

# Comparison of Nurses' Image in Korean Online Newspaper Articles before and after COVID-19: A Text Mining Analysis

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## Abstract

**Background/Objectives:** This study investigated nurse-related keywords which were presented together with nurse on phrase, clauses or sentence of documents or conversations in the Korea online newspaper articles.

**Methods/Statistical analysis:** Text mining, which is a common method of analysis for large datasets, was used to analyze the changes in nurses' image before and after COVID-19. A total of the linking words with nurse were calculated by the number of presentation on online newspaper article in Naver before and after COVID-19. In order to identify the meaning of the words, clustering of the collected linking words by categories was analysed and the characteristics of each cluster were classified. Over 5,000 articles were identified as targets for a keyword analysis.

**Findings:** The most frequently presenting words were hospital, medical and patient. Before COVID-19, the words related to 'workplace bullying' were highly presented and after COVID-19, the words related to 'care' were highly presented.

**Improvements/Applications:** With analyzing the trends of changes and characteristics of words by COVID-19 and clusters, we attempted to investigate the image of nurse that the public think and feel about nurse.

**Keywords:** Nurse' image; Online newspaper; COVID-19; Text mining analysis

## Introduction

The World Health Organization (WHO) declared that COVID-19 entered the pandemic phase on March 11, 2020 [1]. As of May 24, 2020, there were 5,201,549 confirmed cases of COVID-19 and 337,405 deaths across the world [2], as well as 11,190

confirmed cases and 266 deaths in Korea, where the first confirmed case occurred on January 20, 2020 [3]. Since the beginning of this unprecedented public health emergency, nurses around the world have been on the frontlines [4], treating patients suffering from a highly contagious disease. A key aspect of being on the frontlines during this pandemic is the risk of contracting the virus. Accordingly, the media continues to highlight the role of nurses in responding to the pandemic, leading to an increase in public interest in both nursing and nurses[5].

Nursing is a patient-oriented, therapeutic interpersonal process, and the rapport between the nurse and patient is a key factor in its success.

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Therefore, the image that a patient has of nurses is an essential factor in determining whether a therapeutic relationship with the patient will be effective. In addition, a positive public image of nurses is associated with increased self-evaluation, self-concept, professional intuition, and job performance and decreased turnover intention among nurses [6-8]. Therefore, the public's image of nurses affects the quality of nursing, which in turn affects the quality of public health [9].

In today's rapidly changing society, the public's perception is greatly influenced by the media [10]. Therefore, the depiction of nurses in the media can have a considerable effect on the public's attitudes and behaviors toward nurses [11]. Given the link between the public's perception of nurses and the quality of public health, it is worthwhile to evaluate how nurses are portrayed in the media and how the portrayal is received by the public.

The MERS outbreak in Korea demonstrated the crucial role of the media in the public's perception of nurses and nursing. In fact, COVID-19 is not the first time in recent history that Korean nurses have been on the frontlines of a public health crisis. In the MERS outbreak, Korean nurses worked day and night to protect the lives of the public despite considerable financial and non-monetary losses [12]. However, several aspects of the country's response to MERS, including the information policy that prevented the public from obtaining accurate information through the media, the untimely response to MERS from the government, and the spreading of false information regarding the inadequate treatment of patients or neglected medical examinations, led to the perception that healthcare providers, including nurses, had become unreliable [12].

In the ever-changing situation created by COVID-19, no data have emerged to quantify the image of nurses or the public's trust in nurses. News

media is the most influential medium in forming public awareness of nurses [13]. Particularly in Korea, the internet and smartphones are integral to everyday life [14], and the public accesses news mostly via the internet [15]. Therefore, a textual analysis of online newspaper articles may provide valuable insights into the image of nurses, and is suitable for analyzing the medical service needs of consumers. Given that over four months have elapsed since Korea had its first confirmed case of COVID-19, there is also a sufficient amount of data from online news sources to evaluate the portrayal of nurses in the media.

There have been studies of nurses' image in various media, including internet newspapers [16-17], hospital newspapers [18], and the internet and social media [19], but studies of nurses' image in television [20-23] predominate. However, data analyzed in these studies predate COVID-19 and do not reflect the changes in the image of nurses since the beginning of the COVID-19 pandemic. A textual analysis of online news articles pre-and post-COVID-19 is expected to capture the breadth of images of nurses both within and outside of the nursing industry and provide a basis for a connection of relevant social issues or nursing policies. Therefore, this study aimed to help develop a strategy for the nursing community to deliver a desirable image of themselves and their profession by identifying the portrayals of nurses highlighted in the media.

## **Method**

### **1. Purpose of research**

Text mining, which is a common method of analysis for large datasets, was used to analyze the changes in nurses' image before and after COVID-19. This study had two research goals. The first goal was to identify the associated words that appear in online news articles regarding nurses. The second goal was to analyze the nurse-related words to understand how

the image of nurses has changed after COVID-19.

## 2. Data collection

Data for this study were collected from Korean portal websites and social media. All phrases and sentences containing the word “nurse” were collected from the Naver news portal, which features articles from the largest share of news organizations in Korea, to extract words related to “nurse” [24].

Data were collected for two periods. First, data were collected from January 1, 2017 - December 11, 2019 for the analysis of nurses’ image before the occurrence of COVID-19. Second, data were collected from December 12, 2019 to May 10, 2020 for analysis of nurses’ image after the occurrence of COVID-19.

In the data collection phase, online news article data was collected from Naver using the Python algorithm for online data crawling. After collection, the data were stored in a form that could be analyzed.

## 3. Data analysis

In the next text mining stage, the data were preprocessed and analyzed using a range of analytic techniques commonly used in text mining. First, the data were preprocessed using a Python algorithm for natural language processing and morpheme analysis. The purpose of preprocessing the data was to analyze the grammar and structure of the text. Next, the textual data were converted into a term-document-matrix, a structured data type, and processed into a form suitable for analysis.

The extracted words from the processed data were then analyzed. Specifically, the words were classified by morphological analysis, frequency, and correlation analysis and visualization, and all related words appearing simultaneously with the word “nurse”

were classified. Also, to examine the topics relevant to nurses discussed by the writers of the articles, the extracted words were clustered into categories of words with similar characteristics. The final nurse-related words (except for stop words) were arranged by three researchers to classify words with similar qualities. If there was a word corresponding to a higher-level concept among the classified related words or if there was a higher-level concept that could be used to refer collectively to a set of related words, the word was used as a characteristic of the corresponding related-word set group. Similar characteristics of the higher-level concepts were repeatedly identified to classify the characteristics of the related word set in a step-wise fashion. Through this process, the differences in nurses’ image in online newspaper articles before and after COVID-19 were statistically analyzed.

## Result

### 1. Nurse-related news articles

There were 3,410 online news articles before COVID-19 and 1,626 articles after COVID-19 that contained keywords related to the word “nurse.” Before COVID-19, Yonhap News had the highest number of articles with 354 cases (10.4%), followed by Newsis with 348 cases (10.2%), News1 with 197 cases (5.8%), KBS with 161 cases (4.7%), Seoul Economic Daily (SED) with 141 cases (4.1%), and Kookmin Daily with 133 cases (3.9%). After COVID-19, Yonhap News had the highest number of articles with 167 cases (10.3%), followed by Newsis and News1 with 131 cases (8.1%) each, Joins.com with 73 cases (4.5%), and KBS and KookminDaily with 71 cases (4.3%) each (Table 1). In summary, over 5,000 articles were identified as targets for a keyword analysis.





**Cont... Table 2. Results of nurse-related keywords by online news articles**

4	Nursing	4,287	6	Patient	3,930	6.7
5	Working	3,110	4.4	Infection	3,570	6.1
6	Prohibit	2,737	3.8	Confirmed cases	2,698	4.6
7	Workplace bullying	2,618	3.7	Diagnosis	2,517	4.3
8	Doctor	2,249	3.2	Isolation	2,292	3.9
9	Infant	2,075	2.9	Care	2,039	3.5
10	Personnel	2,039	2.9	Working	1,974	3.4

### 3. Analysis of nurse-related keywords

The nurse-related extraction results were classified into the five higher-order categories of place, character, specialty, relation, and work based on the characteristics of the keywords. Table 3 shows the frequencies by category and keyword before and after COVID-19.

This analysis reveals several keywords that began to appear only after COVID-19. For words related to place, “hospital” and “workplace” appeared most frequently before COVID-19. “Daegu,” which had not appeared before COVID-19, appeared after COVID-19. For words related to character, the most frequently appearing words before COVID-19

were “patient” and “doctor,” respectively. After COVID-19, they were “patient” and “personnel,” respectively. For words related to specialty, the most frequently appearing words before COVID-19 were “medical” and “nursing,” respectively. The word “COVID-19” emerged after the occurrence of COVID-19. For words related to relation, there was a significant difference between the most frequently appearing words before and after COVID-19. Before COVID-19, “workforce bullying” and “death” were the most frequently used words, and the words “care” and “support” emerged after COVID-19. For words related to work, the word “workload” appeared before COVID-19, and the word “physical contact” appeared after COVID-19.

**Table 3. Linking words by category**

Category	Rank	Before COVID-19		After COVID-19	
		Linking word	n	Linking word	n
Place	1	Hospital	12,525	Hospital	5,955
	2	Workplace	1,339	Daegu	1,630
Character	1	Patient	4,680	Patient	3,930
	2	Doctor	2,249	Personnel	1,364
Specialty	1	Medical	5,953	COVID-19	7,278
	2	Nursing	4,287	Medical	4,750
Relation	1	Workplace bullying	2,618	Care	2,039
	2	Death	1863	Support	655
Work	1	Working	3,110	Working	1,974
	2	Workload	1,840	Physical Contact	1,386

A word cloud was used to visualize the highly relevant keywords from the main nurse-related keywords used in online newspapers before

### Discussion

In this study, the words simultaneously appearing with the word “nurse” were extracted from newspaper articles appearing on Naver, which is the most popular internet portal in Korea. The most frequent words related to place were “hospital,” “workplace,” and “Daegu.” The newly emerged keyword “Daegu” is the area where the first COVID-19 case was diagnosed in Korea and is significant as a place where many nurses from all over the country volunteer to work as medical personnel. Among the places most frequently associated with nurses, the keyword “hospital” was ranked in the top 1-2 words both before and after COVID-19 indicating that the word “nurse” is still associated with hospitals. In a study by Kim & Kim, direct contact with nurses was found to affect the image of nurses held by 46.1% of the sample, while mass media affected the image of nurses held by 16.3% of participants [25]. Fortunately, a previous study found that experience in hospitals affected the

image of nurses held by the majority of people, and nurses were viewed highly favorably by the patients or caregivers whom they had cared for directly [23].

In the case of the most frequent words related to character, “patient” and “doctor” were ranked first and second, respectively, before COVID-19, and “patient” and “personnel” were ranked first and second, respectively, after COVID-19. Before COVID-19, “nurse” and “doctor” appeared with a high association on social networking websites such as Facebook and Twitter [19]. Conversely, after COVID-19, the words “patient” and “personnel” showed a high association with the word “nurse.” This finding appears to reflect the situation in Korea after mid-February when the lack of nursing personnel due to the spike in the number of patients with COVID-19 was revealed. Sufficient human resources are a significant component of an effective working environment [26]. Nevertheless, there has not been significant improvement in the level of staffing for nurses despite the nursing community’s insistence that adequate nursing personnel is crucial

for patient outcomes [27-28]. The results of this study suggest the public may be beginning to show interest in the problem of the personnel shortage in nursing, which has so far only been noticed by the nursing industry, and this may be an ideal time to seek an increase in nursing personnel.

In the case of the most frequent words related to specialty, the word “COVID-19” emerged after COVID-19 in comparison to “medical” and “nursing” before COVID-19. This finding may reflect the current situation, in which nurses are actively serving as experts at the center of the COVID-19 response.

For the most frequent words related to place, character, and specialty, the image of nurses in internet newspaper articles before COVID-19 could be depicted as “with medical professionals, nursing patients in hospitals.” Conversely, the image of nurses in internet newspaper articles as “personnel nursing COVID-19 patients in local hospitals in Daegu” has emerged after COVID-19.

For the most frequent words related to relation, there is a clear difference in the words used before and after COVID-19. “Workplace bullying” and “death” were the most frequently used words before COVID-19, and words such as “care” and “support” emerged after COVID-19. After COVID-19, positive words were predominant, whereas before COVID-19, negative words were the most frequently used. This finding may be because after COVID-19, most news reports were about the actual work of nurses whereas before COVID-19, a great deal of public attention was paid to several provocative incidents involving nurses. For instance, the death of a nurse from burns and the sexual harassment of nurses in the workplace are among the several incidents that had drawn public attention to nurses [29]. News reports of these incidents were not intended to reflect the everyday reality of nurses and nursing work, but rather to select and interpret the reality from a particular perspective,

which explains why “workplace bullying” and “death” were highlighted as words related to nurses. As a result of such news reports, public opinion in Korea supports resolving the problem of workplace bullying at the government level.

In countries such as Sweden, Britain, Japan, Canada, and France, workplace harassment laws have been enacted and enforced, which is considered an effective approach to the issue [30]. Thus, a revision to the Labor Standards Act, including a ban on workplace harassment, was implemented in Korea beginning on July 16, 2019 [31]. Although this law is not only for nurses, it is nevertheless a positive sign that a new law on workplace harassment has been introduced. However, to sustain the current positive image of nurses, the Korean nursing community needs to ensure that the recently implemented law results in specific policies that include site-oriented guidelines and standards.

In the case of the most frequent work-related words, the main finding was the appearance of the word “workload” before COVID-19 and the word “physical contact” after COVID-19. Keywords before COVID-19 were indicative of excessive nurse workload. According to the Health and Medical Workers’ Union survey [32] conducted in 2016, the average daily break and mealtime for nurses was 29.7 minutes, which was 22 minutes shorter than for other healthcare professions, and the average monthly number of meals nurses skipped was 5.9, which is about three times as many as that for other healthcare professionals. Nurses were also working 19.5 minutes more in overtime than other healthcare professionals. Poor working conditions and high work intensity are considered to be the leading causes of harassment in the workplace and nurse turnover [33-35]. In fact, the number of graduates of nursing schools in Korea is 97.3 per 100,000 people, the highest among the OECD countries, but the percentage of graduates who

are active nurses is 46%, which is only half of the OECD average<sup>[36]</sup>. The government has tried to solve the shortage of nurses by increasing the number of nursing colleges to produce more nursing graduates<sup>[37]</sup>. However, unless the poor working conditions for nurses are improved, it will not be possible to solve the shortage of personnel caused by high turnover.

After the COVID-19 outbreak, the frequency of the keywords “care,” “support,” and “physical contact” resulted in a positive image of nurses. This finding is consistent with the purpose of nursing, the study of caring, and a positive image of nurses. In Yom’s<sup>[23]</sup> study, the caring images of nurses were the most prevalent, and subjects who had been cared for by nurses had formed a good image of nurses. Also, Kalisch<sup>[38]</sup> reported that among the images of nurses on the internet, most were viewed as respectable, responsible, confident, and dedicated professionals.

The analysis of the most frequent words related to emotions and work showed that in general, the internet newspaper articles before COVID-19 gave an image of nurses as “receiving poor treatment for their work.” However, in internet newspaper articles after COVID-19, the image of nurses as “positive professionals caring for and supporting the patients by their side in the medical field” was highlighted.

After the COVID-19 outbreak, the image of nurses in the field showed their expertise and ability to care for patients with autonomy. Therefore, the public’s perception was likely more positive than the nurses themselves recognized, and their profession and expertise were acknowledged<sup>[39]</sup>. This change in perception has been subtle, but it is believed that the images of nurses working in the field have begun to be transmitted through mass media. However, it requires considerable time and effort to change a fixed image, but the speed at which information is shared on the internet may accelerate the change<sup>[40]</sup>. More importantly, it is necessary to examine the trends in

nurse-related words in the future<sup>[23]</sup> and focus on how they can be improved. The authors should discuss the results and how they can be interpreted from the perspective of previous studies and the working hypotheses. The findings and their implications should be discussed in the broadest context possible.

## Conclusion

This study analyzed the image of nurses from nurse-related articles in Korean online newspapers. How the newspaper article interprets the role of nurses and delivers it to the public has a significant impact on the public’s image of nurses. Therefore, it is significant that the analysis used Korean online newspaper articles about nurses. In terms of nursing research, this study is meaningful because it provides insights into changes in public awareness of nurses before and after COVID-19. Furthermore, as a country that has been responding to COVID-19 for a longer period than many other countries, Korea will be able to provide a reference for the image reconsideration of nurses struggling around the world through this analysis.

However, this study has many limitations due to data bias and restrictions in analytic methods. First, there was a data imbalance in the period before and after the COVID-19 outbreak and between each newspaper. In order to overcome this limitation, it is suggested that in future research, data is analyzed by the form of media and source of data in order to fully comprehend its meaning. Second, the subjective judgment of the researchers was involved in eliminating meaningless words or stop words while extracting nurse-related words from the data. In this study, the rule that the consent of two or more researchers is required to remove a word was applied. Nevertheless, it is suggested that objective criteria are employed regarding the treatment of meaningless words or stop words in the analysis of the data to minimize the effect of subjectivity on the results.

Further research is also needed to determine how the content of online newspaper articles actually affects the images of nurses. For example, comments posted on the internet may indicate how much the general public trusts and accepts the content of an article. In addition, research on other forms of media, not only in newspapers, should be actively conducted. It is also necessary to constantly monitor nurses described in mass media such as newspapers and seek ways to encourage positive news reports in newspapers, so the public does not form a negative or inaccurate image of nurses. We look forward to continuing the study the image of nurses and to becoming nurses who can respond quickly to the changes.

**Ethical Clearance:** For ethical consideration of the study subjects, Nothing specific-No IRB needed.

**Source of Funding:** This research received no external funding

**Conflict of Interest:** The authors declare no conflict of interest.

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