

# A Sentiment Analysis of Turkish Tweets Shared in Nursing Week During the Pandemic

## Küresel Salgın Sürecindeki Hemşirelik Haftasında Paylaşılan Türkçe Twitter İletilerinin Duygu Analizi

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### Abstract

**Aim:** This study aimed to conduct an artificial intelligence-based sentiment analysis of Turkish tweets about nursing during the nursing week during the COVID-19 pandemic.

**Method:** This is a retrospective descriptive survey. Between May 4 and May 19, 2021, Turkish tweets were analyzed using the Python library Tweepy. The search terms “nurse, nursing, and nursing week” were used to analyze tweets for their positivity, neutrality, or negativity.

**Results:** The analysis of 24,944 tweets revealed that tweets frequently express neutral emotions. The negative tweets frequently discussed issues such as societal gender perception, professionalism, burnout during the pandemic, salaries, inadequate nursing workforce, inequalities, violence against healthcare professionals, and the deaths of nurses.

**Conclusions:** Social media applications can be recommended as important tools for raising awareness of the nursing profession identity, professionalism, visibility, and the perception of society towards nursing, nursing problems, and recommendations for solutions.

**Keywords:** Nursing, social media, artificial intelligence, natural language processing.

### Öz

**Amaç:** Bu çalışmanın amacı, COVID-19 küresel salgını sürecinde hemşirelik haftasını da içeren iki haftalık bir dönemde hemşirelikle ilgili Türkçe iletilerin (tweet) yapay zekâ tabanlı duygu analizini yapmaktır.

**Yöntem:** Çalışma retrospektif, tanımlayıcı olarak gerçekleştirilmiştir. Türkçe iletiler 04-19 Mayıs 2021 tarihleri arasında “hemşire, hemşirelik, hemşirelik haftası” anahtar sözcükleri kullanılarak, Python Library Tweepy ile analiz edilmiştir.

**Bulgular:** Toplam 24.944 ileti belirlenmiştir. Yapay zekaya dayalı duygu analizi gerçekleştirilen çalışmanın sonucunda, hemşirelikle ilgili iletilerin genellikle yansız/tarafsız duygular içerdiği görülmüştür. Olumsuz iletilerde sıklıkla hemşirelerin yaşadığı sorunlar dile getirilmiştir. İletilerde belirtilen sorunların; hemşireliğin toplumsal cinsiyet algısı, hemşireliğin profesyonelliği, salgın döneminde tükenmişlik, düşük maaşlar, hemşirelik işgücünün yetersizliği ve eşitsizlikler, sağlık çalışanlarına yönelik şiddet ve hemşire ölümleri vb. ilgili olduğu belirlenmiştir.

**Sonuç:** Toplumun hemşireliğe yönelik algısı, hemşirelik sorunları, hemşirelik mesleğinin kimliği, profesyonelliği ve görünürlüğü ile ilgili farkındalığın artırılması için sosyal medya uygulamalarının kullanılması önerilebilir.

**Anahtar Sözcükler:** Hemşirelik, sosyal medya, yapay zekâ, doğal dil işleme.

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### Introduction

The first case of coronavirus (COVID-19) emerged in Wuhan, China, in December 2019, and spread rapidly across the world. The first case in Turkey was recorded on 10 March 2020, and from that date to 08.02.2022, a total of 12,237,610 cases and 88,734 deaths have been recorded (World Health Organization [WHO], 2022). The pandemic undoubtedly increased the workload of healthcare personnel, and in the first period of the pandemic, shortages of personal protective equipment, infection and death caused by spread to healthcare personnel caused psychosocial problems in this population. From the beginning of the COVID-19 pandemic, stressors such as uncertainties about treatment, equipment, and care, the frequent changes to duty lists, intense and frequent duties, changes to the lifestyle of healthcare personnel, concerns about becoming infected with the virus themselves or passing it to their families, and limited access to resources, caused healthcare personnel to experience intense stress (Fernandez et al., 2020; Kackin, Çiydem, Aci and Kutlu, 2021).

Nurses are the largest population in the healthcare system and are the healthcare professionals who spend the most time with patients (Fernandez et al, 2020). The World Health Organization (WHO) declared 2020 as the Year of the Nurse and the Midwife, which drew attention to the importance of these two professions. Unfortunately, nurses were then faced with the pandemic in that year (LoGiudice and Bartos, 2021). Not only was COVID-19 a global pandemic, but nurses experienced global problems in that period. In a qualitative study in Turkey by Kackin et al (2021), it was determined that the work and social life of nurses changed during the COVID-19 pandemic, and there were difficulties in respect of mental health. LoGiudice and Bartos (2021) also reported that nurses experienced anger, anxiety, stress, and disappointment with hospital protocols changing every day, difficulties with personal protective equipment, incorrect screening tests, and while some did not wish to work and thought of resigning, others were proud of being a nurse and they were frightened of becoming ill and passing the virus on to those close to them. In a systematic review and a meta-analysis by Fernandez et al (2020), the experiences of 348 nurses were analyzed and it was determined that the concerns of nurses about the safety of themselves and their families were accompanied by physical and mental health symptoms, and that collaboration with supportive teams increased the quality of care.

During the pandemic, many studies were conducted using sentiment analysis of the messages shared on Twitter. Especially in the first stage of the pandemic, these studies evaluated the number of cases and symptoms (Guo, Radloff, Wawrzynski and Cloyes, 2020; Guo, Sisler, Wang and Wallace, 2021), the stigmatization of China (Budhwani and Sun, 2020), concerns about virus mutants according to geography (Guntuku, Bittenheim, Sherman, and Merchant, 2021), and public perceptions of vaccines (Eibensteiner et al. 2021; Hussain et al., 2021) and Twitter formed a data pool. In parallel with the development and spread of artificial intelligence techniques, sentiment analysis has been used frequently in recent years, especially in the analysis of on-line applications, as it is an analysis method which explains what emotions are explained in texts and provides determination as positive or negative. Sentiment analysis, which is a Natural Language Processing technique (NLP), is a method frequently used for this purpose and is applied with two approaches. These are the verbal-based approach and the machine learning approach (Pozzi, Fersini, Messina and Liu, 2016). With sentiment analysis, the view of society in current events is evaluated, but these studies are limited in nursing literature (Guo et al., 2020; Guo et al., 2021). The evaluation of tweets related to nursing in nursing week, which coincided with a 17-day lockdown in Turkey as the pandemic continued, will enable the gathering of ideas about recognition of the profession, the current status of the profession, professionalism, and societal perceptions, problems, and recommendations about the profession, and will also allow a review of the subjects shared by nurses.

Therefore, the aim of this study was to conduct sentiment analysis of the tweets on Twitter related to the nursing profession in nursing week during the COVID-19 pandemic. The reason for selecting the time period was that it is the period when nursing is most discussed. As there are few studies related to the perception and opinions of society related to nursing, analysis of the content of Twitter, as a social media application, could be a potential tool to understand societal perception. It is thought that within the scope of this study the benefit to be gained from applying artificial intelligence to Twitter, will be able to contribute to studies that can bring innovation to the field of nursing.

### Method

**Study Design:** A retrospective and descriptive evaluation was made of artificial intelligence-based sentiment analysis of Turkish tweets. The reporting of the research was applied in accordance with the guidelines of The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) (Vandenbroucke et al, 2014).

**Sample and Data Collection:** The data for this study were collected from Twitter using Python Library Tweepy software, in the 2-week time period of 4-19 May 2021. The study universe was formed of all the Turkish tweets in the specified time interval. The study sample was formed of Turkish tweets containing the words “nursing”, “nurse”, or “nursing week”. The tweets with these three words, the users sharing these tweets and the numbers of likes and retweets were used. A total of 24,944 tweets were identified, and a sample was formed of 22,573 tweets, which contained the key words, expressed positive, neutral, or negative sentiments, and were not retweets or duplications (Table 1).

**Data Analysis:** Data of the tweets were collected using the artificial intelligence program, Python Library Tweepy software. To extract the characteristics of the data in the sentiment analysis, the NLP method, “Bidirectional Encoder Representations from Transformers” (BERT) was used. BERT is a current technology method, which has been used in 70 languages on Google since October 2019, and is a technique used in almost all search engines in English. In this study, the pre-programmed BERTurk was used as the technique for feature extraction in Turkish (Schweter, 2020). From the advanced feed Artificial Neural Networks (ANN) classification, which is often used in psychiatry and behavioral sciences, the Multilayer Perceptron (MLP) classification was used (Wu et al., 2020).

**Ethical Considerations:** The study was approved by the Academic Research and Publication Ethics Committee of a university (decision no:2021-2, date:07.07.2021). As the study was conducted on social media, which is a public access platform, institutional permission was not required, and as the data were anonymous, individual informed consent was not required. The data were obtained from Twitter in compliance with the Personal Data Protection Law (2016) and the Ethical Guidelines for Internet Research (Franzke, Muis and Schäfer, 2021) and personal information of the individuals was not obtained.

## Results

**Tablo 1. The characteristics of Turkish tweets related to nursing**

Tweets	n	
Total number of Tweets	24.944	
Number of single Tweets	22.573	
Total number of Retweets	28.060	
Total number of Likes	226.961	
Total number of Unique Users	9306	
<b>Tweet Frequency</b>	<b>Mean</b>	<b>SD*</b>
Number of Tweets per day	1.524.96	1.979.61
Number of likes per day	14.185.06	219.44
Number of retweets per day	1.12	13.34
<b>Users</b>		
Number of Users who liked Tweets	24.38	0.02
Number of users who retweeted Tweets	3.01	0.01
<b>Tweets related to Nursing</b>	<b>n</b>	<b>%</b>
Containing the word “nurse”	22.573	90.49
Containing the word “nursing”	2156	8.64
Containing the word “nursing week”	215	0.86
<b>Characteristics of the Tweets related to Nursing</b>	<b>n</b>	<b>%</b>
Negative	5719	22.9
Neutral	15,970	64
Positive	3255	13
<b>Characteristics of the Negative Tweets</b>	<b>Mean</b>	<b>SD*</b>
Daily number of Negative Tweets	350.62	198.11
Daily number of users sharing Negative Tweets	233	0.00
Daily number of users liking Negative Tweets	1.00	0.02
Daily number of users retweeting Negative Tweets	0.13	0.00

\*SD: Standart Deviation

A total of 24,944 Turkish tweets related to the nursing profession were identified, of which 22,573 were determined to contain the word “nurse”, 2156, “nursing”, and 215 “nursing week” (Table 1).

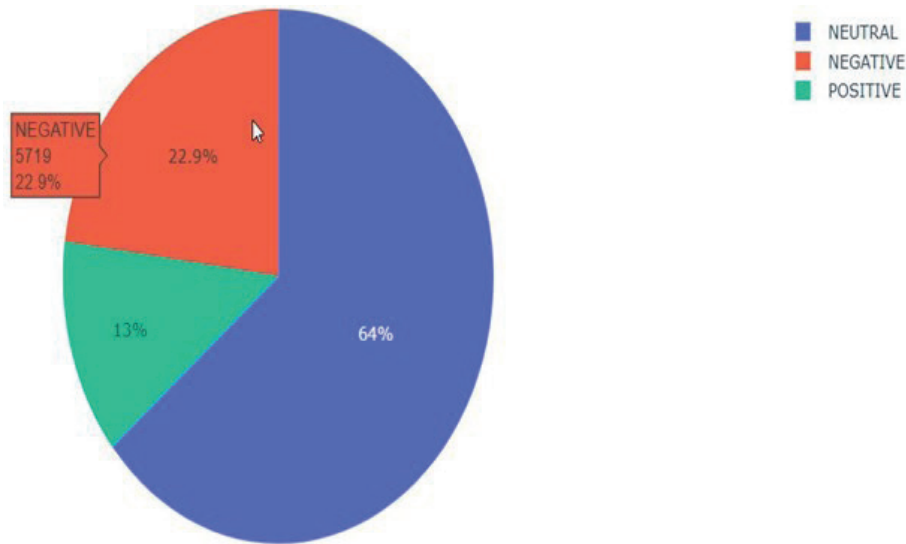


Figure 1. Sentiment analysis of Turkish tweets related to nursing

The tweets shared by 9306 individual users contained neutral emotions in 64%, positive emotions in 22.9%, and negative emotions in 13% (Figure 1).

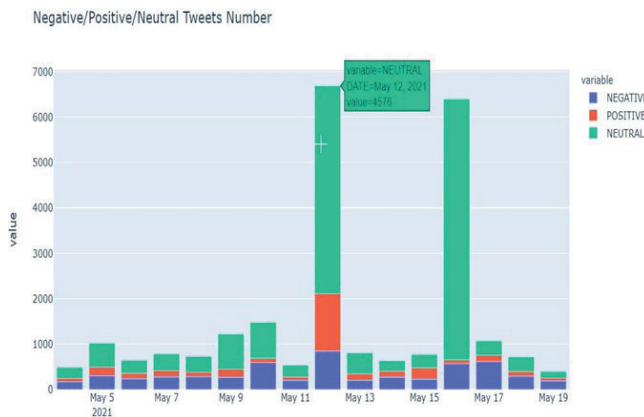


Figure 2. Sentiment analysis of Turkish tweets related to nursing by days

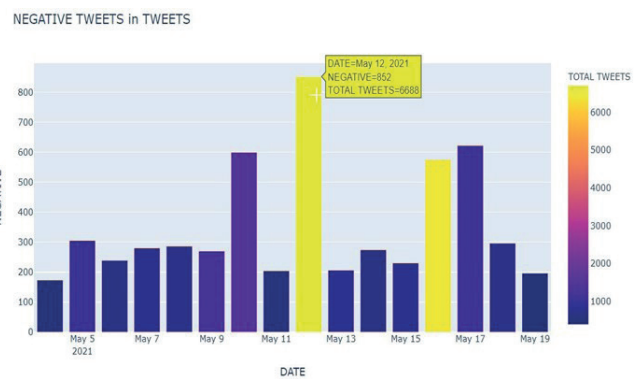


Figure 3. Distribution by days of the negative Turkish tweets related to nursing

The neutral (Figure 2) and negative (Figure 3) tweets were shared most on May 12. Mean  $1524 \pm 1976.61$  tweets per day were shared, which were liked mean  $14,185.06 \pm 219.44$  times and retweeted mean  $1.12 \pm 13.34$  times. The mean number of users liking the tweets was  $24.38 \pm 0.02$  and the mean number of users retweeting was  $3.01 \pm 0.01$ . When the negative tweets and related characteristics were evaluated, the mean number of negative tweets per day was determined to be  $350.62 \pm 198.11$ , shared by mean  $233 \pm 0.00$  users, and these tweets were liked mean  $1.00 \pm 0.02$  times and were retweeted mean  $0.13 \pm 0.00$  times (Table 1).

**Tablo 2. Examples of the most liked and retweeted tweets**

Sentiment Category	Examples of Tweets
<p><b>Positive Tweets</b> Positive tweets generally congratulated nurses on nursing week and thanked nurses for their dedicated work during the pandemic.</p>	<p>“Congratulations on 12-18 May Nursing Week to our valuable nurses who perform their work with unlimited patience, dedication and love”</p> <p>“Nursing is effort, nursing is love, nursing is self-sacrifice, nursing is our safety. Thanks to all the team members who provide health and healing. It’s good that you are here and it’s good that we are with you”.</p> <p>“I celebrate nursing week for all nurses and especially for my dear team #12MayNursesDay”</p> <p>“Starting by saying, “people first”, may Nurses Day be celebrated by all the self-sacrificing, patient nurses and trainee nurses, all heroes in this pandemic in which we now find ourselves”.</p> <p>“Let the day be celebrated of nurses and trainee nurses, who touch so many lives and work unstintingly to improve the lives they touch, and may we see the value we deserve”.</p> <p>“As a symbol of self-sacrifice and heroism, to all my nursing sisters, it’s good you are here.”</p>
<p><b>Negative Tweets</b> The negative tweets generally expressed societal gender perception of nursing, the professionalism of nursing, burnout during the pandemic, salaries of the profession, insufficient nursing workforce and inequalities, violence towards healthcare professionals, and the deaths of nurses.</p>	<p>“A nurse is not a doctor’s assistant, a nurse is not an angel, a nurse is not a witch, nursing is not just a “woman’s” profession. A nurse is a multidisciplinary working professional providing healthcare services in a branch of the profession”.</p> <p>“A male intern and I approach a patient wearing the same uniforms; the patient always calls him doctor, sir, and me nurse, miss. #not surprising in turkey”</p> <p>“Healthcare workers don’t have rights, do they? There is no loyalty in health or in funerals. A 30-year-old nurse dies from Covid, her baby is in intensive care, nobody even mentions their names”.</p> <p>“They’ve lost 420 healthcare workers to Covid. More than 140,000 nurses have become ill. Even during the pandemic, violence to healthcare workers doesn’t stop. Under these intense working conditions, they’ve been forced to live apart from their homes and children for months. They are tired. They are exhausted. They don’t want applause, they want rights!”</p> <p>“Great observation from a citizen. For the nurse pressing cotton wool on the wound, 3000 lira salary, for the imam stuffed with cotton wool, 6000 Turkish liras, and for the farmer producing the cotton, bankruptcy!!!”</p> <p>“I’m watching a Canadian property documentary. There is a 35-year-old-couple, the mother is a nurse, the father is a physiotherapist, they have 2 children and 2 dogs. They bought a 3-storey villa with a pool for 700,000 dollars, and have 2 cars. In Turkey, never mind the villa, a couple like this find it difficult to make it to the end of the month. This is our life!”</p> <p>“With the hope of legal measures taken against violence in the healthcare sector, improving financial and personal rights, regulating intense shifts, drudgery and risky working conditions, I congratulate the nursing week of all nurses who practice their profession with dedication and love.”</p> <p>“One of the reasons for the terror of violence in the healthcare system is that insufficient personnel are employed. Unfortunately, we are way below the OECD average, ranked in the lowest countries for the number of nurses, midwives and doctors. Safe employment is a must”.</p> <p>“The most evident thing I have seen in all my nursing friends is BURNOUT...maybe the physical fatigue will pass after the pandemic, but do you think the psychological fatigue will pass?”</p> <p>“Long working hours, superhuman work, childcare problems, burnout,... these emotions of a woman working in healthcare were expressed in a letter written by Nurse Alev from Manisa”.</p> <p>“Today is 12th May, World Nurses Day. In Turkey, where there are 2 nurses for every 1000 people, nurses are in a state of burnout with the increased workload of the pandemic. Despite the heavy workload, nurses are working for low salaries and have problems making ends meet”.</p> <p>“In Turkey there are 2 nurses for 1000 people. This is not good for us or for the nurses. While their workload increases, the quality of the quality of the healthcare services we receive, falls. Especially in this pandemic, the government should deal with this urgently and assign more nurses”.</p>
<p><b>Neutral Tweets</b> The neutral tweets were seen to announce activities to be held during nursing week, report the history of nursing in Turkey, and discuss nursing within other topics.</p>	<p>“The posters and announcements of the Bursa branch of the Turkish Nurses Association in respect of 12-18 May Nursing Week can be seen in the streets of the city and towns”.</p> <p>“Safiye Hüseyin Elbi (1881-1964) was a professional woman who pioneered the development of modern nursing in Turkey. She worked as a volunteer nurse during the Balkan War and World War I. Following the establishment of the Republic of Turkey, she served in many charities and associations”.</p> <p>“A graduate of the Faculty of Economics and Administrative Sciences is not a professional clerk. They are not teachers, nurses, doctors, food engineers, or construction engineers, they are ADMINISTRATORS. If public administrations do not view them as ADMINISTRATIVE, then close the faculties, we say”.</p>

Examples of the most retweeted and liked tweets are given in Table 2. The results of the sentiment analysis showed that the tweets with positive emotion content were usually congratulating nurses on nursing week, the neutral tweets were giving information and announcements, and the negative tweets were related to professional problems (Table 2).

### Discussion

This study results showed that the majority of tweets about the nursing profession were neutral but the number of negative tweets was approximately double that of positive tweets. Even though neutral tweets were seen to have been shared most, the rate of negative tweets cannot be disregarded. The day on which most negative tweets were shared was on May 12, which was Nurses Day. It was in fact expected that the number of negative tweets would be lower on Nurses Day than on the other days of the 2-week period of the study.

When the neutral tweets were evaluated, it was seen that they announced activities to be held during nursing week, reported the history of nursing in Turkey, and discussed nursing within other topics. The neutral tweets were determined to be compatible with the meaning and importance of the week. In contrast, there was seen to be a low rate of positive tweets in nursing week, despite nurses having emerged in a positive sense as a professional group during the pandemic. It was determined as an expected result that the positive tweets on the subject congratulated nurses on nursing week and thanked nurses for their dedicated work during the pandemic. Regardless of traditional, cultural, and social values, there has been seen to be a worldwide general positive perception of nursing throughout the COVID-19 pandemic.

In previous studies and on social media, the efficacy of the knowledge and experience of nurses in practical management, and the contribution of their behavior with courage, dedication, leadership and responsibility have been reported and it has been emphasized that each one is now seen as a hero in society (Çakmak and Inkaya, 2020). In a study by Rosenberg, Syed, and Rezaie (2020) which evaluated the role of Twitter use during the pandemic, positive attitudes such as the self-sacrifice, dedicated efforts and positive experiences of healthcare professionals in frontline intervention were reported and it was emphasized that the healthcare professionals were seen as heroes (El-Awaisi, O'Carroll, Koraysh, Koummich & Huber, 2020). In a study in Korea which evaluated through social media the public perception of nurses and the nursing profession before and after the pandemic, it was reported that the importance of nurses in preventing and managing a mass epidemic was better understood since the COVID-19 pandemic (Shin, Jung, Park, Lee and Son, 2021). As seen in other research results, a positive attitude developed to nurses and to all healthcare professionals during the pandemic, similar to the results of the current study. Although it was seen that in terms of content, the tweets contained strong positive emotions, frequency was expected to increase in parallel with nursing week, when nurses and nursing are discussed. However, the negative tweets were related about professionals' problems in nursing that, the shared tweets by nurses might be affected the distribution of negative tweets.

In addition to the problems experienced by nurses before the COVID-19 pandemic in Turkey, different problems emerged together with the pandemic. The Turkish Nurses Association (TNA) prepared five reports in accordance with the feedback obtained from nurses dealing with COVID-19 in healthcare institutions and these were forwarded to the Turkish Ministry of Health (Turkish Nursing Association [TNA], 2020). A lack of personal protective equipment and problems related to its use were reported as problems by nurses in this field in Turkey. Problems related to the working environment and conditions (working hours, rest breaks, food, rest areas, patient: nurse ratio, etc.), undertaking duties beyond the responsibility of the nursing profession, lack of psychosocial support (accommodation, transport facilities between home and hospital for duty, exposure to violence, childcare or care of elderly parents as both the nurse and spouse are healthcare workers, etc.), employment rights, and the testing of nurses caring for suspected and diagnosed COVID-19 patients (increase in the number of COVID-19-positive healthcare workers, late reporting of negative tests, etc.) were forwarded as feedback from nurses working in practice (TNA, 2020). Nurses struggled with different problems and perceptions within the intense working conditions during the pandemic. The problems emphasized in the Turkish Nursing Association report were determined to be expressed in the negative tweets.

Many healthcare professionals became infected with COVID-19 or in the most severe cases were lost to mortality. According to the information obtained from the International Council of Nurses (ICN) in January 2021, more than 2800 nurses lost their lives in 69 countries worldwide, but confirmed figures were not known as there is no global systematic, standardized monitoring system (International Council of Nurses [ICN], 2021). The data published by the Turkish Medical Association on 4 August 2021 stated that 427 healthcare professionals from different professions had lost their lives in Turkey, of which 16 were nurses (Turkish Medical Association [TMA], 2021). In the current study, it was seen that negative tweets emphasized healthcare professionals who had lost their lives because of COVID-19, and that the rights of dedicated healthcare professionals were not given attention and respect.

In a 2021 report by the ICN entitled, “Nurses: A Voice to Lead a Vision for Future Healthcare: International Nurses Day 2021 Resources and Evidence”, it was reported that together with many problems during the COVID-19 pandemic, healthcare workers also experienced professional burnout (ICN, 2021). In a nationwide study in Turkey by the Turkish Medical Association, it was determined that during the COVID-19 pandemic, 80.3% of nurses experienced anxiety, 61.5% felt afraid, and 50.7% experienced burnout. Nurses who performed their duties with several problems before the COVID-19 pandemic, had more intense working hours in this period because of nursing shortage. According to the Organization for Economic Co-operation and Development (OECD) Health Statistics, the number of nurses working in the healthcare sector in Turkey is 2.1 per 1000 people. This places Turkey 6th from the bottom of 44 countries (OECD, 2019). When this rate is considered, it can be seen that there was an insufficient workforce of nurses caring for patients before the pandemic. Together with this ratio, the workload increased during the COVID-19 pandemic (OECD, 2019). Adding to these nurses experienced fear and anxiety about the risk of infection, missed their families, had no support systems, were not given employment rights such as annual leave, and with several other factors then experienced feelings of burnout (TNA, 2020). The loss of rights experienced by nurses, the workload, and the insufficient workforce are subjects frequently found in the tweets analyzed in this study.

**Study Limitations:** The tweets analyzed in this study were limited to a defined date range and Turkish language. In addition, the emotions in the tweets in this study were analyzed with the NLP method was only made with artificial intelligence and therefore, validity and reliability could not be examined. The absence of studies with similar subjects and methods in the literature has caused difficulties in making comparisons. Nevertheless, this study can be considered of value as the first study in Turkey to have used sentiment analysis of Twitter content from social media applications to be able to see as a whole the view of society of nursing during the COVID-19 pandemic, the problems experienced by nurses, and recommendations.

## Conclusion and Recommendations

In pandemic, nurses in Turkey experienced many physical, mental, social, and professional problems, and often expressed these problems in written, visual, and social media. In this study, it was determined that the tweets usually contained neutral emotions and the negative tweets often expressed the problems of nurses. In the context of negative tweets in particular, the problems related to nursing were determined to be the societal gender perception of nursing, the professionalism of nursing, burnout during the pandemic, salaries, insufficient nursing workforce and inequalities, violence directed at healthcare professionals, and the deaths of nurses. Independently of nursing week, nurses expressed their problems in traditional mass communication tools and on social media. However, by specifically determining the time period of this study to include nursing week, a comprehensive evaluation was made of the problems. Therefore, as an important finding of this study, it can be recommended that social media applications are used to increase the awareness of the identity, professionalism and visibility of the nursing profession together with the perception of society towards nursing, nursing problems, and recommendations for solutions.

## Implications for Nursing Management

Little is known about the public perception of nursing, and recommendations for the resolution of problems through the use of social media. Therefore, the use of social media by nurses could be beneficial in increasing the recognition, professionalism and visibility of the nursing profession. On the other hand, this study results showed the professional's problems of nursing has still continued during the pandemic and nurses have tried to announce their voice with social media that could be effective. Because, there is a need to implement healthy working conditions to manage the problems related to the nursing conditions on behalf of patients, nurses and health institutions and organizations. In this context, it can be suggested that nurse managers should lead the nursing profession together with healthcare policy-makers in terms of creating legislation and communication platforms for professional problems, and conduct research and education programs in respect of the public perception of nursing.

**Ethics Committee Approval:** Fenerbahçe University Academic Research and Publication Ethics Committee approval was obtained (Date: 07.07.2021 - Number: 2021-2).

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