval

This study protocol was carried out in accordance with the relevant guidelines of the Principles of the Declaration of Helsinki and was approved by the Clinical Research Ethics Committee of Afyonkarahisar Health Sciences University report numbered 2023/2.

### Statistical Analysis

Statistical evaluations of the obtained data were made using SPSS23.0 (IBM SPSS Statistics, Armonk, USA). The upper and lower microhardness values obtained from the samples were analysed by Kruskal wallis H-test according to the normality of the data and multiple comparisons were made by Mann Whitney-U test. Significance level was set at $p < 0.05$.

## Results

The bottom and top surface hardnesses and average hardness rates of the composite samples are presented in Table 2 and Table 3. The bottom and top surface hardness values of the XBF composite samples (43.82±0.95 MPa, 47.87±0.59 MPa) were statistically significantly higher than the other bulk-fill composite samples ($p$<0.001). The bottom and top surface hardness values of the FBF composite (27.85±0.56 MPa, 22.05±1.40 MPa) were found to be statistically lower than other bulk-fill composite samples ($p$<0.001). There was a statistically significant difference between the top and bottom surface hardness values in all bulk-fill composite groups. XBF (0.91±0.01HR) composite had no difference between SDR (0.89±0.03 HR) ($p$=.059), while it had statistically higher VMH rates compared to the other composites ($p$<0.05).

## Discussion

In this study, VMH values of five different low viscosity bulk-fill composites were tested. Among the tested materials, FBF composite was found to have the lowest VMH value. According to these results, the null hypothesis was rejected. In the VMH test of a composite resin, the ratio

**Table 2.** Upper and lower surface hardness values of composite samples and mean and standard deviations of hardness ratios.

| | Top surface vickers microhardness value (MPa) | Bottom surface vickers microhardness value (MPa) | *p* |
|---|---|---|---|
| **Estelite Bulk-fill Flow (EBF)** | 39,93±1,47$^{ad}$ | 35,6±1,15$^{a}$ | 0,001 |
| **Filtek Bulk-fill Flow (FBF)** | 27,85±0,56$^{b}$ | 22,05±1,40$^{b}$ | 0,001 |
| **SureFil SDR Flow (SDR)** | 39±1,51$^{a}$ | 37,72±0,65$^{a}$ | 0,001 |
| **Tetric EvoFlow Bulk-fill (TEFBF)** | 40,85±0,55$^{d}$ | 33,25±0,72$^{c}$ | 0,001 |
| **X-tra Base Bulk-fill (XBF)** | 47,87±0,59$^{c}$ | 43,82±0,95$^{d}$ | 0,001 |

Values with the same letters in the same column were not statistically different. ($p$=0.05)

of the lower surface hardness value to the upper surface hardness value gives the hardness rate of the composite resin. Polymerization of the composite resin is considered sufficient when this hardness rate is at least 80%. When this ratio is 1, it means that the polymerization of the composite resin is complete [19,20]. The inorganic content of composite resins is responsible for mechanical and physical properties [21]. It is stated that there is a proportion between the inorganic content of composite resins and their hardness values. For this reason, it has been shown that composite resins have different hardness rates due to the difference in inorganic and matrix content [22]. In this study, the microhardness values of the FBF composite with a low filler ratio (64.5% by weight) were found to be lower than the other composites included in the study. The filler content of the XTB (75% by weight) composite was higher and the microhardness values were found to be higher than other bulk-fill composites. In a study, it was found that the decrease in the filler amount of composite resins caused the surface hardness of the composite to decrease [23]. The low bottom and top surface hardness values of the FBF composite can also be attributed to the presence of zirconium particles in the filler structure. It has been stated that zirconium negatively affects polymerization by reducing light transmittance due to its high refractive index [24]. In a study by Besegato et al. [25], they found that FBF composite exhibited mechanical behavior that could compromise the quality and longevity of the restoration. In XTB and SDR bulk-fill composites, the manufacturer reduced the amount of filler and increased the filler size. As a result, by reducing the surface area between the filler content and the matrix, light scattering was reduced and the composite was enabled to reach sufficient hardness after polymerization [7]. SDR is the first bulk-fill composite produced. The modified UDMA resin in its structure contains a photoactive group. This content allows deeper penetration of light during the polymerization of the SDR composite and reaches a higher microhardness rate [26]. In our study, the VMH value of the SDR bulk-fill composite was found to be 89% and reached sufficient microhardness. Aggarwal et al. [27] found the VMH rate in SDR bulk-fill composite samples to be over 80%, in parallel with the current study. In a study investigating the polymerization depths of traditional flowable composites and "bulk-fill" composites, the microhardness ratio in SDR samples was found to be over 80% [28]. TEFBF contains a translucent filler. This allows light to pass through the material during its polymerisation. [27] In addition, this composite contains Ivocerin (a photoinitiator based on dibenzoyl germanium). According to the manufacturer, it has higher photocuring activity than camphorquinone due to its higher absorption in the region between 400 nm and 450 nm. It can be used without the addition of an amine as a co-initiator. It forms at least two radicals capable of initiating radical polymerisation; therefore, it is more effective than the camphorquinone/amine system. [29-31] In our study, the TEFBF microhardness ratio (0.81) was found to be above 80% and it can be said that this bulk-fill composite has sufficient microhardness. In a study by Sousa-Lima et

al.[32] the microhardness ratios of TEFBF and a conventional composite were analysed. The results of the study were found to be compatible with the results of our study. Differences in results in studies examining the microhardness of bulk-fill composite resins may be due to the use of different light devices or the molds used being made of different materials [11]. In the research conducted, instead of using metal molds for samples to be prepared from composite resin, polymethylmethacrylate molds were used, which have low light absorption and allow light to easily reach the lower surface without decreasing its intensity [33,34].

## Conclusion

Considering the limitations of the current study, it can be said that EBF, SDR, TEFBF and XTB bulk-fill composite resins with VMH values above 0.80 have reached sufficient microhardness, thus these bulk-fill composite resins show sufficient polymerization depth for clinical use. For FBF composite resin, the VMH value was found to be below 0.80. In addition, the bottom and top surface hardness values of FBF composite resin were found to be significantly lower than other bulk-fill composite resins.

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### *Conflict of interest*

There is no conflict of interest between the authors of this study.

### *Data availability statement*

Data can be requested from the authors.

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ORIGINAL ARTICLE

# Defining the cultural care needs of Syrian university students in Türkiye using Leininger's Sunrise Model

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**Abstract**

Nurses are expected to recognize the cultures of their patients and provide suitable medical service. Accordingly, the medical services to be provided to foreign students who come from different cultures and whose numbers are on the rise should be adapted to the cultures of these students. This study aimed to use the Leininger's Sunrise Model for determining the cultural care needs of Syrian University Students in Türkiye. This qualitative study was conducted using the ethno-nursing research method. The sample of the study consisted of 19 Syrian undergraduate students. The Consolidated criteria for reporting qualitative research (COREQ) reporting guidelines were used in both the framing and reporting of this study to guarantee that sufficient details on the methods of data collection, analysis and interpretation were provided. The data examined under the 12 titles was assessed with the descriptive analysis method used in qualitative research. Students noted that care was provided voluntarily in their cultures, that families had the responsibility of providing care, that they needed professional and religious care simultaneously, and that the obstacles of receiving nursing care were language, gender, and privacy. Results in this study indicate that cultural values and beliefs had a significant impact on receiving medical care, and that professional and traditional treatments were used based on relevant cases.

**Keywords:** Culture, culturally competent care, students, Syria, universities, Türkiye

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## Introduction

Students migrate to other countries to receive education in line with their personal goals. International student movements have reached beyond five and half million all over the globe [1]. The number of international students has recently increased in many countries including Türkiye [2]. These students, who constitute a large group of people, experience psychological, financial, socio-cultural, and language-related problems in the countries where they study [3]. Relevant studies indicate that students experience cultural shock while trying to adapt to the culture of the countries they are studying in [4,5]. Research conducted with the international students in Türkiye found that students suffered issues due to cultural differences [6,7]. Syrian students in Türkiye perceive social exclusion in such dimensions as economic, spatial, city-based, education and health. In addition, when the problems of Syrian university students arising from being refugees combined with educational problems in higher education, they cause multiple disadvantages [8]. A study in Syrian Students in Türkiye had descripted the framework of various basic problems such as acceptance, social interaction, uncertainty, foreignness, stigmatization, and marginalization [9]. Another research, the participants mentioned that they had some problems in their relations with the Turkish students at the university, the faculty members and the student affairs officers. Researchers conducted with the international students in Türkiye had founded that student suffered issues due to cultural differences [10]. Another a study finding of the study indicate that Syrian students in Türkiye have difficulties in expressing themselves to their friends, teachers and other agents [11]. Another study conducted with Syrian students indicated that they had problems accessing the medical services, too [12]. Cultural traits affect people's perceptions of health and diseases as well as their attitudes. Nurses are expected to recognize the cultures of their patients and provide suitable medical service [13,14]. Accordingly, the medical services to be provided to foreign students who come from different cultures and whose numbers are on the rise should be adapted to the cultures of these students. Based on the number, Syrian students rank first among the foreign students in Türkiye [15]. A research results had showed some prejudice and stereotypes produced through Syrian refugees such as university entrance without examination, free and privileged education [16]. A study determined that Syrian immigrant nursing students have difficulties in communicating with patients and their relatives and the team in the application. In addition, the students stated that they found nursing education difficult, that they were marginalized by Turkish nurses, patients and students, that some of the academicians found their approach negative and that they could not understand the lessons [17]. Healthcare professionals' cultural prejudices toward individuals' cultural beliefs, attitudes, and perceptions affect the care they provide. Their awareness of their bias is closely associated with the quality of healthcare provided [18]. However, no studies defining the cultural care for the Syrian students in Türkiye were found. Defining a cultural care program for these students is believed to be useful for both nurses and other medical personnel in terms of planning and offering medical services to both Syrian university students and other Syrian people. Models and guides are known to be the best instruments for defining the cultural traits and proper care. Cultural data can be accessed in a more systematic and standardized manner using the cultural models and guides. Leininger's Sunrise Model is one of the most commonly used instruments thus developed in this field [13]. The number of people from different cultures has been steadily increasing in Türkiye, and these people demand care suited to their cultures. Receiving such care will increase the satisfaction from nursing care, care quality, and patient outputs. To provide a culturally-suitable care, cultural traits of the people being cared for as well as the definition of health, disease, and care in their cultures and the factors affecting these concepts should be revealed. This study will help nurses determine what sort of care they should provide to Syrian people and what they need to consider while providing the care. Moreover, it will serve as a guide for determining what so This study aimed to define the cultural care for Syrian university students

with this Leininger's Sunrise Model.

***Research Question:*** What is the concept of care in the culture of Syrian university students?

## Materials and Methods

This qualitative study was conducted using the ethno-nursing research method between October 13, 2017, and August 9, 2018. The COREQ [19] reporting guidelines were used in both the framing and reporting of this study to guarantee that sufficient details on the methods of data collection, analysis and interpretation were provided. The population of the study consisted of 68 Syrian undergraduate students who studied at a state university in west of Türkiye during the 2017-2018 academic year. The aim was to reach everyone in the population. *The inclusion criteria* were being a Syrian and a student of the university where the study was being conducted, and the ability to understand and speak Turkish. A total of 23 students who met the aforenoted criteria were reached, and the study was conducted with 19 of them who volunteered to participate in the study. The data was collected using the semi-structured interview form. The interview form consisted of two sections. The first section included descriptive items regarding participants' age, gender, marital status, duration of living in the city where they were studying, their department, and their grade. The second section of the interview form consisted of Leininger's Semi-Structured Inquiry Guide. The guide contained the following 12 titles: 1. Worldview, 2. Ethno history, 3. Kinship and Social Factors, 4. Cultural Values, Belief and Lifeways, 5. Religious/ Spiritual/Philosophical Factors, 6. Technological Factors, 7. Economic Factors, 8. Language and Communication Factors, 9. Political and Legal Factors, 10. Educational Factors, 11. Emic and Ethic Care Beliefs and Practices, 12. General and Specific Nursing Care Factors [Leininger, 2002]. Data was collected by the researchers using an in-depth face-to-face interview method between October 2017 and March 2018 as the necessary privacy conditions were ensured. Interviews were conducted for 60-90 minutes, and participants' statements were recorded after receiving their permission. The transcription of participants' statements was performed by the researcher considering the 12 titles in the interview form. Instead of students' names, the letters "F" and "M" were used to reflect their gender, and numbers were added next to these letters based on the order of interview. For instance, the first female interviewed was coded as F-1. Data was created by the researcher who transcribed the records. After the transcription phase, checks were done by the researchers through the repeated listening sessions. The data examined under the 12 titles in line with the guide was assessed with the descriptive analysis method used in qualitative research [21]. A frame was formed for the descriptive analysis in parallel to the interview form, and data was processed to the thematic frame. The results were defined and interpreted in line with the processed data.

### Ethical Consideration

Before the initiation of the study, necessary permissions were received from the Ethical Committee (2011-KAEK-2017-E.84729), Directorate General of Migration Management (62103649-604.02.02-44368), and the rector's office of the university where the study was performed (78179085-044-E.110179). Participants also gave their written permissions.

## Results

Students were between 19 and 24 years of age. Of the students, 4 were female and 15 were male, and all of them were single. All of the students were undergoing undergraduate education. The duration of time living in the city where they were studying ranged from 1 to 54 months (Table 1).

The cultural care traits of the Syrian students were defined under 12 titles in line with Leininger's Semi-Structured Inquiry Guide.

**1. Worldview:** Students generally noted that all people were equal for them, and that people needed to be benevolent and not be racist. *M-4 "The world is a place where people live as different groups. We may be from different countries, but we are still humans, regardless of our countries of origin. We have spread over different locations, and cultures, and are in various countries, but we still live in the same environment…"*

**2. Ethnohistory:** Of the participants in the study, 14 were Arabic, four were Turkmen and one was Kurdish. Of these students, 14 stated that their roots were from Syria and mentioned the Syrian city they were from, four stated that their ancestors were from Türkiye, and one student indicated a migration from Egypt to Syria in his background. *F-1 "My family is Arabic. One of my grandfathers is from Egypt while the other one is from Türkiye.*

**3. Kinship and Social Factors:** Students generally mentioned that their families and friends were highly important for them. *M-9 "Family is everything for us, protecting and guiding us. Families are invisible heroes. They are everything, from a financial and spiritual perspective…".* Stating that offering care had a significant place in their culture, students said that the people who provided care or whose care was desired by the students were their family members, particularly the women in their families. All the students mentioned that families had the responsibility of proving care. *F-1 "…No patient is deprived of care in Syria because people there give utmost importance to care. An elderly person in a Syrian family is cared for by his/her children. They consider this very important. Women generally provide care."*

**4. Cultural Values, Beliefs and Lifeways:** Students mentioned cultural values including social reputation, privacy, and avoidance from malevolence and lying. *F-2 "Living in line with Islam is important. Avoiding harming anyone or anything or staying away from stealing, talking to males within certain rules as a female, and respecting the elders."*

**5. Religious/Spiritual/Philosophical Factors:** Students stated that they needed to receive professional religious care when they had a disease, that they might need religious care before nursing care, and that religious practices helped them relax. They added that religion enabled them to cope with the disease, search for a cure, and accept death. *M-5 "I think this is valid not only for Islam, but also for other religions. You can hold onto life if you believe in the presence of God. For instance, if I did not believe in life after death, I would get upset about my cousin who passed away, thinking that we would not be able to meet again. As I believe in life after death, I get upset relatively less as I think we will meet again."* Students stated that they performed certain rituals such as performing prayers, reading Quran, giving alms, and praying when they were ill. *M-15 "… My friends and family should pray for me. Giving alms.*

**Table 1**. Descriptive traits of Syrian students.

| | Age | Duration (month)* | Faculty / College | Department | Grade |
|---|---|---|---|---|---|
| **F-1** | 23 | 36 | Health College | Nursing | 2 |
| **F-2** | 21 | 36 | Faculty of Medicine | Medicine | 3 |
| **F-3** | 19 | 1 | Faculty of Education | Turkish Teaching | 1 |
| **F-4** | 19 | 1 | Faculty of Education | Turkish Teaching | 1 |
| **M-1** | 23 | 36 | Faculty of Science and Letters | Department of History | 2 |
| **M-2** | 24 | 48 | Faculty of Engineering | Computer Engineering | 4 |
| **M-3** | 24 | 24 | Faculty of Engineering | Food Engineering | 2 |
| **M-4** | 21 | 30 | Faculty of Education | Turkish Teaching | 2 |
| **M-5** | 20 | 12 | Faculty of Communication | Radio, Television and Cinema | 2 |
| **M-6** | 22 | 36 | Faculty of Political Sciences | Economy | 2 |
| **M-7** | 22 | 36 | Faculty of Communication | Radio, Television and Cinema | 2 |
| **M-8** | 24 | 36 | Faculty of Engineering | Computer Engineering | 2 |
| **M-9** | 23 | 54 | Faculty of Tourism | Tourism Management | 3 |
| **M-10** | 23 | 30 | Faculty of Engineering | Computer Engineering | 2 |
| **M-11** | 24 | 48 | Faculty of Economics and Administrative Sciences | International Relationships | 3 |
| **M-12** | 22 | 36 | Faculty of Marine Sciences and Technology | Water Products | 3 |
| **M-13** | 23 | 36 | Faculty of Communication | Radio, Television and Cinema | 3 |
| **M-14** | 22 | 36 | Faculty of Engineering | Computer Engineering | 2 |
| **M-15** | 22 | 48 | Faculty of Engineering | Computer Engineering | 2 |

*Duration of living in the city where they are studying.

*Animals are sacrificed after recovering from a disease. I want to read and listen to Quran."*

**6. Technological Factors:** Students mentioned that technology was useful in the fields of health, education, and communication, and that it might be harmful only when used in an inappropriate manner. They added they would obligatorily use technological instruments if they needed them to recover from a disease or to survive. *M-5 "…I would use to survive. Society would also use. If I would die because I did not use technology, that would be equal to committing suicide. Nobody wants anything like that."*

**7. Economic Factors:** Students noted that money was important for having an examination, purchasing medicine, consuming healthy products, and buying medical equipment, stating that it therefore affected their health. *M-3 "Money is necessary to see a doctor, buy medicine or undergo a surgery. The more money you have, the more opportunities you gain."* These students also mentioned that parents and older children are included in money earning activities. Moreover, women were also included in such activities, and women, in certain cases, undertook the responsibility of caring for the entire family as well as maintaining the domestic finances. *M-1: "Both a mother and father. My older brother also earns."*

**8. Political and Legal Factors:** Most of the students believed that political and legal factors were effective in accessing and using medical services. *F-1 "…Of course they have an impact. For instance, having no medical insurance is a great problem. In such cases, people need to pay a certain sum to have an examination which is not so cheap here in Türkiye."*

**9. Educational Factors:** Most of the students indicated that education had a positive impact on staying healthy or an illness. *M-3 "…Educated people act in a healthy manner. Educated people know when to visit a hospital. However, uneducated ones do not visit a hospital, or they just ask for help from a religious authority."*

**10. Language and Communication Factors:** Stating that they speak in Arabic with their families and friends, students mentioned that they generally used verbal and face-to-face communication, body language, gestures, and facial expressions, and that they preferred to communicate through eye contact. *F-2 "Eye contact and body language are important and common. "M-7 "I do not desire verbal or body language solely. These two communication forms become effective when used collectively."*

**11. Emic and Ethic Care Beliefs and Practices:** Students defined the concept of disease as a physical disorder and a punishment from Allah, while they defined the concept of health as physical and psychological integrity, or physical and psychological wellness. They explained wellness as not being ill, being healthy spiritually and physically, and being around beloved ones. *M-1 "Health is consuming good products, doing sport, and living peacefully. Wellness means there are no problems. No problems in health and life itself… I do not consider a disease as a punishment by Allah. There should certainly be a reason… Not everybody thinks like me though. Some consider diseases as a trouble or punishment by Allah...".* Some of the students stated that social healthcare treatments did not help stay healthy or recover or even harmed their health in certain cases, while some believed these practices/people would help them. Furthermore, a couple of students thought that such treatments would be beneficial in the early phases of a disease or for less serious diseases, while some noted they preferred these methods as they did not want to see a doctor. *M-2 "I drink chamomile tea when I have headache. Elderly people generally perform cupping for diseases. I have not researched this, but I think cupping has no impact on cleaning the blood."M-3 "…I want to receive professional care. Social healthcare treatments may be used based on the disease. Dislocation of a joint, for example."*

**12. General and Specific Nursing Care Factors:** Students noted that care meant meeting the personal needs, showing attention, or raising a child. They added that caring for a person was a positive and benevolent action in their culture, that providing care was a voluntary action, and that providing care was considered as a good deed or favor by the society. *M-4 "Showing attention to people and meeting their needs are good and benevolent things. Especially when provided to the relatives and elderly…"* Students stated that

they valued and respected professional medical personnel, that they needed to receive care from the nurses in case of a severe disease, and that they wanted to receive care from a nurse in a hospital setting and from their families in a domestic setting. *M-14 "It may be in the hospital. For the elderly, it may be in the home."* Students explained the obstacles of good nursing care as the inability to speak the same language, privacy, gender, bias, and absence of religious and cultural knowledge. According to the students, nurses should display an approach appropriate to their culture, have no bias against them, and be respectful and cheerful in order to provide good nursing care. *M-3 "Language and gender." F-3 "If the nurse is a male, I should not touch him, and I should have a distance from him. If the nurse is a female, there is no problem."M-7 "When in Türkiye, we need to know the Turkish culture. However, if a Turkish nurse learns our culture and tries to make an effort to provide service in accordance with our culture, that would be a professional service..."*

## Discussion

Studies conducted with Muslim Syrians indicated that their world views focused on the Syrian culture and Islam. They believe that life is a test, that one needs to be peaceful, respectful, and tolerant toward people from other religions [22,23]. This study indicated that religious beliefs and cultural traits are reflected in the world views of Syrian students, which is a result in line with the relevant literature. Students emphasized the importance of being respectful and living in peace. Family is considered as the building stone of society in Muslim communities [22]. and providing care is a significant responsibility in Muslim Syrian families. This action is considered as meeting the needs of other people in a helpful manner [24]. Studies conducted with people from similar cultures, such as Lebanese [25], Jordanian [26] and Arabic people [27,28] associate providing care with the domestic role of women. The present study found that family was important, that family and particularly the women in a family came to mind first when the concept of care was mentioned, that family members were responsible for one another in terms of providing care, and that providing care was considered as a positive and benevolent voluntary action, which suited the results of other studies conducted with Muslim Syrians and people living in similar regions. Muslim Syrians believed that the care provided in line with the religious rules improved health and prevented diseases, and that religion supported spiritual health and gave them peace [24]. Additionally, in a study conducted with Muslims, methods such as showing patience, performing meditation and praying were used to cope with diseases and death [22]. Students in the present study noted that religion and religious rituals helped them cope with the disease, find solutions to their medical problems, and accept death. Furthermore, students stated that technology had benefits for health and care and that it might be harmful only when used in an inappropriate manner. In a study conducted with Muslim Syrians, participants said that advanced technology would contribute to better medical services and be acceptable if it suited Islam, but that technological addiction might be harmful [29]. The results of the relevant studies suit the result of the present study. Religious views should be considered while using technology to provide medical and care services to Muslim Syrians. Students in the present study stated that they had communication-related problems while receiving medical and care services, and they mentioned the inability to speak a foreign language and privacy as the reasons for these problems. Relevant studies indicate that certain obstacles are experienced while trying to communicate with Syrians, with the most distinctive one being language [30-32]. Another study conducted with nurses similarly indicated that the inability to speak a foreign language was an important issue [33]. Use of an interpreter can help increase the quality of medical service and reduce such conflicts [34]. Furthermore, studies conducted with Muslim Arabs indicated that other than language, gender could be an obstacle before hand-shaking or establishing eye contact [26,27]. Overall, the obstacles in communication were the inability to speak a foreign language, gender, neglecting privacy and not showing respect, which suited the results in the relevant literature. An important parameter in shaping the care is how the concepts of health, disease, and wellness

are perceived in a specific culture. Students in this study considered health as physical and psychological wellness, while a disease was a physical problem or a punishment and test from Allah. Studies indicated that Muslims thought about their health and physical, mental, social, and psychological wellness. They considered disease and death as a natural process, and as a test by Allah which eradicated their sins [22]. Muslim Syrians believe that their bodies warn them when they need to pay attention to their bodies. Moreover, disease was also considered as a sign of Allah's love and a reminder of the duty of praying [24]. Syrian students in this study had medical and disease-related perceptions like those of the Muslim Syrians in other relevant studies. Attitudes regarding traditional treatments and healers can be seen in care-focused approaches regarding health, disease, and other relevant concepts. Students in the present study stated that traditional treatments or healers were not reliable but that they still utilized these methods against certain diseases or mild disorders rather than visiting a hospital. Other studies with Syrians indicated that herbal and traditional treatments were used to treat diseases [23,35]. Participants of this study said they wanted to receive care from a nurse in case of a severe disease and also added that they needed this nursing care in a hospital setting but that they would want to receive care from their families in a home setting. According to these students, the obstacles to good nursing care were the inability to speak the same language, gender, bias, and absence of religious and cultural knowledge. The literature indicates that Syrian Muslims wanted to receive care from nurses on the condition that the gender factor was considered [24], and spiritual needs as well as privacy would be valued while providing care to Muslim patients [22]. All Syrian students in the study said they were Muslims. Moreover, ethnic roots of the majority of the students were Arabic. As there were no participants with a different religious belief (other than Islam) and ethnic background, updating the data for this group of people is challenging.

## Conclusion

This study indicated that Islam and cultural traits affected Syrian students' lifestyles, world views, and care-related perceptions. Moreover, these students considered care as the benevolent act performed to meet the needs of people and as a domestic responsibility in their culture. Education as well as technology, legal amendments, and personal finance had direct impact on health and medical services. Furthermore, it was observed that religion was a significant determinant factor for health/disease and care, and that religious beliefs helped them cope with disease and death and determined the type of medical service to be received. Results also indicated that cultural values and beliefs had a significant impact on receiving medical care, and that professional and traditional treatments were used based on relevant cases. Students accepted nursing care but there were certain obstacles such as the inability to speak the language, gender, and privacy. Moreover, they would prefer to receive nursing care in the hospital setting rather than in their homes.

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*Conflict of interest*

The authors do not have any conflict of interest in this study.

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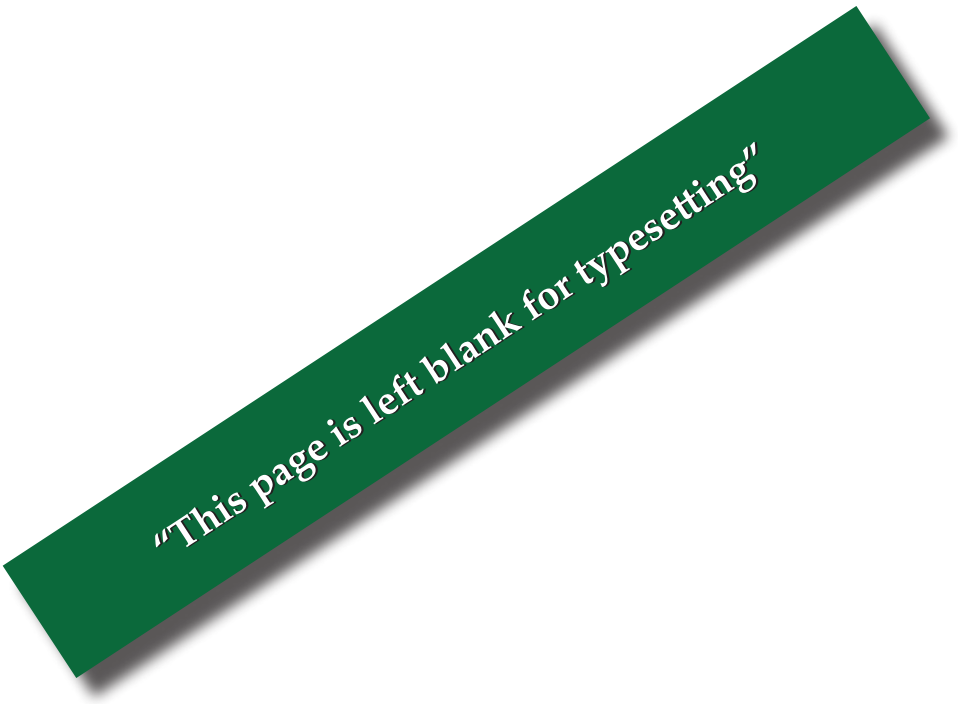
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ORIGINAL ARTICLE

# Examining the health service satisfaction levels of children with visual impairment

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**Abstract**

It is aimed to examine the difference between the satisfaction levels of children with visual impairments with the health services they receive according to some variables. The study examining the satisfaction levels of children with visual impairments with the healthcare services they receive is descriptive and was conducted between 1 August 2023 and 12 October 2023. The study population consisted of children with visual impairment. The sample consisted of 120 visually impaired children who voluntarily participated using the simple sampling method from the non-probability sampling method and were selected with their own and parental consent. Data were collected online with the support of the children's parents. Sociodemographic data form (gender, age, educational level, disability level, social security) and health service satisfaction scale were used to collect data. SPSS 25.0 data analysis program was used to statistically analyze. Notably, 33.3% (66.7%) of the children with visual impairment were girls (boys). Regarding educational level, 51.7%, 34.2%, and 14.2% were primary-school, secondary-school, and high-school students, respectively. Visually impaired children participating in the research; The relationship between sociodemographic factors (such as gender, health insurance type, educational status, disability level, age) and the health service satisfaction scale was found to be high and showed a significant difference ($p$ <0.05).

Sociodemographic factors are important for evaluating satisfaction with health services among children with visual impairment. Future studies should examine satisfaction with health services among children with visual impairment and address relevant problems. Since studies on the level of utilization of health services in children with visual impairment are insufficient and the reason for this is difficult in terms of specificity and accessibility, providing alternatives to research in this field will guide future research.

**Keywords:** Children with visual impairment, low vision, health service

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## Introduction

Increasing service quality and presentation by health service providers positively impacts patient satisfaction. Providing special services to disabled patients especially individuals with visual impairment is important for their satisfaction. Moreover, providing humane services to patients has a legal dimension [1]. In Türkiye, legal and physical arrangements for disabled patients are being developed. The Ministry of Health published the "Basic Information Guide on Accessibility for Individuals with Disability" with the circular numbered 2010/79 to implement the provisions of the law in locations where health services are provided [2,3].

Children with visual impairment in addition to the difficulties and problems that they face in their living spaces owing to their disability face problems specific to their condition in hospitals [4]. These problems can be addressed through effective health services and legal regulations. For patients with visual impairment who want to receive health services from a health institution, the presence of functional arrangements in the institution can increase their satisfaction and loyalty. from the moment patients first arrive at the hospital, the following must be considered: Did they benefit from the disabled car park? Were they welcomed by the patient greeter? Did they benefit from the hospital sketches, patient rights, and priority patient signs? Did they have easy access to a place where they could sit and the consultancy when they applied to the outpatient clinic? Did they communicate easily with the employees? Did they benefit from the elevators, direction signs, and toilets arranged for the disabled that is, places that facilitate the maneuvering of chairs and stretchers? These and similar arrangements can benefit children with visual impairment through "disabled application points or offices" established in organizations. Consequently, satisfaction with the healthcare services received by individuals with visual impairment ensures both the quality of care and mobilization of the individuals concerned. This study aimed to examine the level of satisfaction with the healthcare services received by children with visual impairment.

### Research Question

Do the levels of satisfaction with the health services received by children with visual impairment differ?

## Materials and Methods

***Type of Research:*** This study is descriptive in nature.

***Place and Time of Research:*** The research data were collected online with the support of the parents of 120 children with visual impairment selected by a simple sampling method, those who are visually impaired children participate voluntarily and have parental consent.

### Population and Research Sample

The research population comprised children with visual impairment. The sample comprised 120 children with visual impairment, who participated voluntarily and were selected by a simple sampling method, ensuring parental consent. According to the national disability data system in Türkiye, 281,439 of 2.5 million disabled people are visually impaired. Thus, the number of individuals with visual impairment is limited [5].

### Data Collection Tools

Research data were collected through the following data collection forms:

- Sociodemographic data form

- Health Service Satisfaction Scale

***Sociodemographic Data Form:*** This form comprised five questions on gender, age, educational level, disability level, and social security.

***Health Service Satisfaction Scale:*** The scale was developed by Ercan et al. (2004) [6]. The Likert-type scale comprises 8 subscales and 43 items. These items' scores range from 0 to 4. The lowest and highest scores that can be obtained are 0 and 172, respectively. Higher scores indicate patients' satisfaction with the health services provided. Ercan et al. (2004) [6] analyzed the Cronbach's alpha, theta, and omega reliability coefficients for the scale, finding it to be highly reliable ($\alpha$=0.9682, $\theta$=0.9709, $\Omega$=0.9841).

**Table 1.** Distribution of participants according to demographic characteristics.

| | | f | % |
|---|---|---|---|
| Gender | Girls | 40 | 33.3 |
| | Boys | 80 | 66.7 |
| Educational level | Primary school | 62 | 51.7 |
| | Middle school | 41 | 34.2 |
| | High school | 17 | 14.2 |
| Disability level | Lightweight | 2 | 1.7 |
| | Low vision | 80 | 66.7 |
| | Very low vision | 25 | 20.8 |
| | Completely visually impaired | 13 | 10.8 |
| Health insurance | SSI (pension fund, BAGKUR, etc.) | 99 | 82.5 |
| | Other (private health insurance) | 21 | 17.5 |

**Table 2.** Descriptive values of the scores obtained from the health service satisfaction scale.

| Variables | Min. | Maks. | Med. | Ort/m[a] | Ss |
|---|---|---|---|---|---|
| Outpatient examination and treatment | 5 | 32 | 20.91 | 2.61 | 6.91 |
| Clinic (inpatient treatment) | 5 | 32 | 20.26 | 2.53 | 7.08 |
| Other health and bureaucratic transactions | 6 | 28 | 19.28 | 2.75 | 5.33 |
| Staff evaluation | 0 | 16 | 10.83 | 2.71 | 4.29 |
| Patient rights | 1 | 20 | 13.14 | 2.63 | 4.54 |
| Physical assessment of the hospital | 2 | 16 | 10.91 | 2.73 | 3.63 |
| Cafeteria services | 0 | 16 | 10.68 | 2.67 | 3.89 |
| General evaluation | 0 | 12 | 8.03 | 2.68 | 3.1 |
| HSSS total | 84 | 320 | 114.04 | 2.65 | 27.59 |

HSSS=Health Service Satisfaction Scale. [a]0-0.8= very low; 0.9-1.6= low; 1-7-2.4= medium; 2,5-3,2= high, 3,3-4,0= very high.

**Table 3.** Means, standard deviations, and independent groups t-test results for the health service satisfaction scale scores according to the child's gender.

| Variables | Gender | N | Med. | Ss | t(120) | *p* |
|---|---|---|---|---|---|---|
| Outpatient examination and treatment | Girls | 40 | 18.5 | 7.75 | -2.78 | 0.01 |
| | Boys | 80 | 22.11 | 6.15 | | |
| Clinic (inpatient treatment) | Girls | 40 | 18.1 | 5.77 | -2.41 | 0.02 |
| | Boys | 80 | 21.34 | 7.45 | | |
| Other health and bureaucratic transactions | Girls | 40 | 19.55 | 4.92 | 0.39 | 0.7 |
| | Boys | 80 | 19.15 | 5.55 | | |
| Staff evaluation | Girls | 40 | 9.03 | 4.53 | -3.39 | 0.00 |
| | Boys | 80 | 11.73 | 3.88 | | |
| Patient rights | Girls | 40 | 11.2 | 4.79 | -3.47 | 0.00 |
| | Boys | 80 | 14.11 | 4.1 | | |
| Physical assessment of the hospital | Girls | 40 | 10.53 | 3.67 | -0.82 | 0.42 |
| | Boys | 80 | 11.1 | 3.62 | | |
| Cafeteria services | Girls | 40 | 9.55 | 4 | -2.30 | 0.02 |
| | Boys | 80 | 11.25 | 3.72 | | |
| General evaluation | Girls | 40 | 7.45 | 3.31 | -1.46 | 0.15 |
| | Boys | 80 | 8.33 | 2.97 | | |
| HSSS total | Girls | 40 | 103.9 | 29.88 | -2.94 | 0.00 |
| | Boys | 80 | 119.11 | 25.06 | | |

**Data Evaluation**

Distribution of the Health Service Satisfaction Scale scores was analyzed by calculating the skewness and kurtosis coefficients. Descriptive analysis was performed to determine children's satisfaction levels with health services. Independent groups *t* test and ANOVA were used to compare the satisfaction levels of the participants according to their demographic characteristics. *Pearson* correlation coefficient was calculated to examine the relationship

**Table 4.** Pearson correlation coefficients for the relationship between age and health service satisfaction scale scores.

| Variables | Age of Child |
|---|---|
| Outpatient examination and treatment | -0.218* |
| Clinic (inpatient treatment) | -0.088 |
| Other health and bureaucratic transactions | -0.012 |
| Staff evaluation | -0.151 |
| Patient rights | -0.051 |
| Physical assessment of the hospital | -0.191* |
| Cafeteria services | -0.107 |
| General evaluation | -0.183* |
| HSSS total | -0.172 |

*$p$<0,05; N=120

**Table 5.** Means, Standard deviations, and ANOVA results for the health service satisfaction scale scores according to the children's educational level.

| Variables | | Educational level of the child | N | Med. | Ss | F(2;117) | *p* | Scheffe post hoc |
|---|---|---|---|---|---|---|---|---|
| Outpatient examination and treatment | 1. | Primary school | 62 | 22.42 | 5.89 | 3.19 | 0.04 | 1>2, 1>3 |
| | 2. | Middle school | 41 | 19.34 | 7.42 | | | |
| | 3. | High school | 17 | 19.18 | 8.14 | | | |
| Clinic (inpatient treatment) | 1. | Primary school | 62 | 21.34 | 6.95 | 2.15 | 0.12 | - |
| | 2. | Middle school | 41 | 18.44 | 5.66 | | | |
| | 3. | High school | 17 | 20.71 | 9.75 | | | |
| Other health and bureaucratic transactions | 1. | Primary school | 62 | 19.53 | 4.82 | 2.51 | 0.09 | - |
| | 2. | Middle school | 41 | 18.05 | 6.09 | | | |
| | 3. | High school | 17 | 21.35 | 4.68 | | | |
| Staff evaluation | 1. | Primary school | 62 | 11.56 | 3.77 | 2.37 | 0.10 | - |
| | 2. | Middle school | 41 | 9.71 | 4.74 | | | |
| | 3. | High school | 17 | 10.82 | 4.59 | | | |
| Patient rights | 1. | Primary school | 62 | 13.58 | 4.16 | 0.61 | 0.55 | - |
| | 2. | Middle school | 41 | 12.61 | 4.33 | | | |
| | 3. | High school | 17 | 12.82 | 6.22 | | | |
| Physical assessment of the hospital | 1. | Primary school | 62 | 11.69 | 3.21 | 3.23 | 0.04 | 1>2, 1>3 |
| | 2. | Middle school | 41 | 9.93 | 4.06 | | | |
| | 3. | High school | 17 | 10.41 | 3.48 | | | |
| Cafeteria services | 1. | Primary school | 62 | 10.9 | 3.74 | 0.51 | 0.60 | - |
| | 2. | Middle school | 41 | 10.71 | 4.26 | | | |
| | 3. | High school | 17 | 9.82 | 3.56 | | | |
| General evaluation | 1. | Primary school | 62 | 8.53 | 3.02 | 2.51 | 0.09 | - |
| | 2. | Middle school | 41 | 7.83 | 2.7 | | | |
| | 3. | High school | 17 | 6.71 | 3.96 | | | |
| SHHH total | 1. | Primary school | 62 | 119.56 | 22.63 | 2.87 | 0.06 | - |
| | 2. | Middle school | 41 | 106.61 | 29.24 | | | |
| | 3. | High school | 17 | 111.82 | 36.15 | | | |

between satisfaction level and age. Analyses were performed using SPSS 25 statistical package program.

**Ethical Consideration**

Permission for using the Health Services Satisfaction Scale was obtained from Erdem et al. (2004) via e-mail. Permission for the study was obtained from Hakkari University Scientific Research and Publication Ethics Committee (2023/89-1).

## Results

According to Table 1, 66.7% of the participants are boys, 51.7% graduated from primary school, 66.7% suffer from low vision, and 82.5% have SSI health insurance and 17.5% have private health insurance. The ages of the participants range between 7 and 17, and the mean age is calculated as 10.96 (SD=2.52).

In Table 2, the mean scores for outpatient examination and treatment, clinic (inpatient treatment), other health and bureaucratic transactions, personnel evaluation, patient rights, physical evaluation of the hospital, cafeteria services, general evaluation, and HSSS total are 20.91 (SD=6.91), 20.26 (SD=7.08), 19.28 (SD=5.33), 10.83 (SD=4.29), 13.14 (SD=4.54), 10.91 (SD=3.63), 10.68 (SD=3.89), 8.03 (SD=3.10), and 114.04 (SD=27.59), respectively. The mean scores obtained indicate that the participants' satisfaction with health services is high.

In Table 3, no significant difference exists in the mean scores of other health and bureaucratic procedures (t[120]=0.39; $p$>0.05), physical evaluation of the hospital (t[120]=-0.82; $p$>0.05),

**Table 6.** Means, standard deviations, and ANOVA results for the health service satisfaction scale scores according to the disability level of the child.

| Variables | | Disability level of the child | N | Med. | Ss | F(2;117) | *p* | Scheffe post hoc |
|---|---|---|---|---|---|---|---|---|
| Outpatient examination and treatment | 1. | Light & low vision | 82 | 22.35 | 5.99 | 6,25 | 0,00 | 1>3 |
| | 2. | Very low vision | 25 | 17.48 | 7.83 | | | |
| | 3. | Completely visually impaired | 13 | 18.38 | 7.92 | | | |
| Clinic (inpatient treatment) | 1. | Light & low vision | 82 | 21.68 | 6.35 | 6,09 | 0,00 | 1>3 |
| | 2. | Very low vision | 25 | 16.48 | 7.46 | | | |
| | 3. | Completely visually impaired | 13 | 18.54 | 8.14 | | | |
| Other health and bureaucratic transactions | 1. | Light & low vision | 82 | 19.46 | 5.05 | 2,65 | 0,08 | - |
| | 2. | Very low vision | 25 | 17.52 | 5.97 | | | |
| | 3. | Completely visually impaired | 13 | 21.54 | 5.16 | | | |
| Staff evaluation | 1. | Light & low vision | 82 | 11.96 | 3.54 | 10,61 | 0,00 | 1>2, 1>3 |
| | 2. | Very low vision | 25 | 8.36 | 4.39 | | | |
| | 3. | Completely visually impaired | 13 | 8.38 | 5.59 | | | |
| Patient rights | 1. | Light & low vision | 82 | 13.99 | 3.66 | 4,91 | 0,01 | 1>3 |
| | 2. | Very low vision | 25 | 11.08 | 5.47 | | | |
| | 3. | Completely visually impaired | 13 | 11.77 | 6.15 | | | |
| Physical assessment of the hospital | 1. | Light & low vision | 82 | 11.33 | 3.51 | 2,14 | 0,12 | - |
| | 2. | Very low vision | 25 | 9.64 | 3.26 | | | |
| | 3. | Completely visually impaired | 13 | 10.69 | 4.61 | | | |
| Cafeteria services | 1. | Light & low vision | 82 | 11.07 | 4.01 | 1,38 | 0,26 | - |
| | 2. | Very low vision | 25 | 9.68 | 3.6 | | | |
| | 3. | Completely visually impaired | 13 | 10.15 | 3.39 | | | |
| General evaluation | 1. | Light & low vision | 82 | 8.73 | 2.64 | 7,75 | 0,00 | 1>3 |
| | 2. | Very low vision | 25 | 6.2 | 3.18 | | | |
| | 3. | Completely visually impaired | 13 | 7.15 | 4.12 | | | |
| HSSS total | 1. | Light & low vision | 82 | 120.59 | 22.16 | 8,91 | 0,00 | 1>3 |
| | 2. | Very low vision | 25 | 96.44 | 30.21 | | | |
| | 3. | Completely visually impaired | 13 | 106.62 | 37.6 | | | |

and general evaluation (t[120]=-1.46; $p$>0.05) according to the gender of the child. The mean satisfaction scores for outpatient examination and treatment (mean=22.11; SD=6.15), clinic (inpatient treatment; mean=21.34; SD=7.45), personnel evaluation (mean=11.72; SD=3.88), patient rights (mean=14.11; SD=4.10), (mean=10.53; SD=3.67), (mean=11.10; SD=3.62), (mean=9.55; SD=4.00), (mean=11.25; SD=3.72), and SHMO total (mean=119.11; SD=25.06) are significantly higher among boys.

Analyzing the statistically significant relationships in Table 4 a negative relationship between age and outpatient examination and treatment (r=-0.218; $p$<0,05), physical evaluation of the hospital (r=-0.191; $p$<0,05), and general evaluation (r=-0.183; $p$<0.05) scores. The higher the participants' age, the lower their satisfaction with outpatient examination and treatment, physical evaluation of the hospital, and general evaluation.

Table 5 indicates no significant difference in the mean scores according to the children's educational level. However, a significant difference is observed in the mean scores for outpatient examination and treatment (F[2;117]=3.19; $p$<0.05) and physical assessment of the hospital (F[2;117]=3.23; $p$<0.05). According to the post hoc test results, the mean scores of the children who graduated from primary school for satisfaction with outpatient examination and treatment and physical assessment of the hospital are significantly higher than the mean scores of the children who attended secondary school and high school.

**Table 7.** Mean scores, standard deviations, and independent groups $t$-test results of the health service satisfaction scale according to the children's type of social security.

| Variables | Social security of the child | N | Med. | Ss | t(120) | $p$ |
|---|---|---|---|---|---|---|
| Outpatient examination and treatment | SSI (pension fund, BAGKUR, etc.) | 99 | 20.31 | 6.99 | -2,08 | 0,04 |
| | Other (private health insurance) | 21 | 23.71 | 5.88 | | |
| Clinic (inpatient treatment) | SSI (pension fund, BAGKUR, etc.) | 99 | 20.04 | 6.96 | -0,73 | 0,47 |
| | Other (private health insurance) | 21 | 21.29 | 7.71 | | |
| Other health and bureaucratic transactions | SSI (pension fund, BAGKUR, etc.) | 99 | 19.37 | 5.02 | 0,40 | 0,69 |
| | Other (private health insurance) | 21 | 18.86 | 6.74 | | |
| Staff evaluation | SSI (pension fund, BAGKUR, etc.) | 99 | 10.45 | 4.39 | -2,08 | 0,04 |
| | Other (private health insurance) | 21 | 12.57 | 3.31 | | |
| Patient rights | SSI (pension fund, BAGKUR, etc.) | 99 | 12.68 | 4.61 | -2,49 | 0,01 |
| | Other (private health insurance) | 21 | 15.33 | 3.47 | | |
| Physical assessment of the hospital | SSI (pension fund, BAGKUR, etc.) | 99 | 10.59 | 3.67 | -2,15 | 0,03 |
| | Other (private health insurance) | 21 | 12.43 | 3.04 | | |
| Cafeteria services | SSI (pension fund, BAGKUR, etc.) | 99 | 10.64 | 3.78 | -0,29 | 0,78 |
| | Other (private health insurance) | 21 | 10.90 | 4.45 | | |
| General evaluation | SSI (pension fund, BAGKUR, etc.) | 99 | 7.84 | 3.25 | -1,50 | 0,14 |
| | Other (private health insurance) | 21 | 8.95 | 2.09 | | |
| HSSS total | SSI (pension fund, BAGKUR, etc.) | 99 | 111.92 | 27.39 | -1,85 | 0,07 |
| | Other (private health insurance) | 21 | 124.05 | 26.97 | | |

Table 6 presents a significant difference in the mean scores according to the disability level of the child. According to the results of the post hoc test, the mean scores of children with mild and low vision are higher for outpatient examination and treatment, clinical (inpatient treatment), personnel evaluation, patient rights, and general evaluation and HSSS total.

Table 7 indicates no significant difference in the mean scores according to the children's type of social security. However, a significant difference is observed in the mean scores for outpatient examination and treatment (t[120]=-2,08; $p$>0,05), personnel evaluation (t[120]=-2,08; $p$>0,05), patient rights (t[120]=-2,49; $p$>0,05), and physical evaluation of the hospital (t[120]=-2,15; $p$>0,05). Participants with other types of health insurance (private health insurance and other) have significantly higher mean satisfaction scores for outpatient examination and treatment (mean=23.71; SD=5.88), staff evaluation (mean=12.57; SD=3.31), and physical evaluation of the hospital (mean=12.43; SD=3.04)

## Discussion

Sociodemographic variables including gender, age, educational level, level of disability, and social security are important factors for satisfaction with health services among children with visual impairment. This study's results pertaining to the participants' sociodemographic characteristics are similar to those of Rahi et al.'s study (2005) [8] on health service experiences of parents of children with newly diagnosed visual impairment. Moreover, findings from Açıl and Ayaz's (2015) [9] study on screening children with visual impairment for health problems and from Reddy and Sharma's (2011) [10] study on the prevalence of oral health problems among children with visual impairment are similar to this study's results.

A significant difference was observed in the mean scores of children with visual impairment according to gender. Bhandary et al. (2013) [11], in their study on caregivers' knowledge regarding oral healthcare of children with visual impairment, the level of healthcare among boys was significantly higher than that among girls. Priyadarshini et al.'s (2015) [12] study on the evaluation of oral health status among children with visual impairment revealed that boys had higher mean scores in the evaluation of their health status. Rahi et al. (2004) [13] in a study involving families in health services research on visual impairment in childhood; Barriers to participation in healthcare and related findings parallel the gender results in our study (i.e., boys participated more than girls).

A negative relationship was observed between participants' age and the health service satisfaction scores, and their satisfaction levels decreased as their age increased. This finding is similar to that of Tagelsir et al.'s (2013) [14] study on oral healthcare of school children with visual impairment in Khartoum State of Sudan, where children did not attach importance to oral health and were not satisfied with the health services that they received as their age advanced. Similarly, in Boulton et al.'s (2006) [15] study on health-related quality of life of children with visual impairment or blindness, the rate of falling sick increased as age advanced, and health checks remained incomplete; thus, they benefited less from health services, were not satisfied, and their quality of life was negatively affected. Additionally, Flanagan et al.'s (2003) [16] findings are similar to this study's results.

A significant difference was observed in participants' mean scores for health service satisfaction according to their educational level, and the mean scores of children in secondary and high school were higher. In Qtoof et al.'s (2022) [17] study a research on the satisfaction of visually impaired students, their parents and teachers with auxiliary services, the number of children receiving health services is less than those in primary school and the level of receiving health services increased as the educational level increased. In a Nellis, 2019 study [18] on the oral health status of children with visual impairment in New Delhi, children in middle and high school were included in the oral health program and were satisfied with the health services that they received, positively affecting their oral health. Knight et al.'s (2018) [19] findings on the characteristics specifically, educational level of children with visual impairment under the age of

four in two public tertiary hospitals in Selangor, Malaysia, are similar to those of our study.

A significant difference was observed in the mean scores of health service satisfaction levels of children with visual impairment according to the level of disability. Nellis's (2005) [20] study on the satisfaction of parents of children with severe visual impairment with and without concurrent disability demonstrated that Parents' satisfaction levels with the health service their children received were found to be lower than those of children with positive satisfaction levels. Perrin's (2002) [21] study on health services provided to children with disabilities showed that children with mild disabilities received more health services than visually impaired children. In the study conducted by Cabral and Moraes (2015) [22] on family caregivers of children in need of special health care, it was revealed that the health care need scores of visually impaired children with mild disabilities were higher than their peer groups.

No significant difference were observed in the mean scores for clinical (inpatient) treatment, other health and bureaucratic procedures, cafeteria services, and general evaluation according to the type of social security of children with visual impairment. Moreover, no significant difference was observed in the mean scores for physical evaluation of the hospital, personnel evaluation, patient rights, outpatient examination, and treatment. Our results are similar to those of Marcon et al.'s (2020) [23] study on special health and primary care needs of families of children with visual impairment, where the utilization level of health services differed according to the children's health insurance. In Särkikangas and Autio's (2017) [24] study on families of children with special needs who use social and health services, Activities of daily life vary depending on the health insurance status of families and children; those who receive state support benefit more from health services. Harrison et al. (2020) [25] investigated the barriers to access to health services for people with disability in rural Malawi. Significant differences were observed in the examination and treatment processes for people without social security who could not directly benefit from health services. The results of the study by Lee et al. (2024) [26] on the oral health status and oral health-related behaviors of visually impaired Hong Kong students are similar. Similarly, the results of the study by Shankar et al. (2024) [27] on the effect of oral health education interventions using braille on oral health in visually impaired children: a systematic review proposal and the results of Zhao et al. (2023) [28] on a human-centered design strategy for self-educated health care for visually impaired people are similar.

In this research; It will guide the determination of visually impaired children's utilization of health services and the research to be conducted in the relevant field. This study did not examine all visually impaired children in Türkiye and was limited to visually impaired children who participated in the study voluntarily and whose parental consent was obtained. The small sample size was limited because it was a specific flu. Even though it is a limitation, it will be a guide for future studies.

## Conclusion

It has been determined that children with visual impairments differ according to their level of utilization of health services and some variables. Problems experienced by children with visual impairment regarding healthcare, accessibility, and satisfaction with care are affected by various factors, especially sociodemographic characteristics. In this context, quick and effective solutions should be proposed. It is necessary to evaluate patients' needs to increase satisfaction with the existing health services and improve knowledge, training, and experience of health professionals. Increasing accessibility to and satisfaction with healthcare services provided to children with visual impairment may enable them to receive quality services, with an equal, non-discriminatory, and holistic approach.

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