Nursing Issues in the Media During Four Emerging Infectious Disease Epidemics in South Korea:Topic Modeling Analysis

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Submitted to: Journal of Medical Internet Research
on: May 11, 2024

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Nursing Issues in the Media During Four Emerging Infectious Disease Epidemics in South Korea:Topic Modeling Analysis

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Abstract

Background: Emerging infectious disease disasters receive extensive media coverage and public attention. During health crises such as pandemics, nurse burnout and increased attrition are also at their peak. However, nursing issues related to responding to recurrent emerging infectious disease crises have rarely been studied over time.

Objective: The purpose of this study was to analyze and draw implications from changes in key nursing issues reported by the news media during four emerging infectious disease outbreaks in Korea since 2000.

Methods: We analyzed news articles that were published during the outbreaks of SARS, influenza A, MERS, and COVID-19. A total of 51,489 news articles were extracted by search for the key words "nursing" or "nurse" in the title or body of the article during the new infectious disease outbreaks. The collected news articles were analyzed for text and structure using a three-step method keyword analysis, latent Dirichlet allocation topic modeling, and keyword network analysis after preprocessing.

Results: The number of topics selected per epidemic period was five each for SARS, influenza A, and MERS, and six for COVID-19. The common themes that emerged across the four epidemics were "Response to Emerging Infectious Diseases in Korea," "Demand for Nurses," "Vulnerability in the Work Environment," and "Roles and Responsibilities of Nurses. Despite the same theme names, the overarching keywords were different for each epidemic.

Conclusions: Analysis of the identified themes and the associated keyword network revealed that issues related to nurse shortages, working conditions, and poor treatment were not unique to the COVID-19 pandemic, but rather recurring themes from previous epidemics. Our findings can be used to inform strategies to improve the professional role, environment, and treatment of nurses during health crises. Suggestions for future nursing-related policy impact and change research are also provided.

(JMIR Preprints 11/05/2024:60446)
DOI: https://doi.org/10.2196/preprints.60446

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Original Paper

Topic Modeling of Nursing Issues in the Media During Four Emerging Infectious Disease Epidemics in South Korea : Descriptive Analysis

Abstract

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Keywords: news articles; nursing issues; text analysis

Introduction

An emerging infectious disease (EID) is a newly recognized or previously known infectious disease that has a new virulence or is spreading in an area where it did not previously occur [1]. Since 2000, South Korea has had four EIDs: Severe Acute Respiratory Syndrome (SARS) in 2003, novel swine-origin influenza A (H1N1) in 2009, Middle East Respiratory Syndrome (MERS) in 2015, and Coronavirus disease 2019 (COVID-19) in 2020. Among them, the influenza A and COVID-19 have been declared as pandemics by the World Health Organization (WHO).

EID catastrophes receive extensive media coverage and public attention. Indeed, public interest in nurse peaks during health crises, such as infectious disease epidemics [2]. EID outbreaks increase public recognition and attention to the dedication of nurses working on the front lines of disaster response [3]. Meanwhile, nurses experience physical and psychological burnout as well as professional ethical conflicts owing to the risk of infection, heavy workloads, patient violence, and the stigma of being a carrier of infection [4-7]. The rising rates of nurse burnout and resignation in the context of poor infectious disease crisis response has been noted as a global concern [8,9]. The loss of skilled nurses may lead to a decline in the quality of nursing care and organizational nursing capacity, which may pose a risk to national health crisis response and public health.

While infectious disease outbreaks can be traumatic for individuals and communities, they can also lay the groundwork for health system transitions after the outbreak ends, through institutional and policy improvements that identify and address health system weaknesses revealed during the response. With respect to issues in the nursing workforce, scholars have suggested that societal consensus for improvements in working conditions and institutional arrangements for health resources and protection are needed to minimize nurse burnout and attrition in special situations, such as infectious disease outbreaks [5,7,10,11]. At the national level, discussions about appropriate investments and compensation systems for the training and deployment of infectious disease professionals and collaboration with the medical community are needed, whereas at the societal level, increasing public awareness of health workers and building public consensus through media coverage are emphasized as obligations [6,12,13]. Issues of high public interest become public issues, recognized by the public as deserving government attention and developed into specific health policy agendas. However, not all problems that become national social issues undergo this process and lead to policy improvements. Indeed, many remain unresolved for long periods and resurface in crisis situations.

Previous studies analyzing media coverage during infectious disease outbreaks have focused on public perceptions of nursing images and issues [2,3,14-15] and are mostly limited to specific epidemic periods. Thus, they have not tracked how nursing issues have been portrayed during recurrent outbreaks since 2000, and what the unique characteristics of each period are and how they have changed. In the context of the COVID-19 having been declared endemic by the WHO, policies that address the underlying issues and promote a better future urgently need to be developed.

Therefore, this study aimed to analyze and draw implications from the changes in key nursing issues reported by the news media during four outbreaks of new infectious diseases since 2000. Specifically, we aimed to identify the issues that should be considered to effectively respond to new infectious disease crises that may occur in the future and ensure public safety. Our findings could provide the basis for the development of desirable infectious disease response strategies.

Methods

Data extraction

We collected data from the Korea Press Foundation’s article information website [16], an open integrated database and analysis system containing news articles from 54 media organizations. The data collection period was from April 2003 to May 2021, when each EID epidemic occurred. We

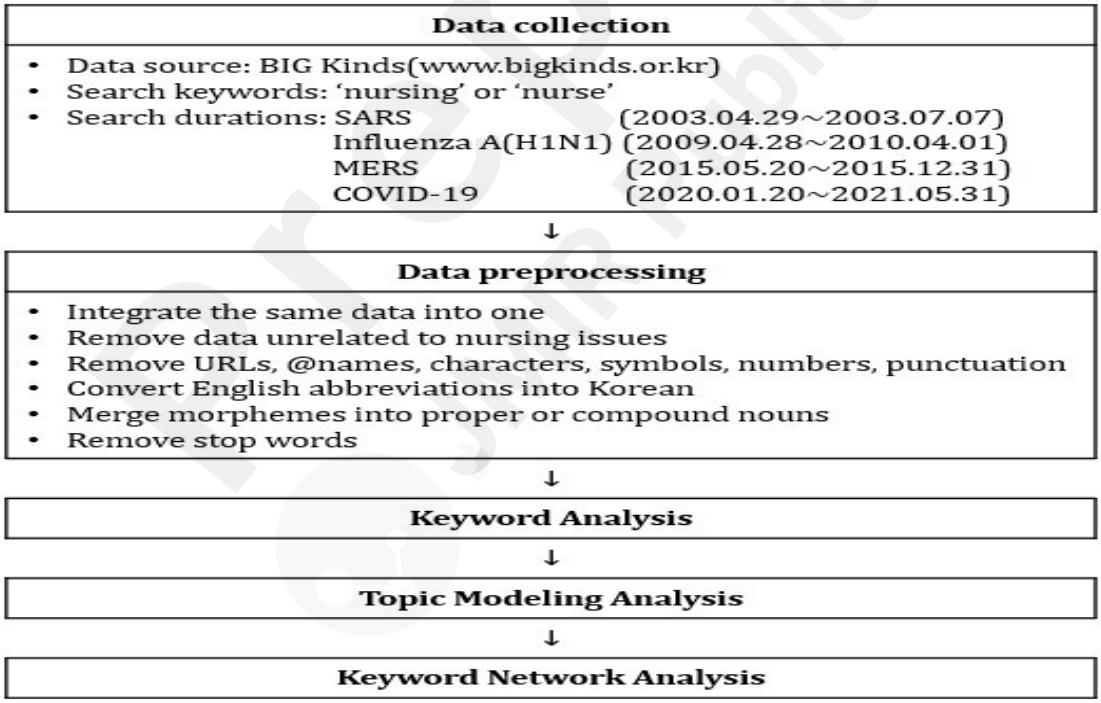
analyzed news articles published during the SARS, influenza A, MERS, and COVID-19 outbreaks. In total, we analyzed 51,489 news articles that were extracted by searching for the key words “nursing” or “nurse” in the title or body of the article during the outbreaks of new infectious diseases. The articles were in Korean. Figure 1 presents data processing of this study in detail.

Data Preprocessing

The collected articles were pre-processed to exclude duplicates and irrelevant data. After data purification, we conducted topic modeling analysis to identify the main topics during the epidemic period.

We processed the metadata of the news articles selected for this study using the KoNLP and tm natural language preprocessing packages in the R 4.1.0 version. Specifically, we removed unspecified words, such as symbols and special characters, and ambiguous words. In the morphological analysis, we employed N-gram analysis, for calculating the continuity of words, and the original article content. We converted compound nouns into proper nouns where nouns were split, to resolve ambiguity in the meaning of the original text.

Figure 1. Data processing flow chart.



Topic modeling

Topic modeling is a process of classification and integration of different topics in a large number of documents, based on probabilistic statistical methods, to extract the topics implicit in the documents and derive common high-level concepts latent in the topics [17]. We used the Latent Dirichlet Allocation (LDA) algorithm of the topicmodels package of the R 4.1.0 version program to analyze

the topics embedded in the documents. The coding of the analysis was based on the work of Grün and Hornik [15] and open source code on the GitHub site.

We also conducted a quantitative analysis to select the appropriate number of topics. We calculated perplexity values ranging from 2 to 20 using the topic models and LDAvis packages of the R program. The topic modeling analysis was repeated by applying different numbers of topics based on the perplexity values. On the basis of the quantitative analysis and validation by nursing professionals, we selected the number of topics and applied to the LDA algorithm to derive the final results of the topic analysis. For the analysis, we repeated the adjustment of the λvalue of the LDA visualization, and then backtracked the original text of the news article to extract a list of the top 30 keywords deemed clear for the concept and category of the topic. Finally, we visualized the keyword network analysis and named the topics.

Ethical considerations

The news article data used for analysis in this study are publicly available and copyright-free. The study was approved by the institutional review board of the University of Kyung Hee(IRB No. KHSIRB-21-334(EA)).

Results

News and Keyword Counts

After preprocessing the data from a total of 51,489 news articles, we extracted 1,974 keywords for the SARS epidemic, 9,520 for influenza A, 15,639 for MERS, and 24,888 for COVID-19, for a total of 52,021 keywords. The average number of news articles per day was the highest during the period of the MERS outbreak.

Top topics and keywords during epidemics

The key words and topic names of the selected topics for each of the epidemic periods are shown in Table 1. The number of selected topics per epidemic period was five each for SARS (perplexity = 1599.241, λ = 0.7), influenza A (perplexity = 977.101, λ = 0.8), and MERS (perplexity = 1717.432, λ = 0.7), and six for COVID-19 (perplexity = 2515.911, λ = 0.6). We sorted the topics in the order of the largest percentage of word clusters that make up the topic and identified them as themes. Table 1 shows the topics and word clusters identified by our model.

Table 1. Themes and keywords of topics

Themes and category	Top keywords contributing to the topic model	Token (%)
Theme 1: Response to emerging infectious disease in Korea		
SARS (Topic 3)	Hospital bed, SARS, Quarantine, Suspected patients, Outbreak, Health personnel, National Institute of Health, Designation	18.2
Influenza A (H1N1) (Topic 2)	General hospitals, Outbreak, Prevention, Medical staff, Tamiflu, The dead, Countermeasure, Mask	21.7
MERS (Topic 3)	Hospital, Medical staff, Exposed, Emergency room, Closed, Central MERS Control Countermeasure Headquarters, Isolation, Addition	21.5
COVID-19 (Topic 2)	Masks, Medical staff, Protective clothing, Pandemic, Virus, World, The dead, Hospital room	20.8

Theme 2: Demand for nurses		
SARS (Topic 1)	Elderly, Professional, Mental, System, Policy, Dementia, Welfare, Disabled	31.2
Influenza A (H1N1) (Topic 1)	Service, Nursing department, Capacity, System, Manpower, Expansion, Employment, Insufficiency	26.3
MERS (Topic 1)	Expansion, Comprehensive nursing Service, Nursing staff, Countermeasure, System, Infectious diseases, Nurse's aide, Care	23.6
COVID-19 (Topic 3)	Safety, Support, Medical personnel, Shortage, Dispatch, Critical care, Residential treatment center, Specialty hospital	17.7
Theme 3: Vulnerability in the working environment		
SARS (Topic 2)	Children, Women, Risk, Workplace, Night work, Childcare, Work-related illness, Trust, Parent	19.7
Influenza A (H1N1) (Topic 4)	OECD, Hospital bed, Level, Medical Service, Shortage, Medical expenses, Intensive care unit, Region	18.7
MERS (Topic 5)	Korea Centers for Disease Control and Prevention, Contact, Hospital, Duty, Nurse, Infection, Emergency room, Isolation	16.0
COVID-19 (Topic 4)	Contact, Manpower, Infection, Duty, Rest, Screening center, Workplace, Protective clothing	17.5
Theme 4: Roles and responsibilities of nursing professionals		
SARS (Topic 5)	Nurse, Hospital, Doctor, Sexual harassment, Nurse's aide, Contravention, Illegal, Injection	15.4
Influenza A (H1N1) (Topic 3)	Criminal investigation, Death, Untruth, Grandmother, Obstetrics and gynecology, Adjudge, Contravene	21.1
MERS (Topic 2)	Nurse, Medical staff, Heart, self, Intensive care unit, Protective clothing, Gratitude, Support	21.8
COVID-19 (Topic 1)	Government, Policy, Strike, Improvement, Medical resident, Nurses' Association, The public, Medical school quota	23.9
Theme 5: Government response and public opinion		
MERS (Topic 4)	Response, Fear, Transmission, Government, Information, Anxiety, Preventive measures, the Middle East	17.0
COVID-19 (Topic 5)	Nurse, President, Gratitude, Commitment, Encouragement, Cheer, Social network service, Labor	13.0
Theme 6: Vaccination for emerging infectious disease		
Influenza A (H1N1) (Topic 5)	Student, School, Immunization, Health facility, Nurses, Securing, School nurses, Shortage	12.2
COVID-19 (Topic 6)	Korea Disease Control and Prevention Agency, Nurse, Convalescent facility, Public health center, Side effects, Vaccine for COVID-19, Injection	7.1
Theme 7: Response to emerging infectious disease in other countries		
SARS (Topic 4)	China, Taiwan, Outbreak, Hong Kong, Singapore, The dead, WHO, Spread	15.5

SARS epidemic

We extracted five topics from the news reports published during the SARS epidemic. First, we identified the theme "Demand for Nurses," which pertained to the aging society, human rights of people with mental illness, need for implementation of systems related to the welfare of people with disabilities, and need for the activation of geriatric and psychiatric nurses. The second theme was "Vulnerability in the Work Environment," which covered the risk of work-related illness owing to nurses' work. The third and fourth topics were "Response to Emerging Infectious Diseases in Korea" and "Response to Emerging Infectious Diseases in Other Countries," respectively. The fifth theme, or

the least popular topic, was “Roles and Responsibilities of the Nursing Profession.”

H1N1 pandemic

During the H1N1 epidemic, the most common theme of the news reports was “Demand for nurses.” News reports focused on the increased demand for nursing care related to social security services, including the implementation of a long-term care insurance system for older adults and a pilot project for a long-term care security system for people with disabilities, as well as measures to expand nursing departments due to nursing shortages. As shown in Table 1, the second topic was “Response to Emerging Infectious Diseases in Korea,” followed by “Roles and Responsibilities of Nursing Professionals,” which pertained to coverage on incidents involving nurses engaging in illegal behavior. The fourth theme, “Vulnerability in the Working Environment,” dealt with the low quality of health care in South Korea in comparison to other member states of the Organisation for Economic Co-operation and Development (OECD) and regional disparities in the health care system. Finally, the topic of “Vaccination for Emerging Infectious Diseases” was derived from the coverage of immunization initiation and the shortage of vaccinators.

MERS epidemic

The “Demand for Nurses” theme was the most prominent, with news reports focusing on the urgent need to improve the traditional culture of caring for the family for patients and visitors in clinics; this was emphasized because of the rapid spread of new infections, as well as imbalances in nursing supply and demand. The second theme, “Roles and Responsibilities of Nursing Professionals,” focused on caring for patients with infectious diseases and the ethical conflicts nurses feel amidst their fear of infection and concern for family and colleagues. The third and fourth themes, “Response to Emerging Infectious Diseases in Korea” and “Government Response and Public Opinion,” related to the social atmosphere in Korea during the MERS outbreak. The final theme was “Vulnerability in the Working Environment,” which focused on MERS infection among nurses and the vulnerability of nurses to infectious diseases in emergency room environments.

COVID-19 pandemic

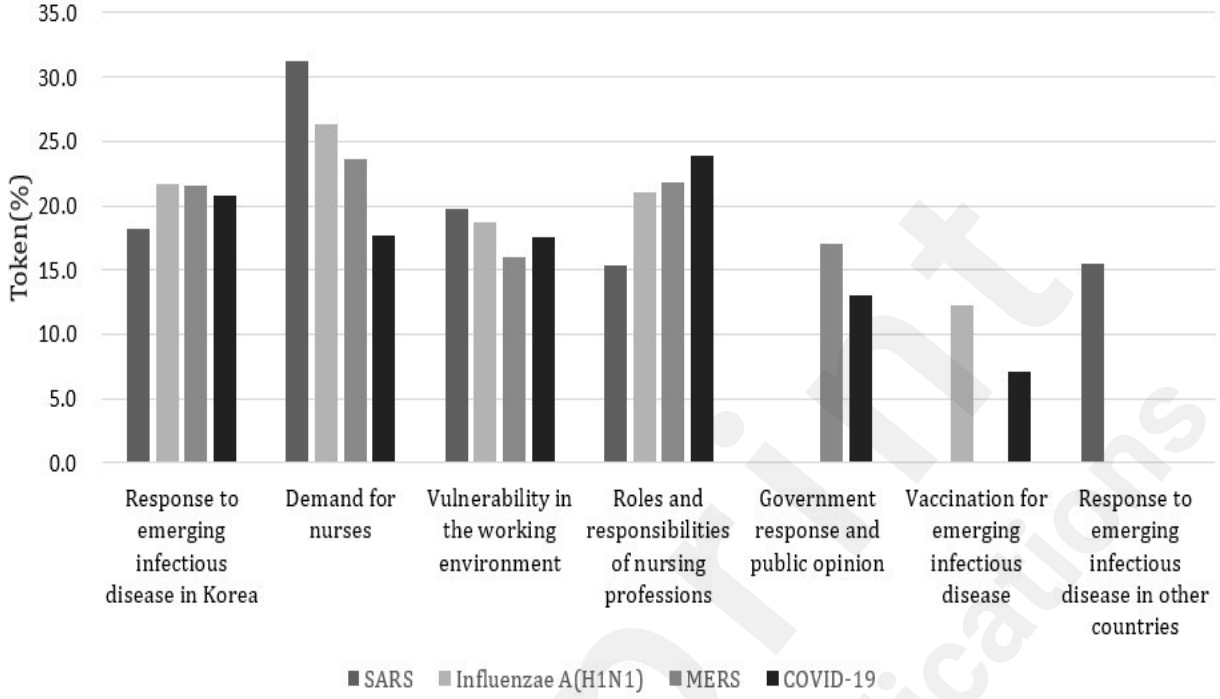
As shown in Table 1, the first theme to emerge was “Roles and Responsibilities of Nursing Professionals,” followed by “Response to Emerging Infectious Diseases in Korea,” and “Demand for Nurses.” Stories under these themes focused on the increased need for nurses to respond to the rise of new infectious diseases and for nurses with critical care experience. The fourth theme was “Vulnerability in the Working Environment,” with reports on high-risk work environments. The fifth theme was “Government Response and Public Opinion,” with coverage focused on the “Thank You Challenge” campaign and the controversy over the president’s thank you message to nurses for their work during the doctors’ strike. Finally, the sixth topic was “Vaccination for Emerging Infectious Diseases.”

Trends in nursing-related topics in media coverage

According to the topic modeling analysis, we classified a total of seven topics from all news articles. Notably, the keywords that comprised the topics for each epidemic period differed. We observed that the topic “Vaccination for Emerging Infectious Diseases” appeared only in the H1N1 and COVID-19

pandemics, and “Government Response and Public Opinion” appeared only in the MERS and COVID-19 periods. Moreover, the topic “Response to Emerging Infectious Diseases in Other Countries” appeared only during SARS (Figure 2).

Figure 2. Trends in nursing-related topics in media coverage



Discussion

Principal Findings

The prolonged COVID-19 pandemic reaffirmed the vulnerability of nurses in infectious disease emergencies owing to poor working conditions and staff shortages. This study aimed to explore the nursing-related issues highlighted during the past four epidemics and the points to be considered to improve public awareness and policy on nursing.

The common themes that emerged across the four epidemics were “Response to Emerging Infectious Diseases in Korea,” “Demand for Nurses,” “Vulnerability in the Work Environment,” and “Roles and Responsibilities of Nursing Professionals.” Despite the same theme names, the encompassing keywords were different under each epidemic.

First, the keywords that made up “Response to Emerging Infectious Diseases in Korea” were clustered with similar keywords during the four epidemics, indicating a serious response to infectious diseases. The terms “National Institutes of Health,” “dedicated,” and “designated” for SARS and “designated infectious disease hospital” for influenza Aindicated the need for practical policy improvements and measures to prepare for future infectious diseases. From a social perspective, reports uncovered the negative Not In My Back Yard phenomena, such as local opposition to and fear of the establishment of a designated infectious disease hospital. The need for infectious disease preparedness measures, such as the designation of regional infectious disease hospitals reported during SARS and influenza, had the effect of being institutionalized as policies after the infectious diseases had ended. However, the MERS and COVID-19 outbreaks again demonstrated that hospital

capacity is insufficient to deal with the explosion in infections [18].

Second, the topic of “Demand for Nurses” was the highest-ranking topic during the SARS and MERS outbreaks, and the third highest during the COVID-19 pandemic. This was consistent with the shortage of nurses and the need for more nurses, which has been a constant concern in Korea for the past 20 years. Our results showed that during the SARS and influenza A epidemics, nurses were needed for infectious disease prevention activities for vulnerable populations, such as older adults. During the MERS epidemic, nurses were in high demand for comprehensive nursing services. Integrated nursing care services comprise a system where hospitalized patients receive 24-hour professional nursing care from dedicated nursing staff, without guardians or privately hired caregivers. It was introduced in Korea in 2013 to ease the burden and cost of nursing care in a nuclearized and aging society, but it had low positive expectations and a very low level of acceptance by hospitals. However, its application accelerated during the 2015 MERS outbreak, when South Korea’s traditional culture of family caregiving and visiting the sick was criticized as a major contributor to the spread of infectious diseases, increasing the demand for nurses with specialized knowledge and skills [19,20].

Regarding the nurse demand topic, keywords related to nurse supply appeared, and the analysis showed that the media focus was different from the policy goal of increasing the demand for nurses —the media explained the background of the nurse recruitment policy as providing a stable job with guaranteed employment. In Korea, the government started establishing new nursing departments and increasing the number of recruits in 2008, before the outbreak of the influenza A. The policy was accelerated as the demand for nurses increased during the influenza A. Subsequently, about 20,000 new nurses were trained every year, and in 2019, the country had 414,000 licensed nurses. However, only about 215,000 nurses, or half of the registered nurses, are actually working in medical and health institutions [21]. This compares to an OECD average of 67.2% for active nurses in 18 countries, with South Korea ranking the lowest at 46.7% [22]. Nurses comprise a profession that recognizes the risk of infection at the scene of an infectious disease; they are called upon to provide frontline patient care with a sense of duty [23]. Rather than emphasizing only the aspect of guaranteed employment in reports on the recruitment of nurses, media coverage should complement the role expectations of the nursing profession according to social changes. This can reduce nurse attrition and increase competent nurses’ intention to stay in the profession.

Third, the topic of vulnerability in the working environment can be interpreted in the same way as the topic of demand for nurses, given that nursing demand, supply, and shortages are highly related to working conditions and treatment [24]. In our study, the main topics of discussion were women’s work–family conflict and health risks due to night shifts during SARS, the low level of domestic health care facilities and personnel compared with OECD countries during the influenza A pandemic, and the shortage of nurses in non-metropolitan areas. The following key variables should be addressed to resolve the current nurse shortage: the high rate of secondary infections among nurses related to EIDs during MERS and COVID-19, working environments vulnerable to infection (e.g., emergency rooms and nursing hospitals), and social expectations (e.g., heavy workload, sacrifice, and dedication). In the context of infectious disease response, high-intensity, high-risk work environments, lack of adequate break times and places, and social stigmatization of not only themselves but also their families as a source of contamination lead to accelerated physical and mental burnout and turnover intentions among nurses. Moreover, secondary infections among nurses

create a vicious cycle of understaffing and transmission of infection to patients [25].

The various policies concentrated on nurse recruitment and allowances. We could not find any improvement measures to ensure the safety of the working environment related to EIDs inherent in the topic. Regarding the vulnerable infection environment, after the end of MERS in 2016, hospitals with 150 beds or more were required to install infection control rooms. Moreover, an "infection prevention and control" health insurance fee was established to support infection control work [26]. In June 2021, the Healthcare Act was amended to expand the requirement to install infection control rooms to hospital-level medical institutions with 100 beds or more [27]. These policies are unlikely to have a significant impact on the obligation to provide facilities and equipment for a safe working environment, and are insufficient to address the infection control gap in hospitals with fewer than 100 beds. The government's measures to find ways to improve the high-risk working environment for medical personnel should reflect the current situation and changed requirements, and consideration should be given to the direction of reporting for social consensus of the public opinion as a stakeholder in medical services.

In February 2019, the government promoted a task force dedicated to nursing policies, such as managing the supply and demand of nursing personnel and improving the working environment. In May 2021, the Nursing Policy Division was established in the Ministry of Health and Welfare amid social consensus on the need for a dedicated department during the COVID-19 pandemic [28]. As such, the government has continued to implement policies to address the shortage of nurses. Many of these policies require some time for their effectiveness to be determined. Therefore, the nursing community needs to continue paying attention to their effectiveness.

Finally, the nursing professional roles and responsibilities topic was dominated by reports on incidents and accidents related to nurses' morality during SARS and H1N1. The focus shifted to infectious disease-related keywords during MERS and COVID-19, with conflicts over professional ethics between caring for infected patients versus nurses' own safety and societal expectations dominating the agenda.

The proportion of related topics increased with each epidemic, with the COVID-19 pandemic emerging as having the most numerous topics—noteworthy in the context of improving the nursing environment. The image of nurses formed in the media has been revealed to influence career choice and intention to work [10]. Additionally, some nurses' immoral incidents may impede the demand for nursing care as well as on advocacy for improved working conditions and treatment in nursing. Thus, many studies have pushed for the monitoring and internal management of the image of nurses in the media [2,3,14]. The ambivalence of the societal expectations of nurses responding to infectious diseases can also be seen in the instantaneous outpouring of public condemnation without fact-checking when news stories about doctors' strikes and the collective resignation of nurses at local hospitals in Korea were reported during the COVID-19 pandemic, followed by praise for volunteer nurses in the Daegu-Gyeongbuk region and presentation of health care workers as heroes through the "Thanks Challenge" campaign. This ambivalent media coverage can be attributed to systemic issues, such as poor hospital management, inadequate government response, and increased public fear through negative media coverage, rather than the professional ethics of individual health care workers. Safe and sustainable health care provision during health crises requires an empathetic and participatory problem-solving approach at the organizational and national levels.

Conclusion

We analyzed the relevance of nursing and nurse-related agendas in news articles during the period of the past four EID outbreaks. The analysis of the identified topics and associated keyword network maps revealed that the issues related to nurse shortages, working conditions, and poor treatment were not unique to the COVID-19 pandemic but rather recurring issues from previous epidemics. On the one hand, both the society and nursing profession view nurses as essential to the health sector. On the other hand, there existed differences in the perceptions of the roles and profession of nurses. The analysis suggested that securing experienced nurses to strengthen crisis response capabilities should be closely linked to the working environment. Furthermore, the shortage of nurses would require not only a quantitative increase in their number but also substantial policy support through the creation of a safe working environment, improvement of treatment, and elevation of social awareness of the role of nurses. Institutions such as medical organizations, associations, governments, and the media should establish policy directions that reflect the voices of nurses. They can foster the building of positive social consensus and agreement on nursing to maintain a stable health care system during a health crisis. Our findings are expected to be used as a basis for establishing strategies to improve the professional role, environment, and treatment of nursing in health crisis situations. We recommend further research on the effects and changes of nursing-related policies.

Acknowledgements

This research was supported by Government-wide R&D Fund project for infectious disease research (GFID), Republic of Korea (grant number:RS-2022-KH125928(HG22C0051)).

Author’s Contributions

EK and JO developed the study design and wrote the first draft of the manuscript. EK supervised the study, checked validation, interpreted the results and wrote and revised the final manuscript. JO collected the data and handled data preprocessing and analysis and assisted EK.

Conflicts of interest

None declared.

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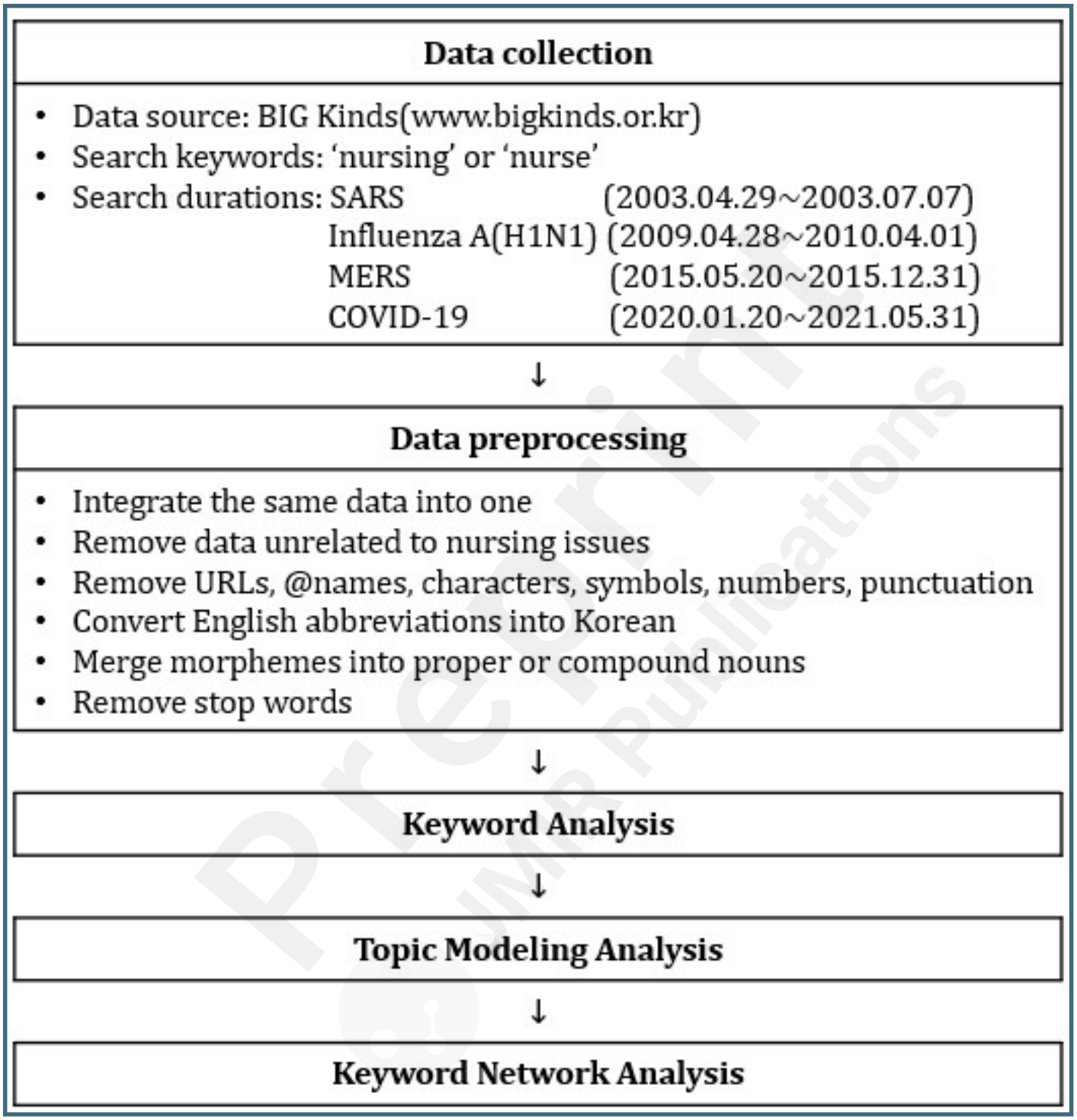
Abbreviations

EID: emerging infectious disease
SARS: Severe Acute Respiratory Syndrome
H1N1: novel swine-origin influenza A
MERS: Middle East Respiratory Syndrome
COVID-19: Coronavirus disease
OECD: Organisation for Economic Co-operation and Development

Supplementary Files

Figures

Data processing flow chart.



Trend in nursing-related topics in media coverage.