Analyzing the influence of COVID-19 Media Coverage on Online Information Seeking Behavior in Korea

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Abstract: COVID-19 can be deemed the most notable health emergency in the 21st century, as it constituted a startling event that compelled billions of people worldwide into lockdown and isolation. As of August 31, 2023, the most recent statistics for Korea reveal 34.57 million cumulative confirmed cases and 35,934 deaths, instigating a nationwide sense of crisis. Despite the downgrade of Korea's current COVID-19 rating from level 2 to level 4, akin to the flu, public anxiety persists. According to the Risk Information Seeking and Processing (RISP) model, individuals actively seek risk-related information in crisis situations in response to the psychological necessity for adequate information. However, finding previous studies that analyze the practical influence of media coverage on information-seeking behavior related to COVID-19 syndrome in Korea has proven challenging. The main goal of this research is to analyze the influence of COVID-19 media coverage on the online information-seeking behavior of the audience using the RISP model through regression analysis and Granger causality tests. The volume of searches for COVID-19 information was extracted using Naver's search trend analysis tool, which continues to rank first in Korea's search market, surpassing Google, and is widely employed in academic research. The number of confirmed COVID-19 cases and deaths was extracted from the COVID-19 outbreak trend statistics provided by the Korea Disease Control and Prevention Agency (KDCA). Regression analysis revealed that newspaper coverage of COVID-19, rather than numerical data related to COVID-19 patients (such as the number of verified cases or fatalities), significantly influenced COVID-19 online information-seeking behavior. Granger causality tests confirmed an interactive relationship between newspaper reports on COVID-19 and the public's online information-seeking behavior, mutually influencing each other. This suggests that newspaper coverage and online information-seeking behavior have interacted to amplify the nationwide response to the COVID-19 crisis in Korea. In conclusion, unlike previous studies, this research, utilizing regression analysis and Granger causality tests, demonstrated that media coverage of COVID-19 was a pivotal factor influencing online information-seeking behavior at a societal level during the COVID-19 pandemic in Korea.

Keywords: COVID-19 in Korea, RISP Model, Media Coverage, Online Information-seeking Behavior, Granger Causality Test

1. Introduction

COVID-19 has emerged as among the most severe public health emergencies of the 21st century, causing shockwaves by confining and isolating billions of people worldwide. According to the KDCA, as of August 31, 2023, South Korea has reported a cumulative total of 34.57 million confirmed cases

and 35,934 deaths since the first case emerged on January 20, 2020. Globally, there have been a cumulative total of 691.66 million confirmed cases and 6,906,110 deaths. By enacting preventive measures like wearing masks, getting vaccinated, and practicing social distancing in response to COVID-19, South Korea has managed to lower its COVID-19 classification from Level 2 to Level 4, akin to that of influenza, as of August 31, 2023. However, the national sense of unease and public anxiety still persists.

While Korea has faced serious infectious diseases like SARS and MERS in the past, the emergence of new types of viruses, such as COVID-19, remains a significant threat. However, despite extensive research on SARS and MERS, there is limited research related to COVID-19. When faced with risky infectious diseases such as COVID-19, individuals often make decisions on how to cope and act based on the information they gather from the media[1]. A survey carried out by the Reuters Institute for the Study of Journalism unveiled that in South Korea, 77% of respondents rely on the media for COVID-19-related information, followed by health organizations at 37% and the government at 31%. The Reuters Institute's research and publications are frequently cited in academic circles, and it has gained recognition for providing valuable insights into global trends in news consumption and digital media. According to previous studies, the media's role in comprehending the status of COVID-19, such as information on confirmed cases and deaths, and collecting information related to government policies like mask-wearing and social distancing, has been identified as crucial[1].

The existing research on South Korea's media coverage of COVID-19 highlights issues such as exaggeration, misinformation, fake news, and biased reporting. Additionally, analyses have been conducted on the primary topics and issues covered by the media, utilizing content analysis. Unfortunately, finding previous studies that analyze the practical influence of media coverage on information-seeking behavior related to COVID-19 syndrome in Korea has proven challenging.

In this context, the objective of this study is to investigate how media coverage of COVID-19 in Korea may have influenced audience behavior, particularly in terms of information-seeking behavior related to COVID-19. The study will employ regression analysis and Granger causality tests to investigate whether there is a causal relationship between changes in COVID-19 media coverage by 10 major Korean newspapers and TV networks (KBS, MBC, SBS) and the information-seeking behavior of the audience.

2. Literature Review

2.1 COVID-19 Media Coverage

In reviewing existing studies on COVID-19 media coverage in Korea, numerous research works primarily employ methods such as frequency analysis, content analysis, and frame analysis to analyze the key topics or issues addressed by the Korean media. In particular, studies emphasizing adherence to journalistic principles by critiquing aspects such as exaggeration, incitement of hatred, dissemination of misinformation or fake news, and politically biased reporting are prevalent.

For instance, research by Lee and colleagues, utilizing frequency analysis, indicates a tendency among major media outlets in Korea to prioritize news on social distancing as a significant topic in their COVID-19-related articles. The study also reveals that broadcasters tend to produce fewer news articles compared to newspapers. It notes that coverage of social distancing in major news articles was more prominent during the first and second waves, coinciding with increases in confirmed COVID-19 cases and government's strengthened policies[2]. Park's study, utilizing frame analysis, finds that both conservative and progressive newspapers in Korea predominantly employed a formal frame centered around events, with straight news reporting on COVID-19 being the predominant form. Conservative newspapers tended to shift responsibility for COVID-19 to the government and local authorities, using

frames that created anxiety through exaggerated or sensational expressions more frequently[3]. In summary, when examining previous research in Korea, the majority of studies focus on criticizing exaggerated expressions, false information, fake news, and politically biased reporting in COVID-19 reports using frequency analysis, content analysis, and frame analysis methods.

Research on COVID-19 media coverage has been undertaken not only in Korea but also in numerous countries, including the United States and Europe. These studies analyze the topics covered by the media in relation to COVID-19 and examine the influence of media coverage on audience[4-6]. Additionally, comparative analyses have been conducted between the current situation with COVID-19 and previous situations, such as SARS and MERS, to understand the media's role and public health communication admist the COVID-19 pandemic[7].

On the other hand, research results indicate that in the case of new infectious diseases with high uncertainty, such as COVID-19, the media plays a crucial role in gathering related information. It also plays a role in verifying and correcting unconfirmed or fake information[8][9]. However, international studies on COVID-19 coverage may differ from the situation in Korea. There is also a gap between Korean research and international research on COVID-19, given the variations in situations and research topics across different countries. Therefore, there is a need to conduct empirical research to compare and analyze these differences

2.2 Risk Information Seeking and Processing (RISP) Model

The RISP model elucidates how an individual's search for risk-related information impact their behavior and decision-making. This model, first proposed by Griffin R. J. and others in 1999, models the proactiveness in exploring risk information based on the degree of risk perception, describing the behavioral intentions related to risk perception[10]. According to the RISP model, individuals, when perceiving current or future risks, are stimulated by psychological and social motivations, leading them to judge the proactiveness of seeking risk-related information. The model suggests that individuals actively search for risk-related information in crisis situations due to a psychological need for information adequacy, which is relevant to actions aimed at preventing or mitigating risks.

The RISP model has been utilized not only for climate, environment issues, and natural disasters but also to various types of risk perception, information seeking processes, encompassing diseases like COVID-19[11]. In Korean research, the RISP model has been utilized in research on COVID-19, examining the utilization of risk perception and information-seeking behaviors to predict related actions. For example, research conducted by Cho and KIm, using the RISP model in COVID-19 studies, suggests that individuals with higher risk perceptions of COVID-19 tend to be more proactive in seeking and processing relevant information[12].

The RISP model has evolved over time, with new independent variables added to the initial model. Recently, studies have been conducted to include media variables in the model[13]. According to the extended RISP model incorporating media variables, when risk perception is high or information is perceived as insufficient, active information-seeking occurs. Hence, media usage is both an outcome of risk perception and a preceding factor influencing individuals' responsive behaviors[13].

3. Research Methodology

3.1 Research Design

According to the RISP model, in uncertain situations like the occurrence of COVID-19, individuals exhibit information-seeking behaviors due to information inadequacy and anxiety. People then perceive the risk of infectious diseases like COVID-19 based on the acquired information, determining how to

respond and act. In this process, the media's coverage of relevant issues can influence not only public awareness of risks but also behaviors[3]. Therefore, analyzing the reporting of COVID-19 topics in Korea, such as newspapers and broadcasts, and understanding its implications is crucial.

Building on this theoretical discussion, this study assumes that the RISP model can be applied by incorporating media variables to ascertain the potential influence of COVID-19 cases, COVID-19 fatalities, and media coverage of COVID-19 (as independent variables) on the dependent variable, which is the behavior of seeking COVID-19 information, or information-seeking behavior. This study seeks to empirically assess the impact of media coverage on the Korean populace at the societal level from January 20, 2020, when the first COVID-19 case was confirmed in Korea, to August 31, 2023, when the COVID-19 classification was lowered to Level 4. To achieve this, three research questions have been formulated:

RQ 1 What factors influence information-seeking behavior related to COVID-19?
　　　H1-1 A rise in COVID-19 verified cases will lead to a rise in COVID-19 information-seeking behavior.
　　　H1-2 A rise in COVID-19 fatalities will lead to a rise in COVID-19 information-seeking behavior.
　　　H1-3 A rise in COVID-19 media reporting will lead to a rise in COVID-19 information-seeking behavior.
RQ 2 Is there a difference in the influence of COVID-19 newspaper reporting and COVID-19 broadcast reporting on COVID-19 information-seeking behavior?
RQ 3 Can COVID-19 media reporting be decisively identified as a cause of information-seeking behavior related to COVID-19?

To answer these research questions, the study has proposed the following regression analysis model:

$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_4 + \beta_{4X4} + \varepsilon_i \quad \varepsilon_i \sim N(0, \sigma)$

Y_i = COVID-19 search volume

X_1 = COVID-19 verified cases

X_2 = COVID-19 fatalities

X_3 = COVID-19 newspaper reporting

X_4 = COVID-19 broadcast reporting

$\beta_0 \ldots \beta_4$ = coefficients

ε_i = error term　　　　　　　　　　　　　　　　　　　　　　　　　　　　　(1)

In the research model, the differentiation of COVID-19 media coverage into COVID-19 newspaper coverage and COVID-19 broadcast coverage was based on previous research results considering that individuals with a keen interest in health information tend to seek information through print media, while those with less interest tend to obtain information through broadcast media[14]. The inclusion of COVID-19 verified cases and deaths as independent variables was based on the likelihood that, similar to the MERS outbreak mentioned in previous research, the count of COVID-19 verified cases and fatalities would have a certain influence on the risk information seeking process during the COVID-19 situation[15][16].

3.2 Data Gathering Procedures

The dependent variable used as a proxy for measuring COVID-19 information-seeking behavior in the research model is 'COVID-19 search volume,' which refers to the COVID-19 search trend index extracted using Naver's 'Data Lab' (http://datalab.naver.com). Naver, according to Internet Trend, a market research firm (www.internettrend.co.kr), is the leading search portal in Korea, commanding a market share of 58.5% as of August 2023, surpassing Google (30.9%) and Daum (4.1%). Naver's Data Lab provides a service to analyze search trends for specific keywords over time. For instance, Naver's Data Lab represents the COVID-19 search trend in relative index form, setting the maximum search frequency of COVID-19-related keywords on the day with the highest search frequency during the analysis period from January 20, 2020, to August 31, 2023, as 100. This standardizes and presents changes in the search volume for COVID-19 information as relative indices.

The independent variables, COVID-19 verified cases and COVID-19 fatalities mean statistics on 'COVID-19 Trends' announced by KDCA(https://ncov.kdca.go.kr). The COVID-19 newspaper reporting and broadcast reporting mean the number of COVID-19 articles reported by the top 10 daily newspapers and the top 3 broadcasters, respectively, obtained through the Korean Press Foundation's (KPF) BIG KINDS. BIG KINDS is the most frequently used media portal in research related to media reporting in Korea. The search terms included six keywords such as COVID-19, Corona, Coronavirus, Novel Coronavirus, COVID19, used in previous research by Choi and Hong[17].

3.3 Statistical Tools

This study aims to conduct regression analysis and Granger causality analysis with 'COVID-19 search volume' as the dependent variable (proxy for audience COVID-19 information-seeking behavior) and four independent variables: 'COVID-19 verified cases,' 'COVID-19 fatalities,' 'COVID-19 newspaper reporting,' and 'COVID-19 broadcast reporting.' Through this, the study seeks to clarify clear causal relationships between variables, addressing the limitations of previous Korean studies predominantly focused on content analysis or frame analysis. All five variables used in this study, including the dependent variable 'COVID-19 search volume' and independent variables such as 'COVID-19 verified cases,' 'COVID-19 fatalities,' 'COVID-19 newspaper reporting,' and 'COVID-19 broadcast reporting,' utilized daily data. The analysis period was from January 20, 2020, to August 31, 2023, and statistical processing for time-series data was conducted using STATA and SPSS.

4. Results

4.1 Basic Statistics of Key Variables

The fundamental statistics of the primary variables utilized in this research are depicted in [Table 1]. This study set COVID-19 search volume as the dependent variable and executed regression analysis using COVID-19 verified cases, COVID-19 fatalities, COVID-19 newspaper reporting, and COVID-19 broadcast reporting as independent variables.

[Table 1] Basic Statistics of Variables (n=1320)

	COVID-19 Search Volume	COVID-19 Verified Cases	COVID-19 Fatalities	COVID-19 Newspaper Reporting	COVID-19 Broadcast Reporting
Mean	5.5	26190.8	27.2	494.4	79.6
S.D.	9.4	59486.9	55.7	389.4	52.9

Min	0.03	0	0	10	1
Max	100	621035	469	1974	235

This research utilized an Augmented Dickey-Fuller (ADF) test to determine the presence of a unit root in each time series dataset. The ADF test is a statistical tool employed to ascertain the existence of a unit root in a given time series dataset.. When time series data contains a unit root, the use of Ordinary Least Squares (OLS) for regression analysis may produce errors, indicating a significant relationship even when none exists. In other words, if the variable is an unstable time series data with a unit root, the issue of spurious regression can arise, causing variables to appear correlated even when they are independent.

[Table 2] Results of Unit Root Tests for Variables (n=1319)

Variable	ADF Statistic	Critical Values		
		1%	5%	10%
COVID-19 Search Volume	-4.425***	-3.430	-2.860	-2.570
COVID-19 Verified Cases	-6.011***	-3.430	-2.860	-2.570
COVID-19 Fatalities	-6.084***	-3.430	-2.860	-2.570
COVID-19 Newspaper Reporting	-11.055***	-3.430	-2.860	-2.570
COVID-19 Broadcast Reporting	-13.782****	-3.430	-2.860	-2.570

Note: **, *** refute the null hypothesis regarding the existence of a unit root at the 5% and 1% significance levels.

The outcomes of the ADF unit root assessments for the five variables are displayed in [Table 2]. The results indicate that COVID-19 search volume, COVID-19 verified cases, COVID-19 fatalities, COVID-19 newspaper reporting, and COVID-19 broadcast reporting are all time-series variables without unit roots, signifying stable time series.

[Table 3] Regression Analysis Results (n=1320)

	Dependent Variable: COVID-19 Search Volume		
	Coefficient	S.E.	t-value
Const	3.4438	1.7799	1.93
COVID-19 Verified Cases	2.59e-06	3.08e-06	0.84
COVID-19 Fatalities	-.0002	.0032	-0.07
COVID-19 Newspaper Reporting	.0044***	.0004	10.82
COVID-19 Broadcast Reporting	-.0045	.0025	-1.84
	Adj R=0.5597, Adj DW=1.7792		

**p<0.05, ***p<0.01

Examination of the VIF values for the independent variables employed in the regression analysis depicted in [Table 3] suggests that the VIF values range from 2.95 to 4.06, with an average of 3.51, This indicates that there are no concerns regarding multicollinearity among the independent variables. VIF values below 5 generally indicate low multicollinearity. VIF is a statistical metric utilized to evaluate the extent of multicollinearity in regression analysis. It measures the extent to which the variance of an

estimated regression coefficient rises when predictor variables are correlated with each other, helping to identify potential issues with collinearity in the model.

However, the Durbin-Watson (DW) test for testing the independence of errors revealed a DW statistic of 0.3645 with a p-value below 0.01, indicating the presence of autocorrelation. In the context of regression analysis, autocorrelation violates the independence assumption, potentially resulting in inefficient estimation and errors in inference. To address the autocorrelation issue, the study employed the Prais-Winsten model, resulting in a DW statistic of 1.7792, much closer to 2, indicating the absence of long-term correlation.

4.2 Results of Research Questions 1 and 2

Regarding the Research Question 1, as observed in the regression results in [Table 3], the coefficient for COVID-19 confirmed cases, as hypothesized, shows a positive sign but is not statistically significant in relation to the dependent variable, COVID-19 search volume. Similarly, COVID-19 deaths also exhibit no significant relationship with COVID-19 search volume. Therefore, hypotheses 1-1 and 1-2 are both rejected. On the other hand, COVID-19 newspaper coverage is estimated to be a predictor that significantly influences the COVID-19 search volume ($\beta = 0.0044$, $t = 10.82$, $p < 0.01$). This means that when newspaper coverage increases by 1, the COVID-19 search volume increases by 0.0044. However, it was found that broadcast coverage has no statistically significant relationship with COVID-19 search volume. Thus, hypothesis 1-3 is supported for newspapers but rejected for broadcast media.

4.3 Results of Research Question 3

The validation of Research Question 1 indicates a noteworty correlation between newspaper coverage of COVID-19 and COVID-19 search volume. If so, can it be conclusively stated that newspaper coverage of COVID-19 is the genuine reason for impact on COVID-19 information seeking behavior? Or did the increase in COVID-19 information searches contribute to the increase in newspaper coverage of COVID-19? To address these questions, the research utilized the Granger causality test to verify the clear directionality of the causality between the two variables.

[Table 4] Results of Granger Causality Test

Null Hypothesis	Obs	χ^2 Stat.	Prob
COVID-19 Newspaper Reporing $\nRightarrow$ COVID-19 Search Volume	1318	201.11	0.000
COVID-19 Search Volume $\nRightarrow$ COVID-19 Newspaper Rerporting	1318	13.519	0.001

Note: 1) $\nRightarrow$ indicates no Granger causality.
2) If the probability value is above 0.05, the hypothesis is accepted at the 5% significance level.

The results in [Table 4] show that the hypothesis "COVID-19 newspaper reporting does not Granger cause COVID-19 search volume" is rejected with a probability value of 0.000. Similarly, the hypothesis "COVID-19 search volume does not Granger cause COVID-19 newspaper reporting" is also rejected with a probability value of 0.001. This implies that there is a Granger causality relationship between COVID-19 newspaper coverage and COVID-19 information search behavior, implying a reciprocal relationship where an uptick in newspaper coverage results in heightened information searches, and conversely.

5. Conclusions

The main aim of this study is to examine how COVID-19 media coverage impacts the online information-seeking behavior of audiences in Korea using the RISP model through regression analysis and Granger causality tests. The summarized results are as follows:

The hypothesis that a rise in COVID-19 newspaper reporting leads to a rise in COVID-19 information-seeking behavior was supported for newspaper reporting but rejected for broadcast reporting. Newspaper coverage of COVID-19 has a greater influence on users' behavioral responses than numerical aspects such as confirmed cases or deaths, emphasizing the crucial role of media coverage in influencing public reactions. Mutual influence was identified between COVID-19 newspaper reporting and users' COVID-19 information seeking behavior.

This suggests that, since January 2020, newspaper coverage and user behavior have interacted to amplify the nationwide response to the COVID-19 crisis in Korea. In particular, COVID-19 newspaper coverage was considered a more influential factor on users' COVID-19 information seeking behavior than COVID-19 broadcast coverage. These results can be considered consistent with existing research findings[17][18]. During periods of heightened uncertainty, such as the COVID-19 pandemic, newspapers may offer more in-depth information compared to broadcasts, influencing users' information-seeking behavior.

This study emphasizes the significance of adhering to journalistic principles during crises, like the COVID-19 pandemic, as sensationalism or biased reporting can lead to national anxiety and distrust[1]. Guidelines, such as the "Infectious Disease Reporting Guidelines" introduced by major Korean media organizations, underscore the importance of accurate reporting based on facts to ensure public safety. It is crucial to monitor and encourage compliance with such guidelines to prevent media outlets from using provocative expressions or negative vocabulary to attract attention. This study is limited by its reliance on time-series data and quantitative analyses, rather than in-depth content analysis of specific media reports. This study also has limitations in that the analysis was limited to television and newspapers. Future research should expand the scope to include various digital platforms like SNS and evolving media landscapes, and conduct more detailed analyses of COVID-19 coverage content. In-depth analysis of users' search for information during risky disease outbreaks through surveys can provide valuable insights for media guidelines and public health communication.

Nevertheless, this study is significant in that it empirically revealed through multiple regressing analysis and Granger causality test that the media, especially newspapers, had a significant influence on the Korean people's COVID-19 syndrome. These results provide important implications regarding Korea's media policy and public health strategies or communications when highly uncertain infectious diseases such as COVD-19 recur.

6. Acknowledgments

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