How to Cite:
Chool Choi, Y.-. (2022). Comparative analysis of the role of medical staff in Korea following the coronavirus pandemic: Comparisons after one and two years. *International Journal of Health Sciences*, *6*(S1), 2190–2219. https://doi.org/10.53730/ijhs.v6nS1.5153

Comparative Analysis of the Role of Medical Staff in Korea Following the Coronavirus Pandemic: Comparisons after One and Two Years

Young-Chool Choi
Professor, Department of Public Administration, Chungbuk National University, Korea

***Abstract*---**The aim of this study is to analyse the roles played by medical personnel such as doctors and nurses in Korea in the context of Covid, and to suggest directions for responding to possible pandemics in the future from the perspective of the roles of medical personnel. For this analysis, Korean YouTube video contents were analysed; the analysis methods employed were text-mining and ego network analysis. The analysis target period was 2020, the year in which the Corona pandemic was declared, and 2021, one year after the declaration of the pandemic. As a result of the analysis six themes, derived from the perspective of the role of medical professionals, were selected in respect of each year. In the future, the Korean medical policy decision-making process should aim to reflect these topics.

***Keywords*---**corona pandemic in Korea, role of medical staff, topic analysis.

Introduction

Almost two years have passed since in 2020 the World Health Organization declared Coronavirus to be a global pandemic. On 20 January 2020, the first case of COVID-19 was reported in Korea. The unprecedented power of this infectious disease has had a direct and indirect impact on Korean society as a whole and has changed everyday life.

Even in the midst of an unprecedented crisis, Korean society is overcoming difficulties by responding to and leading change on its own. COVID-19, though it originated in 2020, continues to spread worldwide. Even though Korean daily life was temporarily halted due to the unprecedented epidemic, we were able to

International Journal of Health Sciences ISSN 2550-6978 E-ISSN 2550-696X © 2022.
***Corresponding author**: Chool Choi, Y.-; Email: ycchoi@cbu.ac.kr*
Manuscript submitted: 18 Nov 2021, Manuscript revised: 09 Feb 2022, Accepted for publication: 27 March 2022

prevent further damage because there were 'nameless heroes' who wanted to do their best. It was thanks to the dedication of medical staff that we were able to contain the momentum of COVID-19 in Korean society in the absence of vaccines and treatments. Medical staff, who overcame their fear of having to work at the forefront of quarantine and who came to the scene before anyone else, played a critical role in preventing the spread of Coronavirus in the community (Hong, 2020; Kang, 2020; Kim, 2020; Lee, 2020)).

Around 7,000 medical personnel were dispatched via Korea's central-government-level accident management organization. Countless medical staff at the quarantine and treatment sites struggled with COVID-19. Due to the dedication of excellent medical staff, the number of Coronavirus cases in Korea remains relatively low compared to those of other countries. The aim of this study is to compare the roles played by Korean medical staff in 2020, the year in which WHO declared the pandemic, with those performed by Korean medical personnel in 2021, a year later, and to analyse the differences. Thereby, it will be possible to discover ways in which medical staff can more effectively contribute to the quarantine problem in the case of a similar pandemic in the future.

Selection of research questions

As of 31 January 2022, of countries with a population of more than 5 million Denmark has the highest ratio of cumulative confirmed Corona cases relative to the population, at 47.89 per cent. Israel is at 40.63 per cent, France 34.86 per cent, the USA 23.58 per cent and Korea 6.11 per cent. The global average is around 5.47 per cent, slightly higher than the average for Korea. As many research papers point out, the reason Korea, which is not a vaccine-manufacturing country, has maintained a relatively low number of confirmed cases is the efforts of excellent, dedicated medical staff (Hong, 2020)

Doctors and nurses went to treat and care for patients out of a sense of duty, but the situation they faced in treating and caring for Coronavirus patients, mainly elderly people with reduced mobility, was very difficult. Loss of physical strength due to such high-intensity labour performed while wearing a protective suit eventually led to a situation in which doctors and nurses had to fight for their own health. Medical staff were anxious, because they were exposed to the risk of infection as well as to physical exhaustion. Although protective clothing, masks and goggles are ubiquitously worn in treating and caring for patients, that is because most medical staff are performing medical and nursing treatment close to the patient. On occasion, if a patient coughed up respiratory matter or phlegm, the fear of infection could not be dismissed. Even after the nursing of patients in the isolation ward ended, nurses continued to struggle.

Removing contaminated and sweaty protective clothing from a patient often takes twenty to thirty minutes because infection can easily occur given only a little carelessness. In fact, in the nine months following the outbreak of COVID-19 159 medical staff were infected with COVID-19, of whom 101 (63 per cent of the total) were identified as nurses, meaning that an average of three nurses were infected every day. This is ten times the number of infected doctors, indicating that nurses in particular are exposed to a much higher risk of infection than any other

medical personnel. In the midst of this situation, medical staff, including doctors and nurses, are evaluated regarding their dedication to their work.

Corona presents many challenges to public health. Our preparations must be incremental concerning how to strengthen public healthcare, how to respond calmly and effectively if an infectious disease recurs and, especially, how to expand the number of public hospitals via long-term plans. In particular, the time has come to comprehensively review how to secure medical staff, assign roles so that they can engage in quarantine work safely, and re-organize the support system (Ah, 2020; Antonopoulou et al, 2021; Blundell et al., 2020; Cho, 2020; Chrisholu-Burns et al., 2021; Diewert, 2020; Dumulescu, 2021; Forester, 2020; Franscisco and Nuqui, 2020).

Since the outbreak of the Corona pandemic in Korea, many research papers (Cho, 2020; Kim, 2020) relating to the problem have been written. However, few of these have dealt systematically with the future role of medical staff or with support issues for medical personnel. The reality is that it is impossible to emphasize excessive duty to medical staff without compensating them properly. Many experts point out that there is a strong possibility that new infectious diseases will continue to develop in the future. Discussion of compensation for losses to medical institutions that have treated and quarantined COVID-19 patients is also very important, but few studies have been conducted in these fields.

In the future, when a new infectious disease becomes prevalent, it is expected to occur on a large scale and spread globally in a short period of time (Tran et al., 2020; Varela and Fedynich, 2020; Wang et al., 2020; Talu and Nazqrov, 2020; Marshall et al., 2020; Murashkin and Tryvainen, 2020; Reinsdorf, 2020). The prevalence of various infectious diseases not only increases the number of hospitalizations and deaths due to health and medical problems, but also promotes social and cultural fear, causing enormous economic damage as well as becoming a political issue (Evans, 2020; Bolden, 2020; Cao et al., 2020).

Therefore, new infectious diseases are highly likely to threaten humanity by appearing more frequently along with unexpected infectivity and virulence, and so preparing in advance is key to minimizing damage (Akbari and Pratomo, 2021; Dolan et al., 2020; Johnson et al., 2020; Lee et al., 2020; Rebecca and Ziyang, 2020). In order to prepare for, promptly detect and control new infectious diseases in advance, what is needed is: an effective infectious disease monitoring, management and control organization; infectious disease experts with expertise and crisis management capabilities; preparation-and-response manuals regarding emerging infectious diseases; and regular education and training, including training on new infectious diseases. It is also necessary to secure a diagnostic test method and to research and develop therapeutic agents and vaccines. In particular, as medical practitioners, physicians are highly likely to encounter new infectious disease patients for the first time. Therefore, it is essential for them to understand the clinical diagnosis of emerging infectious diseases that may be introduced into Korea, as well as to be familiar with infection control prevention, and the treatment of new infectious disease patients (Roy et al., 2020; Song and Kim, 2020)).

In light of this situation, the first thing our society should do is discuss the roles medical staff have played in the past, by examining the case of COVID-19 and reviewing the desirable roles played by medical staff, such as roles divided among medical institutions. In recognition of these problems, this study isolated the following two research questions:

- How did the roles of Korean medical staff change during 2020, when the Coronavirus pandemic first occurred, and the one year later in 2021?
- How can the causal relationship between the main actions of medical staff during these two analysis periods be explained?

Survey design

Analysis periods
In this study, two periods for analysis are established. One is from 11 March 2020 to 21 December 2020, after the global pandemic was declared. Since this first year of the pandemic was the most critical and dangerous period, we analyse the roles played by Korean medical staff during this period and examine what these roles mean.

The second period is from 1 January 2021 to 31 December 2021. This period corresponds to the second year of the pandemic and is reflected through the fiscal budget and systems aimed at solving the difficulties of the previous year. As mentioned above, we also analyse the role played by Korean medical staff during this period.

Analysis method
Text-mining and ego network analysis (a type of text-mining) were the methods we selected to analyse the issues connected with the roles of Korean medical staff in the process of responding to Coronavirus over the two periods 2020 and 2021. These two methods are suited to so-called big data analysis and today are widely used in the field of social science (Borgatti and Everett, 2013; Brandes and Erleback, 2005; Freeman, 1979). As methods of analysing the actions of actors as contained in a text (Haythornthwaite, 1996; Lee, 2019; Liebowitz, 2005; Newman, 2001; Wasserman and Faust, 2009; Woo et al., 2013), or the results of these actions, they are well-suited to the aim of this study.

Analysis target
The subject to be analysed in this study is text content included in YouTube videos. Academic research papers may also be analysed via the methods used here; however, analysis of YouTube videos has more advantages, in that they contain the contents occurring at the Corona site in more vivid form. In this study, YouTube videos available online produced between 11 March 2020 and 31 December 2020, and between 1 January 2021 and 31 December 2021, are analysed. As keywords, the three words ‘Corona’, ‘Korea’ and ‘health’ are inputted, and videos containing these words extracted. Then, word cloud analysis, topic modelling analysis and PFnet (Path Finder Network) analysis are performed on these videos.

Analysis Result

Analysis of the first year of the Corona outbreak (2020)
Basic analysis

For the 2020 period, the words we extracted from one hundred videos by inputting the three words ‘Corona’, ‘Korea’ and ‘health’ totalled 5,670. Word cloud analysis was performed on these words by way of basic analysis. Figure 1 shows the most frequently occurring words and the overall word composition.

Figure 1. Word cloud analysis (2020)

Meanwhile, in Table 1, twenty words are selected and listed on the basis of their frequency.

Table 1
Ranking of words by frequency of occurrence (2020)

		1	2	3	4
		of Speech(P	Frequency	Word length	Name Type
1	코로나	nmon Noun"	782.0	3.0	"-"
2	한국	roper Noun"	498.0	2.0	hical Name"
3	나라	nmon Noun"	484.0	2.0	"-"
4	사람	nmon Noun"	350.0	2.0	"-"
5	중국	roper Noun"	323.0	2.0	hical Name"
6	국민	nmon Noun"	310.0	2.0	"-"
7	정부	nmon Noun"	305.0	2.0	"-"
8	미국	roper Noun"	287.0	2.0	hical Name"
9	생각	nmon Noun"	250.0	2.0	"-"
10	보건	nmon Noun"	219.0	2.0	"-"
11	의료	nmon Noun"	211.0	2.0	"-"
12	세계	nmon Noun"	210.0	2.0	"-"
13	의료진	nmon Noun"	199.0	3.0	"-"
14	사회	nmon Noun"	186.0	2.0	"-"
15	때	nmon Noun"	178.0	1.0	"-"
16	일본	roper Noun"	163.0	2.0	hical Name"
17	검사	nmon Noun"	162.0	2.0	"-"
18	대응	nmon Noun"	159.0	2.0	"-"
19	마스크	nmon Noun"	150.0	3.0	"-"
20	국가	nmon Noun"	148.0	2.0	"-"

As Table 1 shows, the word that appeared the most was 'Corona', with 782 occurrences, followed by 'Korea' with 498. Table 1 and Figure 1 present an overview of the overall occurrences of words, but do not provide in-depth information.

Topic modelling analysis

The next step is to analyse via topic modelling. First, the medical staff ego network was constructed using the keyword *medical staff*. The number of words included in the medical staff ego network was 296. Topic modelling analysis was performed using this ego network. As a result, six topics were extracted (Figure 2).

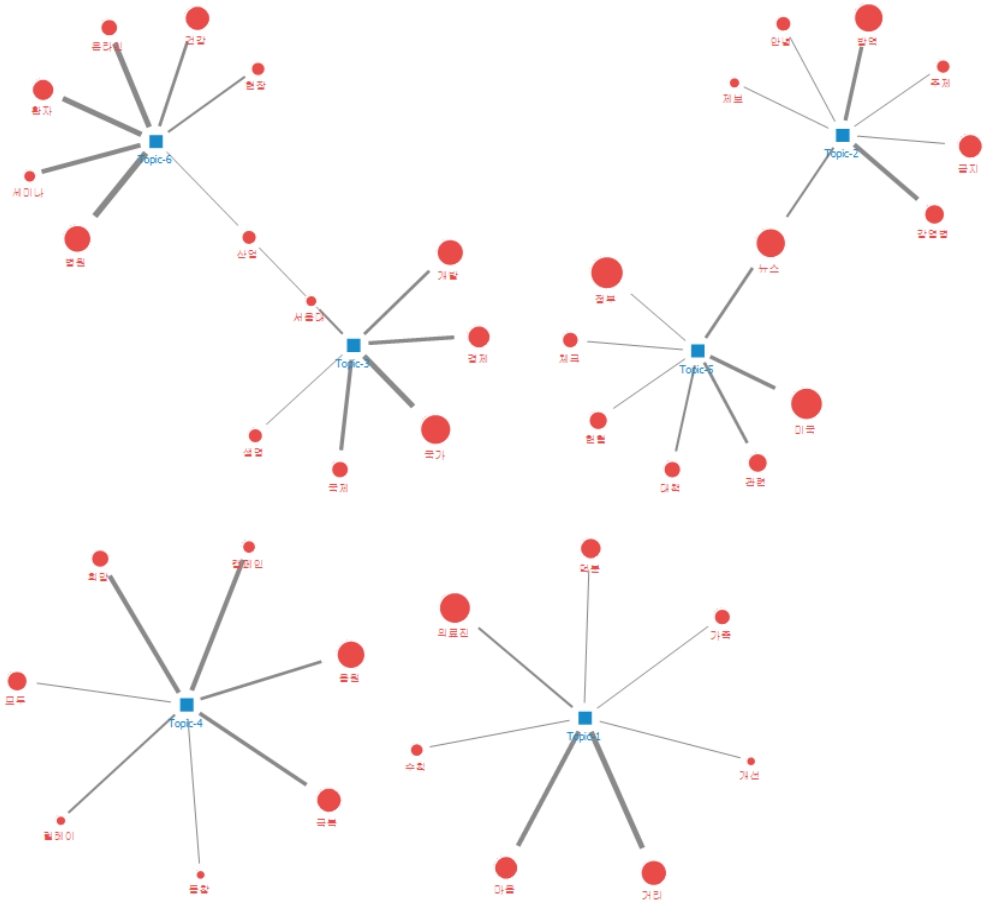

Figure 2. Results of topic analysis

In the following, the characteristics of each of the seven topics will be examined. Topic 1 consists of seven words: *improvement*, *medical staff*, *rules*, *thanks*, *heart*, *family* and *distance*. The number displayed above the link of each node indicates the strength of the relationship between each node and the topic. Looking at Topic 1 (Figure 3), we see that *distance* scores the highest in relation to Topic 1 at 0.181, followed by *mind*, and its connection strength is 0.115. In view of the characteristics of the words with the highest degree of connection with the whole Topic 1, Topic 1 can be called a 'Distance maintenance rule'.

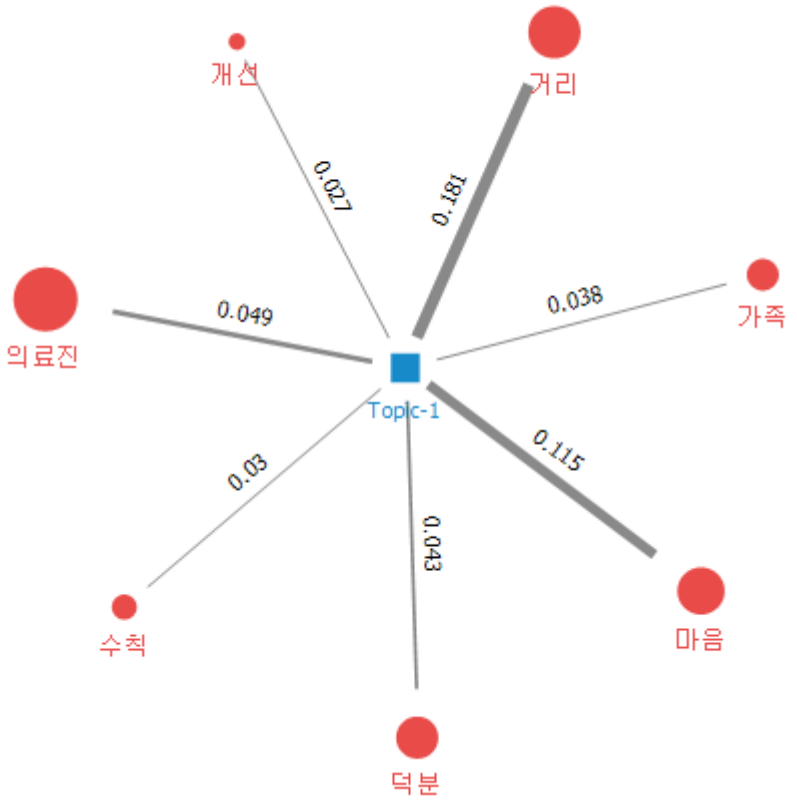

Figure 3. Topic 1: rules for maintaining distance

As Figure 4 shows, Topic 2 consists of seven words: *infectious disease*, *ban*, *report*, *hello*, *news*, *topic* and *prevention*. The relationship between *infectious disease* and Topic 2 was the strongest, at 0.097, with *prevention* next at 0.074. Topic 2 shows the importance of the issue of prohibition of fake information in infectious diseases and quarantine issues. In other words, there is a need to 'prevent exposure of personal information' in the quarantine process. Therefore, Topic 2 can be named 'Preventing personal information from being exposed'.

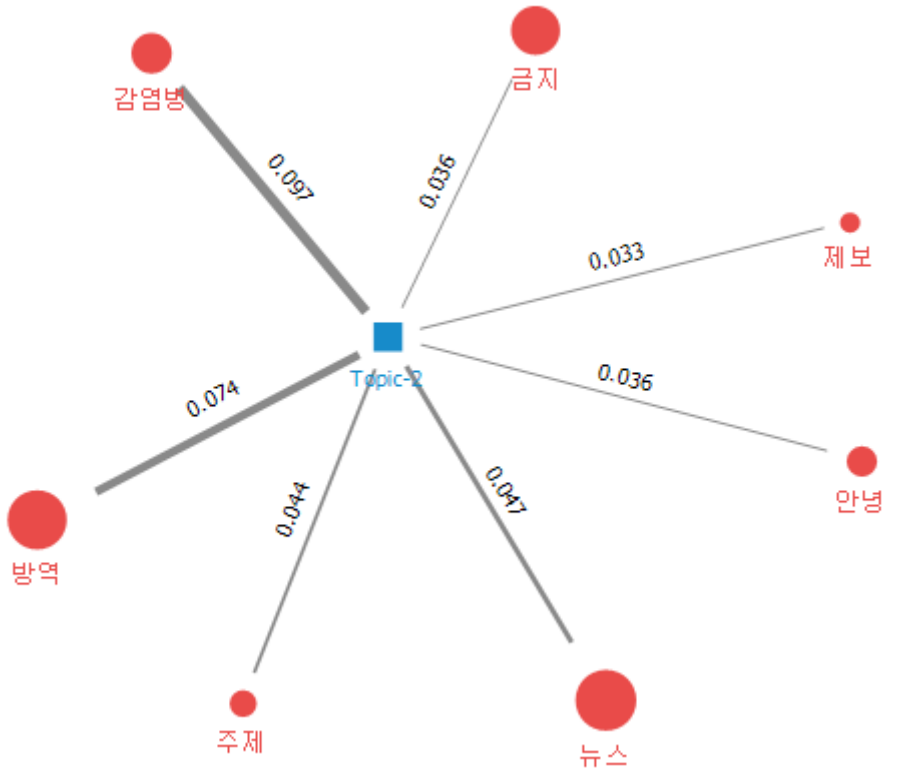

Figure 4. Topic 2: preventing personal information from being exposed

As Figure 5 shows, Topic 3 includes the seven words *national*, *Seoul National University*, *industry*, *international*, *development*, *life* and *economy*. Of these words *country*, at 0.128, had the strongest relation to Topic 3. Topic 3 suggests that universities such as Seoul National University should play an important national role in fostering life-related industries. Therefore, Topic 3 can be named 'The need to foster life industries at the national level'.

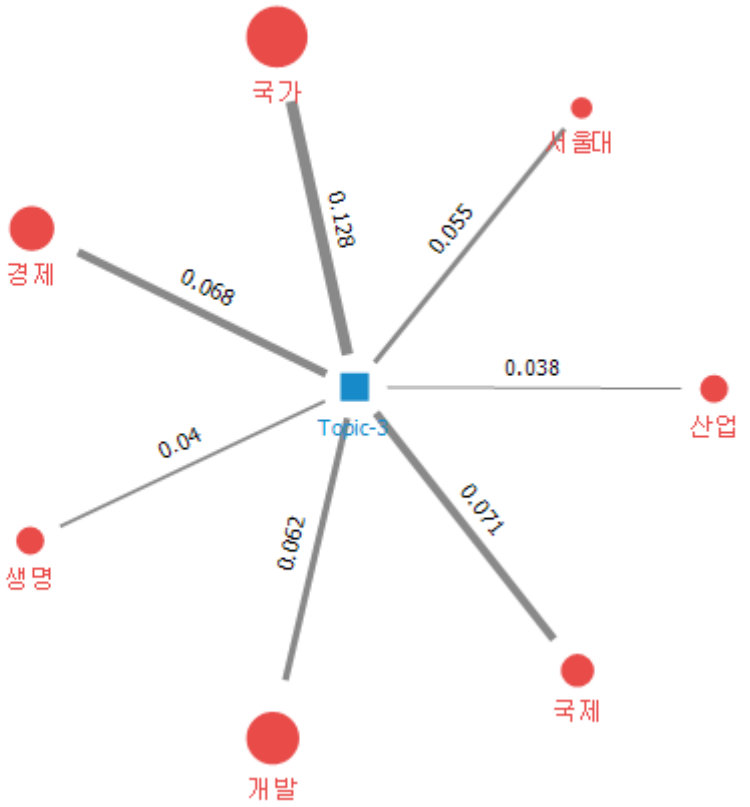

Figure 5. Topic 3: need to foster life industries at the national level

As Figure 6 shows, Topic 4 consists of the words *hope*, *relay*, *campaign*, *support*, *all*, *overcoming* and *participation*. Combining the characteristics of the words included in Topic 4 and the strength of their connection in relation to the topic, we can name Topic 4 a 'Campaign to overcome Corona'.

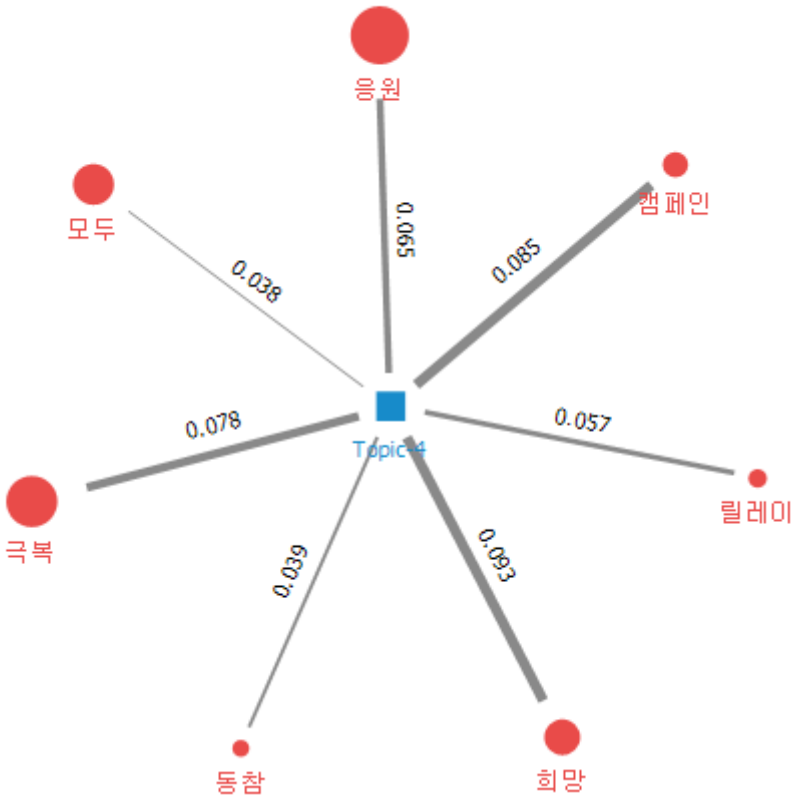

Figure 6. Topic 4: campaign to defeat Corona

As Figure 7 shows, Topic 5 consists of the words *United States*, *measures*, *check*, *government*, *blood donation*, *related* and *news*. Topic 5 appears to emphasize the need for blood donation measures, as the need for this increases with Corona. In other words, Topic 5 can be called 'Necessity of measures such as blood donation'. In the future, if an unexpected pandemic such as Corona occurs, measures such as blood donation are urgently required.

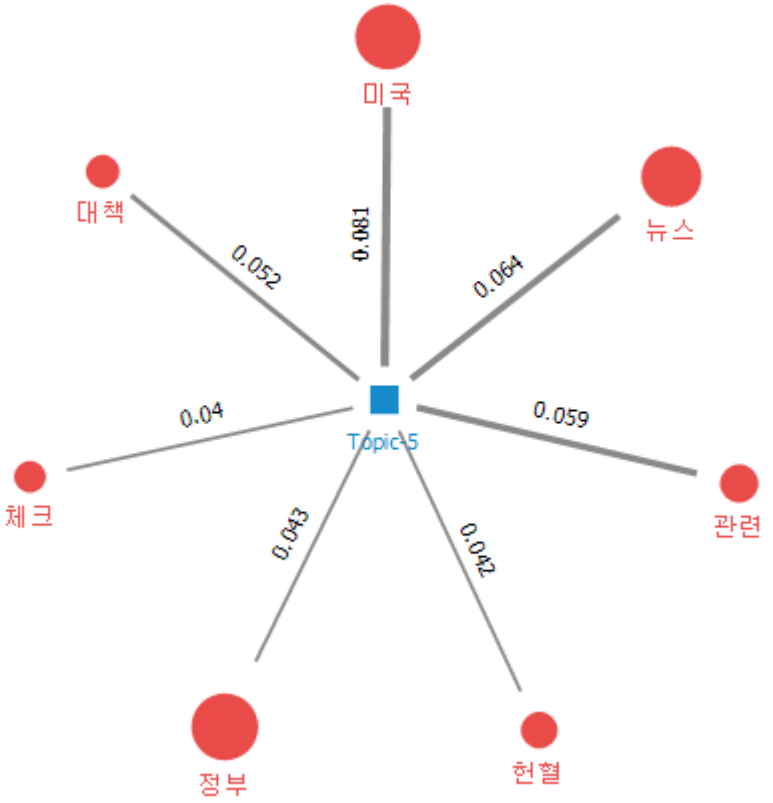

Figure 7. Topic 5: necessity for measures such as blood donation

As Figure 8 shows, Topic 6 consists of seven words: *hospital*, *industry*, *patient*, *seminar*, *health*, *online* and *site*. Looking at the characteristics of Topic 6, we can say that it means 'a support seminar for hospital patients'. As the number of hospital patients increases, various types of support for these patients are needed, so online seminars can be actively used in the context of a non-face-to-face society. It is also important to provide support services for patients online.

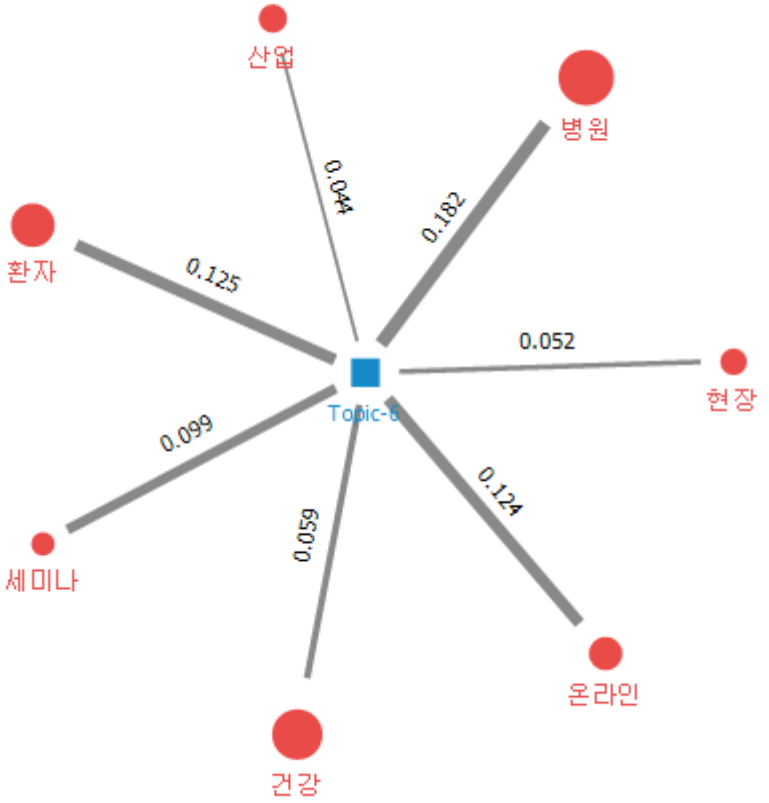

Figure 8. Topic 6: support seminar for hospital patients

Analysis of the causal relationship between words related to the role of medical staff (2020)

As described above, six topics were selected as a result of topic analysis of the medical staff ego network. From the point of view of policymakers, it is important to simply select a topic by topic classification, but it is also important to analyse the causal relationship between the words constituting each topic and other words. The reason for this is that by analysing the causal relationship between the words constituting the themes and other words, information necessary for smooth policy making and execution can be obtained.

A complex network was simplified by using the PFnet analysis method, and word-to-word clustering was performed to reveal the relationship between words. As a result, PFnet analysis results were derived (Figure 9).

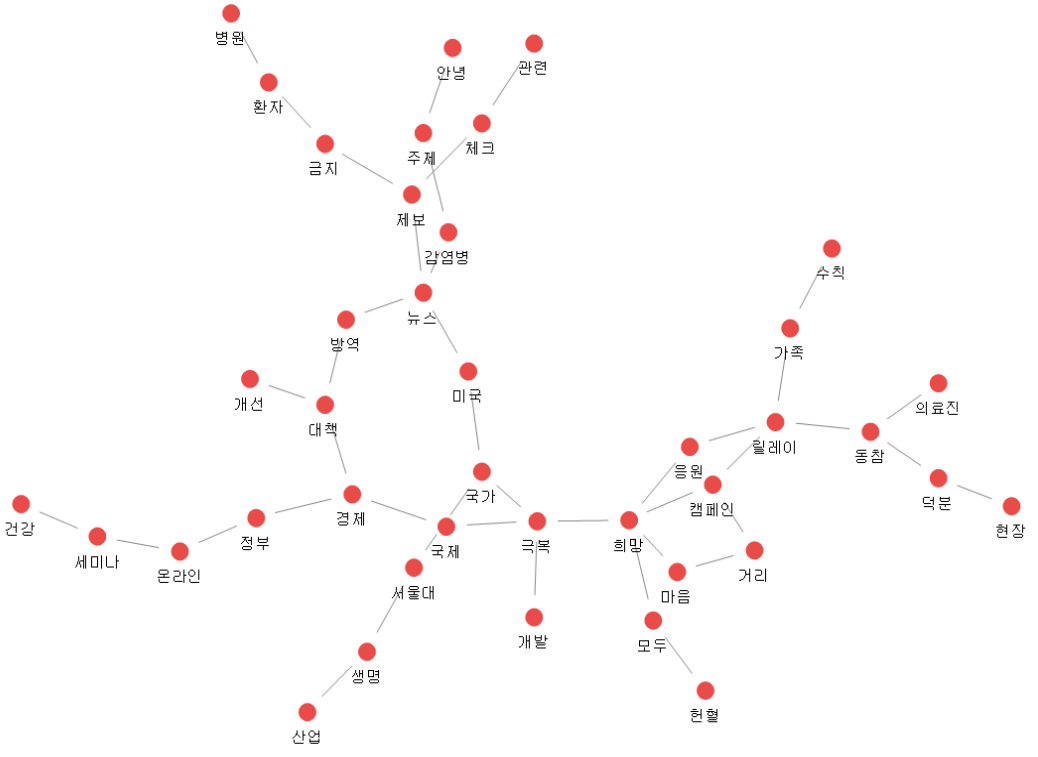

Figure 9. PFnet analysis result

In order to review the above PFnet analysis results more delicately, the results of clustering were set out as shown in Figure 10.

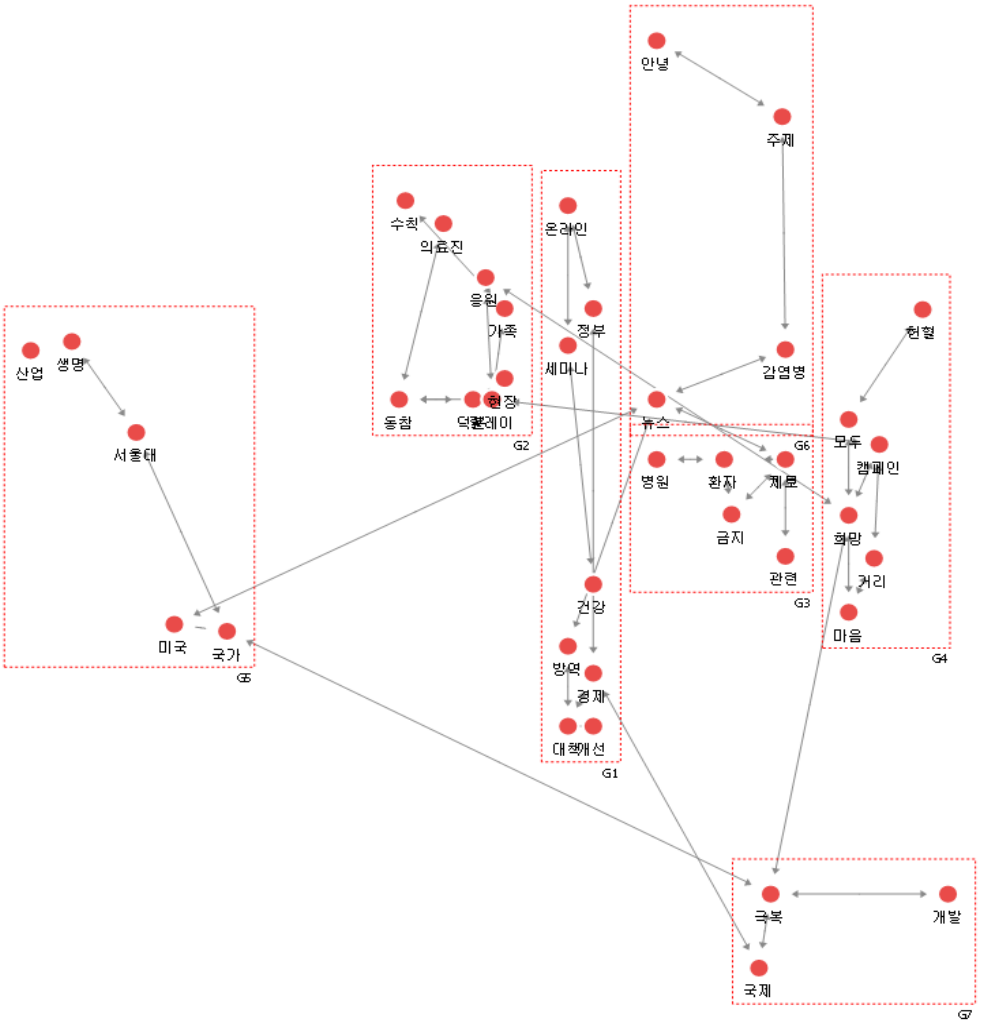

Figure 10. Clustering result

Looking at the above clustering result, we can see how certain words have a causal relationship with other words in one cluster.

Analysis of the second year of the Corona outbreak (2021)
Basic analysis

For the 2021 period, as with the analysis of the first year following the outbreak of Corona, one hundred YouTube videos extracted by inputting the three words 'Corona', 'Korea' and 'health' were analysed. As a result of data analysis in the second year, the total number of words included in the network was 4,442. To obtain basic information about these words, word cloud analysis was performed. Figure 11 shows the results of analysis for the second year, the words that appeared frequently, and the overall word composition.

Figure 11. Word cloud analysis (2021)

On the basis of the results of the data analysis for 2021, twenty words with the highest frequency of occurrence were selected and presented. As Table 2 indicates, the word with the highest frequency is ‘vaccine’, which appeared 804 times, followed by Corona, with 623 occurrences.

Table 2
Ranking of words by frequency of occurrence (2021)

		1	2	3	4
		of Speech(P	Frequency	Word length	Name Type
1	백신	nmon Noun"	804.0	2.0	"-"
2	코로나	nmon Noun"	623.0	3.0	"-"
3	사람	nmon Noun"	289.0	2.0	"-"
4	접종	nmon Noun"	281.0	2.0	"-"
5	보건	nmon Noun"	255.0	2.0	"-"
6	의료	nmon Noun"	228.0	2.0	"-"
7	중국	roper Noun"	202.0	2.0	hical Name"
8	감사	nmon Noun"	202.0	2.0	"-"
9	한국	roper Noun"	180.0	2.0	hical Name"
10	바이러스	nmon Noun"	160.0	4.0	"-"
11	정부	nmon Noun"	142.0	2.0	"-"
12	생각	nmon Noun"	141.0	2.0	"-"
13	의사	nmon Noun"	136.0	2.0	"-"
14	나라	nmon Noun"	133.0	2.0	"-"
15	부작용	nmon Noun"	132.0	3.0	"-"
16	선생	nmon Noun"	117.0	2.0	"-"
17	세계	nmon Noun"	94.0	2.0	"-"
18	국민	nmon Noun"	94.0	2.0	"-"
19	개발	nmon Noun"	94.0	2.0	"-"
20	변이	nmon Noun"	93.0	2.0	"-"

Topic modelling analysis

The next step is to employ topic modelling using the 2021 data. First, the medical staff ego network was constructed using the keyword ‘medical staff’. The number of words included in the medical staff ego network was 218. Topic modelling analysis method was performed using the ego network with ‘medical staff’ as the ego. As a result, six topics were extracted (Figure 12).

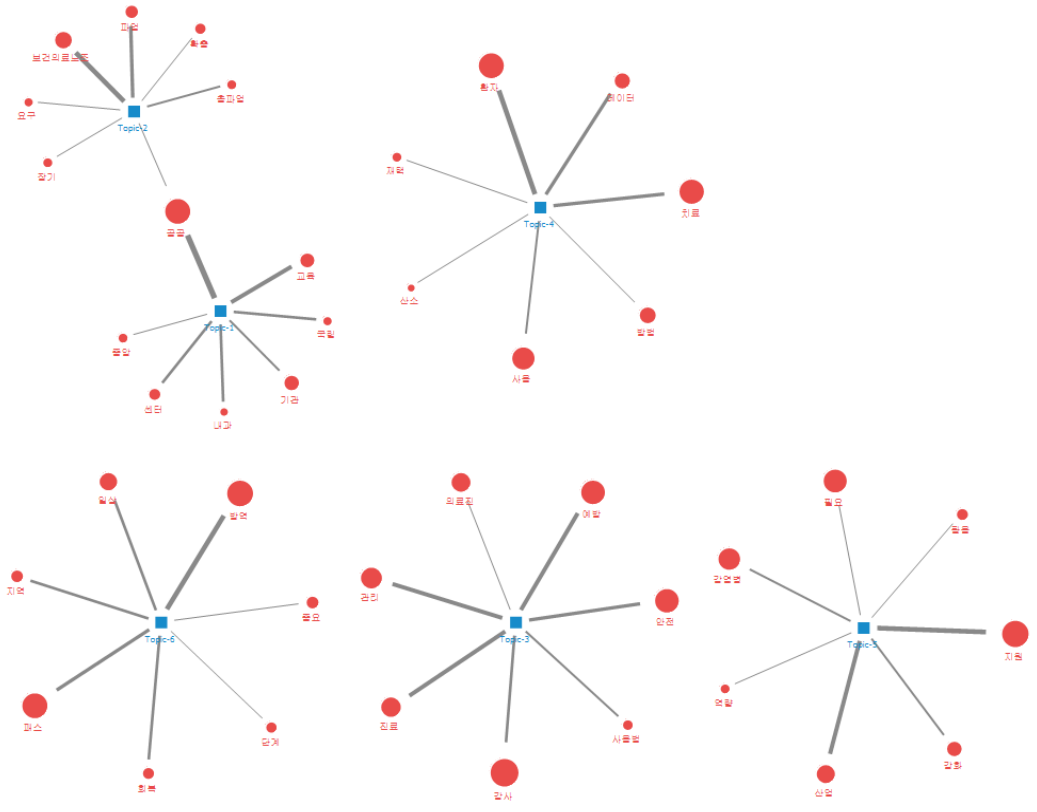

Figure 12. Results of topic analysis (2021)

As with the analysis of the 2020 data, we will analyse the characteristics of each of the six topics. First, as Figure 13 shows, Topic 1 consists of seven words: *public*, *internal medicine*, *education*, *institution*, *central*, *national* and *centre*. Among these words, *public* has a connection degree of 0.257 with Topic 1, which is superior to that of other words. Topic 1 emphasizes the importance of public institutions in responding to Coronavirus. Therefore, Topic 1 can be named 'Importance of public medical institutions in addressing Corona'.

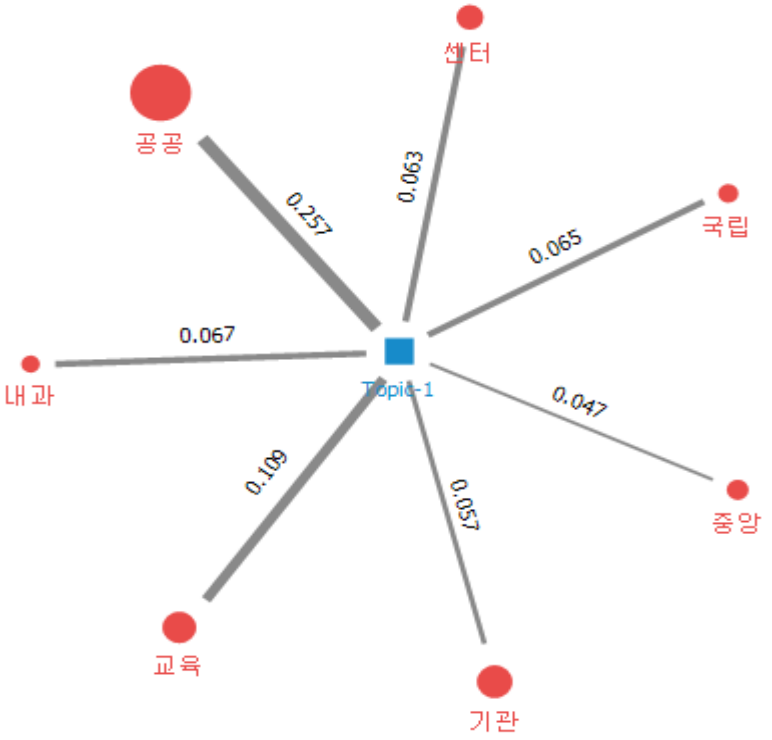

Figure 13. Topic 1: importance of public medical institutions in addressing Corona

Figure 14 shows the components of Topic 2 in 2021. Topic 2 consists of the words *healthcare union*, *expansion*, *strike*, *public*, *general strike*, *request* and *long term*. Of these, the word that has the greatest degree of connection with Topic 2 is *healthcare union*. Topic 2 means to solve the difficulties of medical personnel working in public institutions through strikes. Reflecting these characteristics, Topic 2 can be named 'The problem of strikes by medical personnel'.

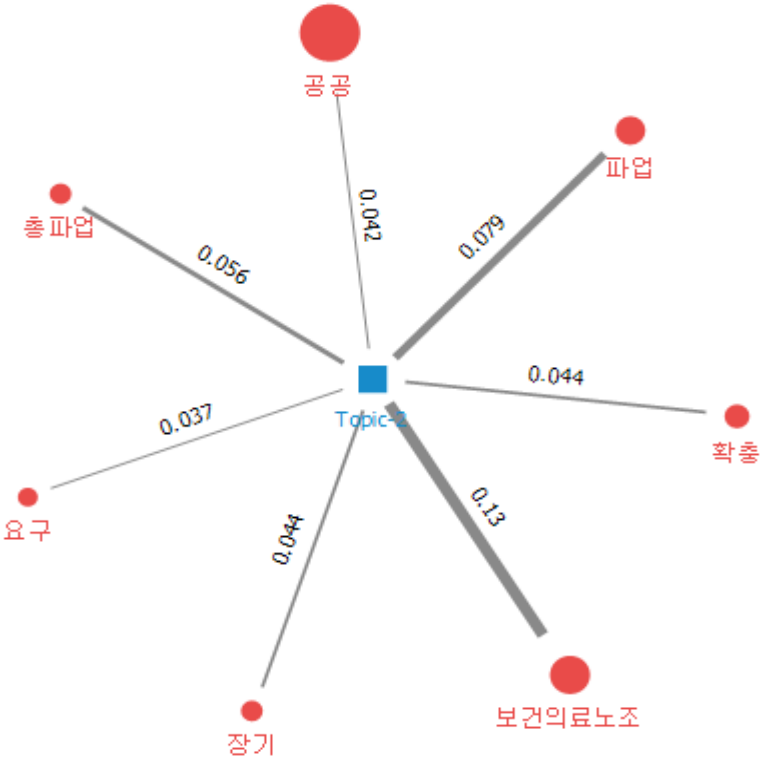

Figure 14. Topic 2: medical workers' strikes

As Figure 15 shows, Topic 3 consists of seven words: *prevention*, *audit*, *management*, *treatment*, *how to use*, *medical staff* and *safety*. Of these, *prevention* has the highest connection score with Topic 3. Topic 3 can be called 'Prevention efforts by medical staff'.

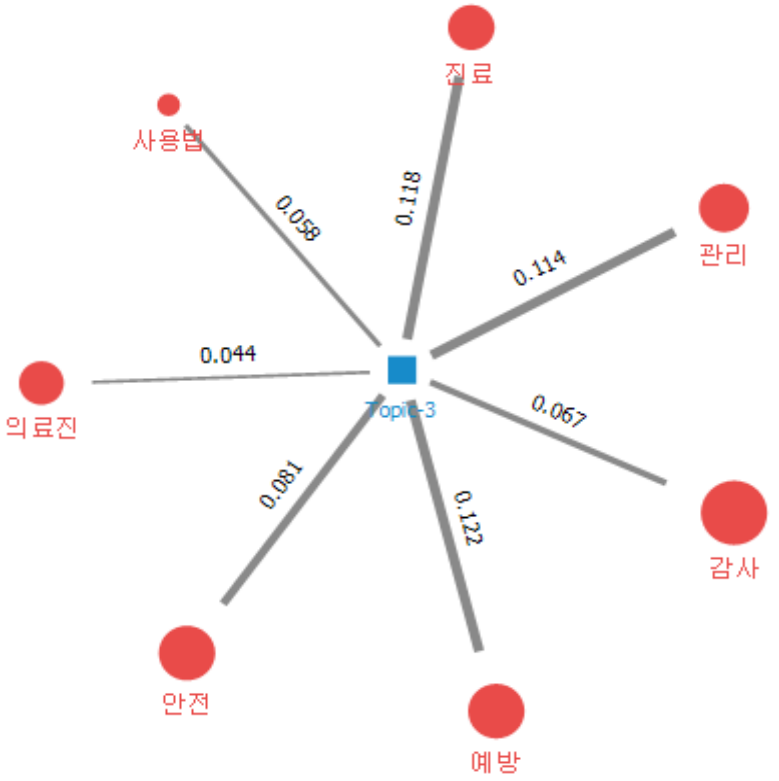

Figure 15. Topic 3: prevention efforts by medical staff

Figure 16 shows the words making up Topic 4. Topic 4 consists of seven words: *patient*, *oxygen*, *at home*, *treatment*, *use*, *data* and *method*. Topic 4 can be called 'Treatment methods for at-home patients'.

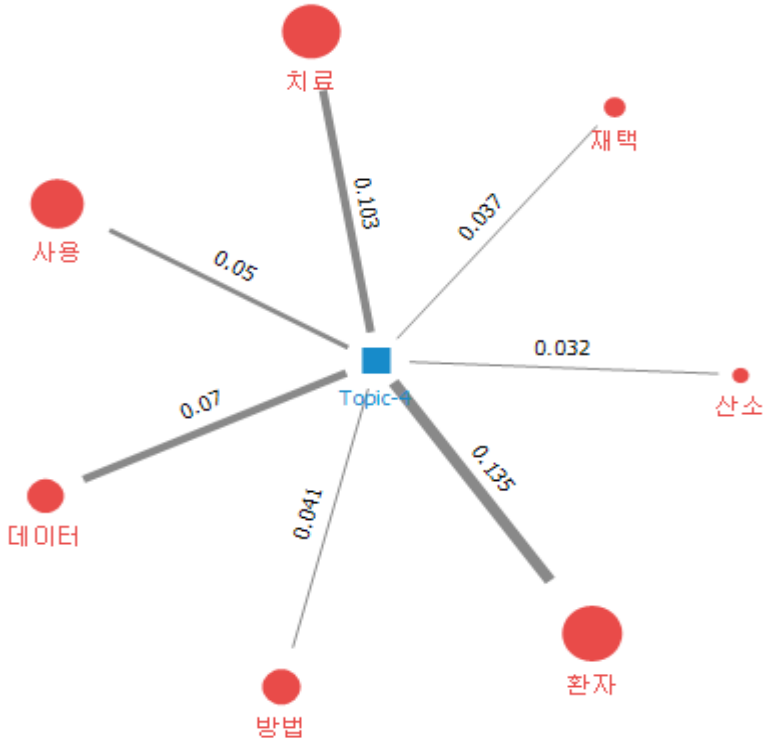

Figure 16. Topic 4: treatment for home patients

As Figure 17 shows, Topic 5 consists of seven words: *support*, *industry*, *utilization*, *need*, *capability*, *strengthening* and *infectious disease*. Among these words, *support*, at 0.178, has the highest degree of connection with Topic 5. Next is *industry* at 0.117. Topic 5 can be named 'Support for capacity building of medical personnel against infectious diseases'.

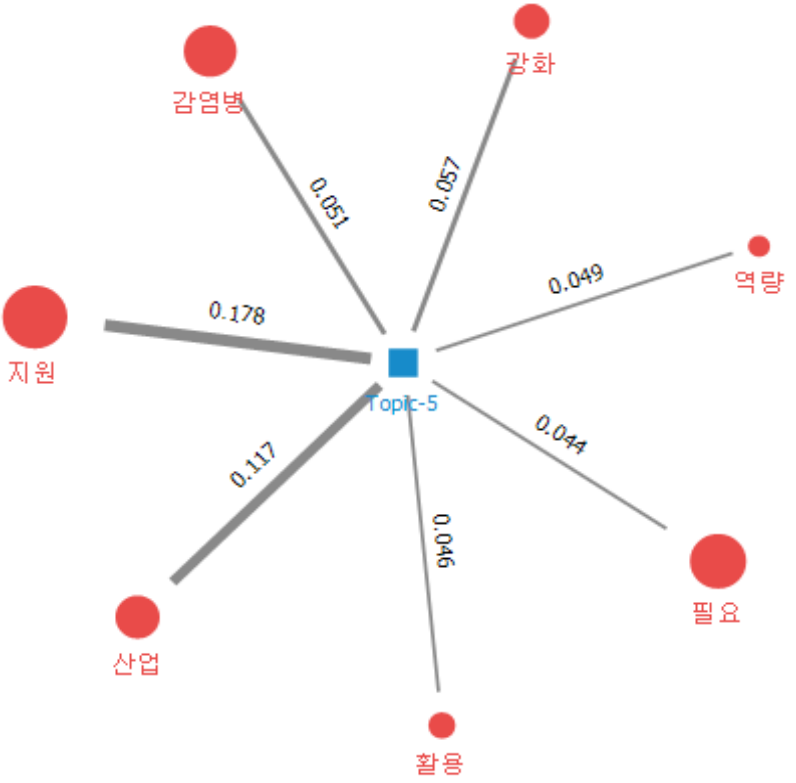

Figure 17. Topic 5: support for capacity building of medical personnel against infectious diseases

As Figure 18 shows, Topic 6 consists of seven words: *prevention*, *recovery*, *important*, *region*, *daily*, *pass* and *step*. Among these, *prevention*, at 0.131, had the highest degree of connection with Topic 6, followed by *pass* with a score of 0.94. Topic 6 characterizes the importance of the quarantine pass.

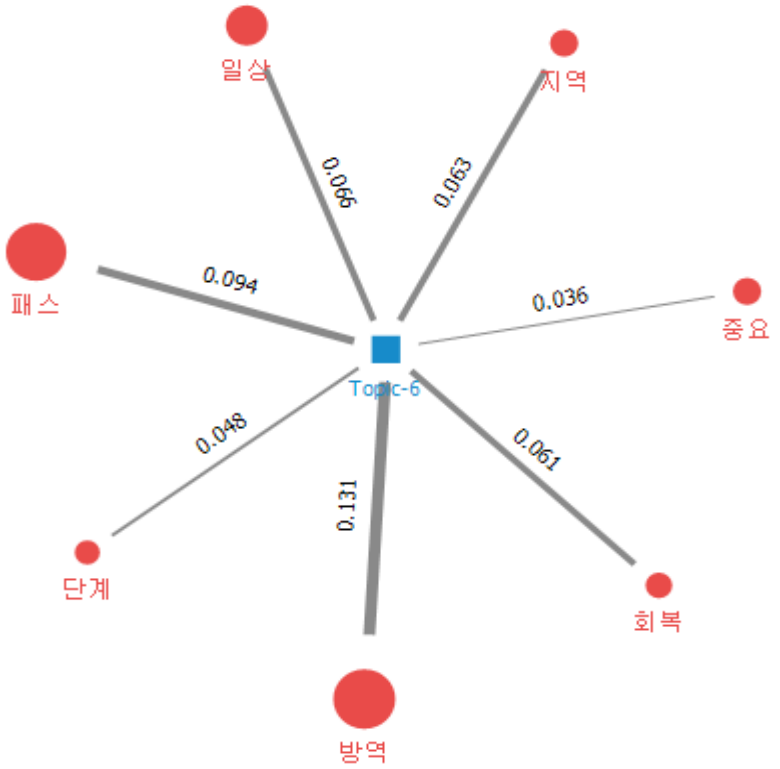

Figure 18. Topic 6: importance of the quarantine pass

Analysis of the causal relationship between words related to the role of medical staff (2021)

As with the method applied in the 2020 analysis, the medical staff ego network for the 2021 data was analysed, and the six topics derived as a result were discussed, focusing on the characteristic aspects of each topic. For the 2021 data, it is necessary to examine the causal relationship between words by performing PFnet analysis.

As with the 2020 data analysis, we tried to simplify the complex network by using the PFnet analysis method. In particular, clustering was performed to show the relationship between words included in the network. As a result, PFnet analysis results were derived (Figure 19).

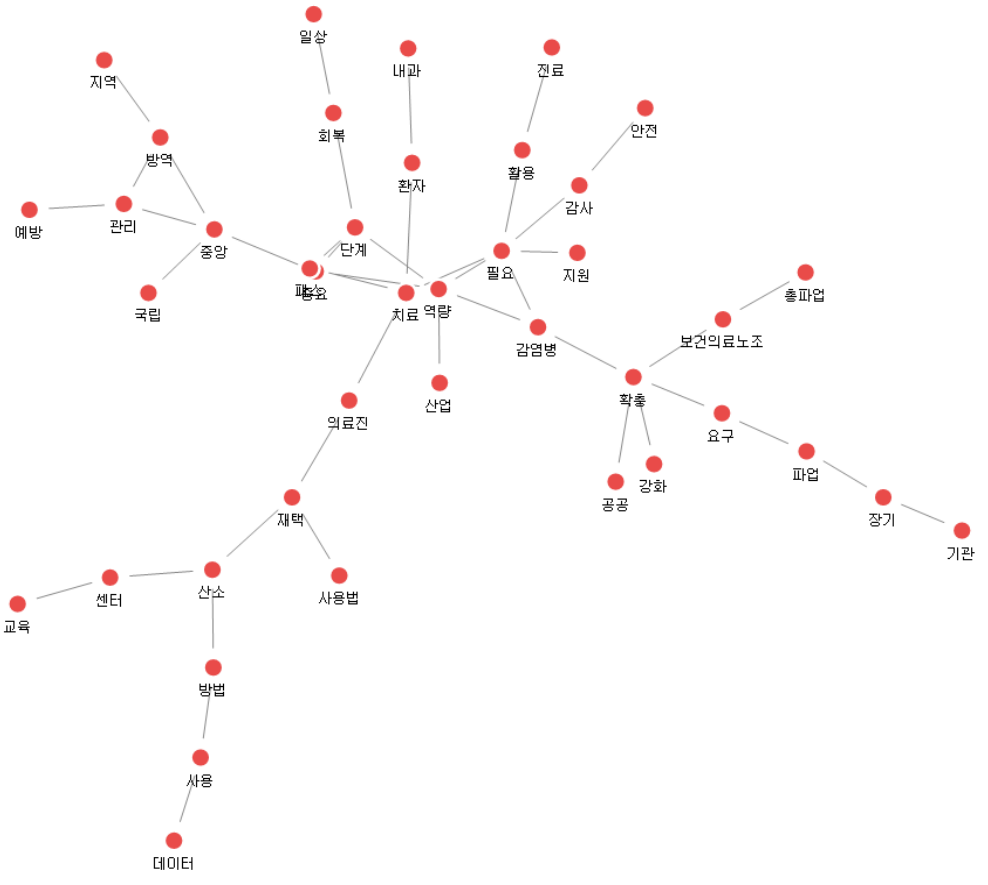

Figure 19. PFnet analysis result (2021)

Clustering analysis was performed again on the above PFnet analysis results and the results are presented in Figure 20.

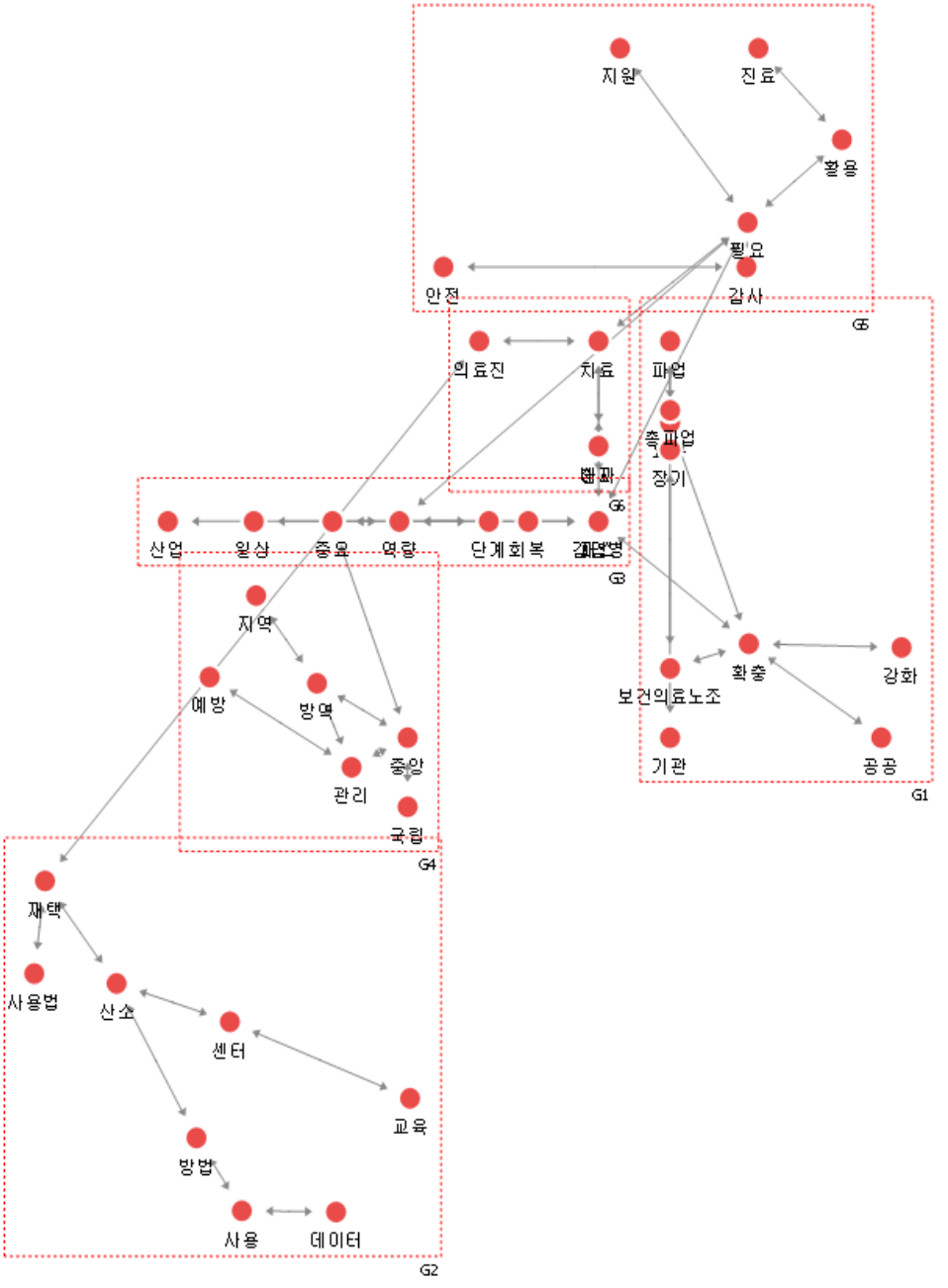

Figure 20. Clustering analysis results (2021)

Looking at Figure 20, we can see that all six clusters are formed and the causal relationship between words in the clustered block can be grasped.

Discussion and Conclusion

The roles played by Korean medical staff in the series of quarantine activities that took place in Korea in 2020 and 2021, the year after the Corona outbreak, are somewhat different. The general features are summarized below. First, in 2020, when the Corona pandemic occurred, words such as 'Corona', 'Korea', 'country' and 'person' appeared the most in the videos**.** This is a natural thing, and it is difficult to see that it has any great significance. However, the word that appears next most frequently is 'China', and the fact that this word is frequently mentioned in relation to the Corona issue has significant implications. The reason for this is connected with the controversial issue of control over travellers from China at the beginning of the pandemic in 2020. By contrast, the word that appeared the most in 2021 is 'vaccine', which shows that the vaccine problem has emerged as the most important issue.

The next most frequently occurring words are 'vaccination' and 'health', and so it can be seen that vaccines and inoculations are the focus of important measures while new infectious diseases are expected to occur. Secondly, the characteristics of subject classification are different in the analysis of the two years. According to the data analysis for 2020, the six themes were 'distance maintenance rules', 'prevention of personal information being exposed', 'need to foster life industries at the national level', 'campaign to overcome Corona', 'blood donation, etc.', the necessity for countermeasures', and 'support seminar for hospital patients'. On the other hand, according to the data analysis results for 2021, the themes were: 'importance of public medical institutions in Corona', 'medical strike problem', 'treatment method for at-home patients', 'support for capacity building of medical personnel for infectious diseases', 'prevention', and 'the importance of the pass'. The difference between the ego network of medical personnel in the analyses for 2020 and 2021 indicates that it is difficult to say that in 2020 the voices of medical personnel were sufficiently reflected in the process of promoting the quarantine policy using government's power at the national level.

However, in 2021, despite all the accumulated tiredness of medical personnel, central government did not take active measures, which exposed the dissatisfaction of medical personnel, and as a result the issue of a strike by medical personnel was aired. In addition, the importance of public medical institutions received further emphasis and the professional services of medical personnel were implemented for home patients. At the same time, it may be said that the need to reflect the expertise of medical personnel in forming policies regarding infectious diseases such as Corona is growing year on year. There are growing calls for the establishment of a compensation system that can redress the harm to dedicated medical professionals, and for the additional training and capacity building of medical professionals.

COVID does not look as if it is going to end any time soon. Therefore, in Korea, policymakers should always listen to the professional opinions of medical professionals and reflect these in establishing mid- to long-term medical policies. In addition, it is time to develop and apply various policies that can improve the damage compensation system for medical personnel and strengthen their morale.

Acknowledgements: This work was supported by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2019S1A5C2A03082775).

References

Ah. Y. J. (2020). Analysis of University Classes in Non-face-to-face Online Education Environment in the COVID-19 Times. The Journal of Humanities and Social science, 11(6), 2001-2016.

Akbari, T. T., & Pratomo, R. R. (2021). The new normal leadership: How technology alter communication style in contemporary organization. Jurnal Komunikasi Ikatan Sarjana Komunikasi Indonesia, 6(1), 1-12.

Antonopoulou, H., Halkiopoulos, C., Barlou, O., & Beligiannis, G. N. (2021). Transformational leadership and digital skills in higher education institutes: during the COVID-19 pandemic. Emerging science journal, 5(1), 1-15.

Blundell, R., Griffith, R., Levell, P., O'Connell, M., (2020), "Could COVID-19 infect the consumer prices index?", Fiscal Studies. Cavallo, A., (2020), "Inflation with COVID consumption baskets", NBER Working Paper 27352.

Bolden, R. (2020). Leadership, complexity and change: Learning from the Covid-19 pandemic.

Borgatti, S. P. & Everett, M. G.(2013). Analyzing social networks. LA: Sage.

Bourdieu, P.(1984)[1979]. Distinction: A Social Critique of the Judgement of Taste. Reprint, Cambridge, MA: Harvard University Press.

Brandes, U. and Erlebach, T.(2005), "Network analysis: methodological foundations," Vol.3418, Springer Science & Business Media.

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. Psychiatry Research, 112934.

Cho, K. H. (2020). An Exercise Rehabilitation Field Revitalization Pl. an for Promoting Elderly Sport for All. Journal of Korea Entertainment Industry Association, 14(4), 305-319.

Chisholm-Burns, M. A., Brandon, H. H., & Spivey, C. A. (2021). Leadership lessons from administrators, faculty, and students during the COVID-19 pandemic. Currents in Pharmacy Teaching and Learning. doi: 10.1016/j.cptl.2021.07.001

Diewert, E. (2020), "Measuring real consumption and CPI bias under lockdown conditions", NBER Working Paper 27144.

Dolan, L. S., Raich, M., Garti, A., & Landau, A. (2020). The COVID-19 crisis as an opportunity for introspection: A multi-level reflection on values, needs, trust and leadership in the future. The European Business Review. 1-17

Dumulescu, D., & Muțiu, A. I. (2021). Academic leadership in the time of COVID-19—Experiences and perspectives. Frontiers in Psychology, 12, 1272.

Evans, N. (2020). Leading with empathy: Supporting faculty through COVID-19 and beyond. The Department Chair, 31(1), 25–26.

Forester, J., & McKibbon, G. (2020). Beyond blame: leadership, collaboration and compassion in the time of COVID-19. Socio-Ecological Practice Research, 1-12.

Francisco, C. D., & Nuqui, A. V. (2020). Emergence of a situational leadership during COVID-19 pandemic called new normal leadership. Online Submission, 4(10), 15-19.

Freeman, L.(1979). Centrality in social networks conceptual classification, Social Networks, 1(3): 215-239.

Haythornthwaite, C.(1996), “Social Network Analysis: An Approach and Technique for the Study of Information Exchange,” Library and Information Science Research, Vol.18 No.4, pp.323-342.

Hong, S. Y. (2020). Teaching Reflection on the General Education Courses in Non Face-to-face Environment Due to the Covid-19 Pandemic. The Korean Association of General Education, 14(6), 283-298.

Johansson, J., Lof, M., Tysklind, O., (2020), “Changed consumption during the pandemic affects inflation”, Economic Commentaries, Sveriges Riksbank

Kang, J. Y. (2020). Simulated Nursing Practice Education in the Ontact Age: A Mixed Methods Case Study. Korean Association For Learner-Centered Curriculum And Instruction, 20(18), 937-957. DOI : 10.22251/jlcci.2020.20.18.937

Kim, D. H. (2020). The Problem of Vocational Education in Korean Universities: Focusing on Science and Engineering. Korean Regional Sociology, 21(3), 137-168.

Lee, J. M. (2020). An Exploratory Study on Effects of Loneliness and YouTube Addiction on College Life Adjustment in the Distance Education During COVID-19. The Journal of the Korea Contents Association, 20(7), 342-351. DOI : 10.5392/JKCA.2020.20.07.342

Lee, Y. I. (2019). Relationship between Exercise Participation Attitudes, Self-esteem and Achievement Goal Orientation of College Students Majoring Physical Education. Journal of the Korea Convergence Society, 10(5), 323-331.

Lee, S.C, S. Y. Kim & S. H. Park. (2020). An early assessment on Korean universities’ response to COVID-19: A case of KNU’s untact class evaluation. Korean Association For Learner-Centered Curriculum And Instruction, 20(20), 993-1019. DOI : 10.22251/jlcci.2020.20.20.993

Liebowitz, J.(2005), “Linking social network analysis with the analytic hierarchy process for knowledge mapping in organizations,” Journal of Knowledge Management, Vol.9 No.1, pp.76-86.

Marshall, J., Roache, D., & Moody-Marshall, R. (2020). Crisis leadership: A critical examination of educational leadership in higher education in the midst of the COVID-19 pandemic. International Studies in Educational Administration, 48(3), 30-37.

Murashkin, M., & Tyrväinen, J. (2020). Adapting to the new normal: A qualitative study of digital leadership in crisis (Unpublished Master Thesis). Department of Business Administration, Umeå School of Business, Economics and Statistics.

Newman, M. E. J.(2001), “Scientific collaboration networks I. Network construction and fundamental results,” Physical Review E, Vol.64 No.1, p.016131.

Rebecca Liao and Ziyang Fan. (2020). “Supply chains have been upended. Here’s how to make them more resilient.” WORLD ECONOMIC FORUM, April 6.

Reinsdorf, M., (2020), “COVID-19 and the CPI: Is inflation underestimated?”, IMF Working Paper/20/224.

Roy, D., Tripathy, S., Kar, S. K., Sharma, N., Verma, S. K., & Kaushal, V. (2020). Study of knowledge, attitude, anxiety & perceived mental healthcare need in Indian population during COVID-19 pandemic. Asian Journal of Psychiatry, 51, 1-8.

Song, S. Y. & H. K. Kim. (2020). Exploring Factors Influencing College Students' Satisfaction and Persistent Intention to Take Non-Face-to-Face Courses during the COVID-19 Pandemic. Asian Journal of Education, 21(4), 1099-1126. DOI : 10.15753/aje.2020.12.21.4.1099

Talu, S., & Nazarov, A. D. (2020). Challenges and competencies of leadership in Covid-19 Pandemic. Proceedings of the Research Technologies of Pandemic Coronavirus Impact (RTCOV 2020), Advances in Social Science, Education and Humanities Research, 486, 518-524.

Tran, H., Hardie, S., & Cunningham, M. W. K. (2020). Leading with empathy and humanity: Why talent-centred education leadership is especially critical amidst the pandemic crisis. International Studies in Educational Administration, 48(1), 39-45.

Varela, D. G., & Fedynich, L. (2020). Leading schools from a social distance: Surveying South Texas school district leadership during the COVID-19 pandemic. National Forum of Educational Administration and Supervision Journal, 38(4), 1-10

Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. International Journal of Environmental Research and Public Health 17(5):1729-1735.

Wasserman, S. & Faust, K.(2009). Social network analysis: methods and applications. NY: Cambridge University Press.

Woo, S. H., Kang, D. J. and Martin, S.(2013), "Seaport research: An analysis of research collaboration using Social Network Analysis," Transport Reviews, Vol.33 No.4, pp.460-475.