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Public health measures on COVID-19 in North Korea: a quantitative analysis of media programmes in 2020–2022

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ABSTRACT

Objectives Details regarding the management of COVID-19 in North Korea are unknown. The aim of this paper was to analyse media programmes in North Korea in order to understand public health measures and policies concerning COVID-19.

Setting State-run news agency in North Korea.

Primary and secondary outcome measures The classification of television programmes on COVID-19 broadcast in a state-run news agency, from January 2020 to May 2022, and public health measures introduced in the programmes.

Results A total of 2671 programmes concerning COVID-19 were included in the study. These programmes provided detailed clinical guidelines to laypeople without medical expertise, including instructions for the usage of medication and preventive measures. An association between the media concern regarding COVID-19 and trade volume, as a proxy of border closure according to the concern of the authorities, provided hints to understand the priorities and aims of the authorities.

Conclusions The research outcomes provided significant insights into the effort to understand an impaired healthcare system and prevalent drug abuse behaviours in North Korea. Findings from further studies on the recently collected data might suggest additional implications on the North Korean policies on COVID-19.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This is the first paper to provide a quantitative analysis of the long-term media programmes concerning COVID-19 in North Korea.
⇒ Our study design to analyse television programmes in North Korea provides original insights to overcome the lack of information, as other sources such as medical journals are not currently available.
⇒ The frequency of subgroups of each programme may show slight differences from the actual programme broadcast, due to the rescheduling of the timetable.

INTRODUCTION

North Korea declared victory against COVID-19 in August 2022, 3 months after their first official acknowledgement of COVID-19 cases.[1 2] The mask mandate has been lifted while it has been reported that restrictions on operating hours in marketplaces have been relaxed, except for the strictly managed border areas.[3] However, the actual situation regarding COVID-19 in North Korea is concealed in a shroud of secrecy; untrustworthy statements and propaganda news reports abound.

Until recently, details regarding the management of COVID-19 in North Korea remained unknown, as reinforced border closures aggravated the isolation of one of the most rigidly closed countries. Since the start of the epidemic, public health authorities have proclaimed the success of their system for quarantine and disease control.[4] Nevertheless, the systematic distinction could not be fully demonstrated under restricted evidence. Campaigns for vaccination against COVID-19 have not been conducted, despite reports on the partial provision of Chinese vaccines to soldiers, and the inadequate supply of essential medications and facilities in North Korea has long been emphasised.[1 5–8] Food insecurity influenced by a variety of factors, including long-standing sanctions, border closures and unfavourable climate problems, may also have hindered the ability of the population to overcome recent difficulties.[5 9] Despite these undesirable conditions, North Korea had persistently claimed no official cases of COVID-19 and declined most humanitarian assistance from various countries and organisations including South Korea and COVID-19 Vaccines Global Access (COVAX) during the pandemic.[4 10]

The authorities only recently acknowledged the COVID-19 outbreak inside the country; the statistics were made public with their state-owned news agency, the Korean Central News Agency (KCNA), reporting the first official cases in May 2022.[2] Reports from KCNA addressed the daily number of 'people with fever as a proxy of confirmed cases' and broadcast instructions for citizens.[5] Official statistics regarding cases of

fever showed a gradual decrease, reaching the asserted end of the COVID-19 crisis within only 3 months (online supplemental figure 1), based on KCNA data collected by *38 North*).[11] The reported cumulative number of deaths related to COVID-19 remained in double digits during the period.

Some researchers and policymakers have questioned the reliability of the 'victory against COVID-19'.[12] Relevant information to estimate undisclosed figures was, however, difficult to obtain, especially due to stricter border closures after the COVID-19 outbreak.[13–15] Therefore, news reports have drawn attention as sources of information considering their real-time feature and accessibility. Researchers and journalists worldwide cited the coverage by KCNA to illustrate North Korean policy during the COVID-19 pandemic, allowing for the propaganda purpose of the broadcast. Nevertheless, the deluge of information placed pressure on researchers to concentrate only on the latest essence, thus scant attention has been paid to quantitative analyses of KCNA programmes. Despite their invaluable significance in North Korean studies, details regarding the characteristics of KCNA programmes on the clinical aspects of COVID-19 were also disregarded.

In order to conduct a thorough evaluation of the North Korean approach to the pandemic, this paper analysed KCNA programmes on COVID-19 from January 2020 to May 2022, from the beginning of the pandemic to the period of the first official acknowledgement of COVID-19 cases. Results of quantitative analyses on the number of broadcasts for each topic may reveal the trend of discussion and the degree of concern regarding the novel virus, while qualitative analyses on each programme may illustrate the clinical guidelines provided by the health authorities for prevention and treatment of COVID-19. The results are expected to be helpful in assessing the unmet needs of North Korea in the era of the COVID-19 pandemic and provide evidences in establishing appropriate policies.

Meanwhile, another variable in addition to KCNA programmes was introduced to understand the concern related to COVID-19 from various perspectives. Trade volume between North Korea and China, one of the few objective and reliable figures from North Korea that can be obtained from the outside world, was used as a key indicator in order to indirectly demonstrate the degree of concern regarding COVID-19. A decline in trade volume is expected under stricter lockdown policies due to increased concern regarding COVID-19[4]; variations in trade figures between North Korea and China may reflect most of the influence of border closures on the trade policy during the pandemic, as North Korean dependence on trade with China is extremely high due to long-lasting international sanction and regulation, reaching 95.2% in 2019.[16]

The comparison of the variables (ie, the number of KCNA programmes on COVID-19 and the trade volume between North Korea and China) would help highlight the purpose and fear of the authorities from diverse standpoints. The former demonstrates efforts towards the propagation and education of their people for disease control and system stability, while the latter reflects endeavours to balance disease control and economic survival. Although more variables including the effects of long-term economic sanctions are needed for an in-depth analysis, the unanimous direction of the two variables may briefly illustrate the over-riding aim of disease control during the pandemic, while also substantiating the utility of media analysis in understanding the situation. The discrepancy of the variables, on the other hand, may indicate the change in their national priority orders.

The purposes of the paper are thus (a) to attain an indirect understanding of the trend of attention to COVID-19 in North Korea with quantitative analyses of KCNA programmes, (b) to understand the clinical and preventive guidelines for COVID-19 presented to laypeople by public media with qualitative analyses of KCNA programmes and (c) to analyse the aims and priorities of the public health authorities in North Korea by comparison with another objective indicator on COVID-19.

METHODS

An analysis of television programmes regarding COVID-19 broadcast in KCNA from 1 January 2020 to 31 May 2022 was conducted, from the first period of the pandemic to the time period around the first official cases of COVID-19 in North Korea. The lists of the broadcast programmes were first obtained from the database of the *Information Portal on North Korea* managed by *the Ministry of Unification, Republic of Korea* (April to May 2022); an analysis of the video materials for each programme was then performed from the digital archives of the *Information Center on North Korea* managed by *the Ministry of Unification, Republic of Korea* (May to June 2022). Online materials from KCNA were not available as sources due to the regulation of the broadcasting authorities.[17] All programmes were broadcast in the Korean language.

The initial screening process was conducted by two researchers who are medical doctors using specific keywords as follows: "COVID-19", "infectious diseases", "disease control", "variants", "sanitation", "symptomatic patients (people with fever)", "medication" and "treatment". Double-checking of programmes included as a result of the screening process was performed in order to determine whether they cover topics concerning COVID-19. The types of television programme included (1) news reports, (2) documentary films, (3) propaganda materials and (4) educational materials; other types of programmes, such as movies, dramas or music programmes did not include any information on COVID-19. Propaganda materials on COVID-19 were included in order to understand the formal guidelines of the health authorities. Duplicate television programmes broadcast in different time periods were not excluded to reflect the

intention of the broadcasting authorities, while evaluating the frequency of programmes.

An analysis of the characteristics and details of each programme was performed using archived video materials, resulting in the classification of programmes into three groups (ie, (a) COVID-19 statistics, (b) clinical aspects and (c) structural and societal aspects) and nine subgroups (ie, (a-1) COVID-19 statistics in North Korea, (a-2) COVID-19 statistics outside North Korea, (b-1) explanation on COVID-19, (b-2) preventive measures, (b-3) instructions for medication usage, (b-4) home-care management, (b-5) instructions for post-COVID-19 conditions, (c-1) national disease control system and (c-2) propaganda materials). Classification criteria and keywords of each subgroup in the study are listed in online supplemental table 1. A few ambiguous cases that included multiple characteristics of each subgroup were classified according to the discussion conducted by the researchers as medical doctors, mainly based on the portion and significance of each topic. Programmes introducing the clinical approach from Koryo medicine, the North Korean oriental medicine such as herbal therapy and acupuncture, were also included and classified into category concerning clinical aspects.[18]

Data regarding trade volume between North Korea and China were obtained from the database of *the Korea International Trade Association* (May to August 2022) in order to attain an indirect understanding of the degree of border closure from January 2020 to May 2022, reflecting the concern of the health authorities regarding COVID-19 during the pandemic.[19] Examination of Pearson's correlations between the trade figures and the number of broadcast programmes on COVID-19 was performed each month. Analysis of data and drawing of associated figures was performed using IBM SPSS Statistics for Windows (IBM Corp., Armonk, New York, USA) and Microsoft Excel (Microsoft Corp., Redmond, Washington, USA).

PATIENT AND PUBLIC INVOLVEMENT

It was not appropriate or possible to involve patients or the public in the design, conduct, or reporting of the research.

RESULTS

Characteristics of programmes on COVID-19

A total of 24 448 programmes in 878 days (1 January 2020 to 31 May 2022) were provided from the database of broadcast programmes in KCNA. As a result of the screening process, 2671 programmes concerning COVID-19 (722 programmes from January to December 2020; 1199 programmes from January to December 2021; 750 programmes from January to May 2022) were identified.

Characteristics of each programme broadcast by KCNA from January 2020 to May 2022 are classified into three groups in table 1, while specific figures according to nine subgroups can be found in online supplemental table 2. Reports including the latest updates on COVID-19 outside North Korea accounted for a large portion of programmes (1152 out of 2671; 43.1%) along with the frequent broadcast of propaganda materials designed to enhance solidarity and exert pressure not to violate guidance regarding public health (1025 out of 2671; 38.4%). Broadcast of measures for the prevention of COVID-19 has been intermittent from the beginning of the outbreak; programmes explaining the disease or virus itself, such as features of the Delta variant or Omicron variant, were also included.

Table 1 Characteristics of KCNA programmes on COVID-19

Broadcast time period	(a) COVID-19 statistics	(b) Clinical aspects	(c) Structural and societal aspects	Total
2020				
Jan	10	6	0	16
Feb	84	47	0	131
Mar	83	108	0	191
Apr	77	14	0	91
May	27	0	0	27
June	2	0	0	2
July	0	1	8	9
Aug	21	3	35	59
Sept	14	4	23	41
Oct	12	5	20	37
Nov	11	10	25	46
Dec	12	15	45	72
2021				
Jan	11	18	43	72
Feb	25	9	33	67
Mar	65	9	49	123
Apr	50	5	43	98
May	63	6	59	128
June	58	2	54	114
July	55	0	54	109
Aug	52	0	52	104
Sept	49	0	48	97
Oct	48	0	49	97
Nov	42	0	43	85
Dec	52	0	53	105
2022				
Jan	57	0	56	113
Feb	37	0	42	79
Mar	58	0	61	119
Apr	44	0	49	93
May	100	152	94	346
Total	1219	414	1038	2671

KCNA, Korean Central News Agency.

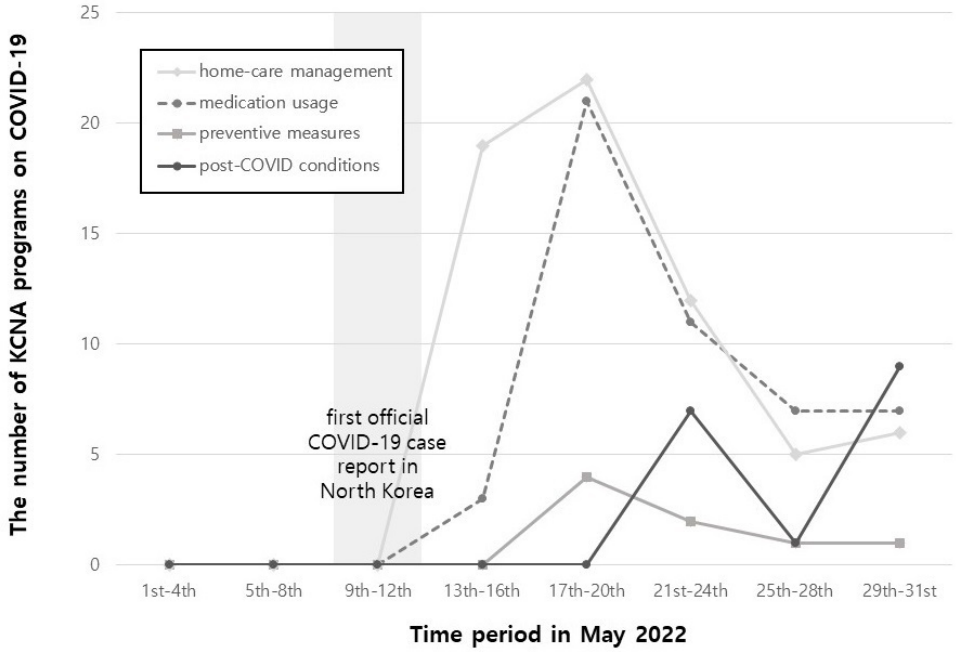

Figure 1 The broadcasting trends of programmes on clinical aspects in May 2022. KCNA, Korean Central News Agency.

The frequency of broadcasting on COVID-19 was greater in May 2022 compared with other months. A total of 346 programmes dealt with COVID-19, 1.8 times greater compared with the month showing the second greatest frequency during the analysed period (ie, 191 programmes in March 2020) and 3.7 times greater compared with the previous month (ie, 93 programmes in April 2022). The latest programmes right before the acknowledgement of COVID-19 cases (May 12) focused on propaganda materials and global news accompanying COVID-19 figures outside North Korea. The tendency has been switched initially to a spotlight on the national disease control system, then a relative focus on the clinical aspects, including medication usage, home-care management and post-COVID-19 conditions since the first official acknowledgement of epidemic.

Programmes after the first official cases of COVID-19

Broadcasting trends in may 2022

An illustration of the broadcasting trends of programmes regarding preventive measures, instruction for medication usage, home-care management and instruction for post-COVID-19 conditions in May 2022 is shown in figure 1. The inclusion of programmes on clinical aspects in the timetable increased after the official reports of patients with COVID-19 (May 12); the numbers of broadcast programmes in each subgroup have skyrocketed one after another. Guidelines on home-care management were first highlighted, followed by instruction for medication usage, and post-COVID-19 conditions by the end of the month. There was less of an emphasis on preventive measures compared with other clinical aspects in May 2022.

Home-care management and preventive measures

Programmes on home-care management mainly provided guidelines regarding two factors: self-quarantine and lifestyle management to improve symptoms. Patients under self-quarantine were required to wear masks and to maintain distance from other family members. Visitors were not allowed during the period of self-quarantine, and regular ventilation throughout the house was recommended. Nasal irrigation with salt water and oral rehydration were highly recommended for the management of symptoms such as sputum, while gentle exercise was also recommended for patients in order to prevent muscle weakness. Preventive measures also included similar factors including social distancing and wearing masks.

Instruction for medication usage

Programmes on medication usage provided an explanation of the proper use of medication in the treatment of COVID-19 symptoms. Participation of community doctors (ie, Hodamdang-euisa) or groups (ie, Inmin-ban) in the distribution of medications was reported; medications for patients in a period of self-quarantine were provided by door-to-door delivery, while regular pharmacy services were still maintained.

Interviews with medical experts, mainly doctors and researchers from medical institutions (eg, Pyongyang Medical University, Kim Man Yu Hospital, Pyongyang Maternity Hospital, General Hospital of Koryo Medicine), accounted for a large proportion of the programmes directing the usage of medication. A summary of the instructions for each target population is shown in table 2.

Interviewees elaborated on specific details of medication usage by stating both the generic names (eg,

Table 2 Instructions for medication usage under COVID-19 symptoms

Target population	Key recommendations and comments
Patients with fever	1. Antipyretics can be used in patients with COVID-19 symptoms including fever, arthralgia, myalgia and headache. Specific dosages of each medication are as follows: paracetamol (500 mg, 2–3 times a day), ibuprofen (400 mg, 2–3 times a day) and diclofenac suppository (one at a time, every 6–8 hours). Paedoksan as Koryo medicine (traditional North Korean medicine) can also be used (4 g, three times a day). 2. Antibiotics can be considered in cases involving accompanying symptoms of bacterial infection, while injection of antibiotics (eg, penicillin, ceftriaxone, levofloxacin) should be managed under the instruction of a doctor. Antibiotic allergy testing is required prior to administration of antibiotics. Antibiotics (eg, amoxicillin, erythromycin) can also be administered orally.
Patients with diabetes	1. Blood sugar level should be strictly managed as elevation of blood sugar levels is frequently observed within 7–10 days after fever. 2. Some antidiabetic drugs such as metformin are not recommended during the period of COVID-19 infection, considering the risk of metabolic acidosis and increased plasma drug concentration, while insulin or sulfonylureas are relatively safe to use. 3. Steroid medications such as prednisolone should not be used without the direction of a doctor.
Patients with gastrointestinal disorders	1. Repeated use of antipyretics, painkillers and antibiotics should be avoided as they can cause gastrointestinal symptoms including abdominal pain, epigastric discomfort, diarrhoea, nausea, vomiting or even gastric bleeding. 2. Foods that do not irritate the mucous membrane, such as porridge or soup, are recommended. 3. Proton-pump inhibitors (eg, omeprazole, pantoprazole, lansoprazole) or H2 receptor antagonists (eg, ranitidine, cimetidine) can be used in cases involving severe symptoms.
Pregnant women	1. The antipyretic effects of medication in pregnant women are relatively low; most antipyretics can pose a risk depending on the period of pregnancy. While paracetamol is relatively safe for pregnant women, those with underlying diseases such as gestational diabetes or impaired liver function should use antipyretics only under the instruction of a doctor. 2. Fluoroquinolones (eg, ciprofloxacin, levofloxacin) should not be used in pregnant women. 3. Some Koryo medicine (traditional North Korean medicine) such as Paedoksan can be safely used in pregnant women with symptoms of COVID-19, regardless of the period of pregnancy.
Children	1. The majority of COVID-19 symptoms are not severe in the child population; early diagnosis and a proper approach to treatment may result in a good prognosis. 2. Antipyretics can be used in children with a fever of 38°C or more, specific dosages of each medication are as follows: paracetamol (10–15 mg/kg), diclofenac (1 mg/kg), ibuprofen (10–15 mg/kg). Diphenhydramine (1–2 mg/kg, one or two times a day) and chlorpheniramine (0.35 mg/kg, one or two times a day) can also be used in cases where fever is accompanied by rhinorrhea and cough. 3. Chlorpromazine, diphenhydramine and diazepam can be used for the management of febrile seizures, while phenobarbital is preferred in neonatal seizures. 4. Antibiotics (eg, penicillin, ceftriaxone, ciprofloxacin, levofloxacin) or corticosteroids (eg, prednisolone, dexamethasone) may be required in patients diagnosed with pneumonia. 5. An oxygen supply or intravenous fluids can be administered in critically ill patients.

paracetamol, co-trimoxazole, chlorpheniramine, omeprazole, metformin) or trade names (eg, *Zantac* as ranitidine, *Voltaren* as diclofenac, *Dimedrol* as diphenhydramine, *Aminazin* as chlorpromazine) in each target population. Some experts explained the dosage of each medication (eg, 500 mg of ampicillin injected into muscle or vein, every 6–8 hours).

Programmes concentrating on the detailed explanation of medication usage have begun to be included in the broadcast schedule since May 2022 despite the existence of brief, intermittent references without specific details throughout the investigated periods. The target audience was not designated or limited to healthcare providers; the instructions were open to all the people watching the KCNA programmes.

Instruction for post-COVID-19 conditions

Programmes on post-COVID-19 conditions elaborated on the guidelines for each target symptom. Doctors and researchers were likewise interviewed in order to provide appropriate advice; there was a relative focus on Koryo medicine (North Korean traditional medicine) compared with the instruction for the usage of medication for the treatment of COVID-19 symptoms. A list of the key recommendations for each target symptom is shown in table 3.

Comparison of trends of media concern and trade volumes

An illustration of the number of programmes regarding COVID-19 broadcast each month is shown as a bar graph in figure 2. Trade volume, the sum of exports and imports, between North Korea and China each month is

Table 3 Instructions for post-COVID-19 conditions

Target symptoms	Key recommendations	Advice based on koryo medicine
Musculoskeletal pain	Ibuprofen, diclofenac, aspirin	Moxibustion, hot massage Herbal therapy (Kalopanax, ginger)
Nausea	Antiemetics, fluid therapy	Moxibustion
Diarrhoea	Fluid therapy	–
Nasal congestion, rhinorrhea	Nasal irrigation, antiviral agents or antibiotics	–
Sore throat, cough	Gargling, antiviral agents or antibiotics	Herbal therapy (garlic, vinegar) Moxibustion, cupping
Neurasthenia, insomnia	Diazepam, paracetamol	–
Pruritus, papules	Diphenhydramine, chlorpheniramine, vitamin supplement	–

presented alongside in figure 2 as a secondhand indicator of border closures,[19] ultimately revealing the degree of concern from the authorities. The respective trend of exports and imports can be found in online supplemental figure 2, based on the data from *the Korea International Trade Association*.

A noticeable increase in the number of programmes broadcast concerning COVID-19 was observed in the early period of outbreak (ie, February to April 2020), followed by a steep decline in the degree of media concern during the subsequent period (ie, May to July 2020). Media coverage again showed an upturn from August 2020 to the recent period included, reaching the latest upsurge in May 2022. Meanwhile, trade volume between North Korea and China showed the opposite trends compared with the number of broadcast programmes. The trade figures plummeted in the early period of outbreak when media coverage concerning COVID-19 increased (ie, February to April 2020), followed by a temporary recovery of the figures when the media concern decreased (ie, May to July 2020). Subsequent trade figures showed a zigzag pattern accompanying a gradual increase, however, the figures again sharply decreased with the domestic issue in May 2022.

The results of Pearson's correlation analysis on the number of KCNA programmes concerning COVID-19 each month and trade volume between North Korea and China are shown in online supplemental table 3. Only North Korean exports showed a negative correlation (r=−0.665, p=0.018) in the first year (ie, January 2020 to December 2020; 12 months included) with media coverage on COVID-19. The overall trade volume and North Korean imports were meanwhile negatively correlated with media coverage on COVID-19 (r=−0.470, p=0.020; r=−0.472, p=0.020), when the second year of the pandemic period was also included in the analysis (ie, January 2020 to December 2021; 24 months included). No correlation was observed between the media coverage and trade volume, with the inclusion of recent data in 2022 (ie, January 2020 to May 2022; 29 months included).

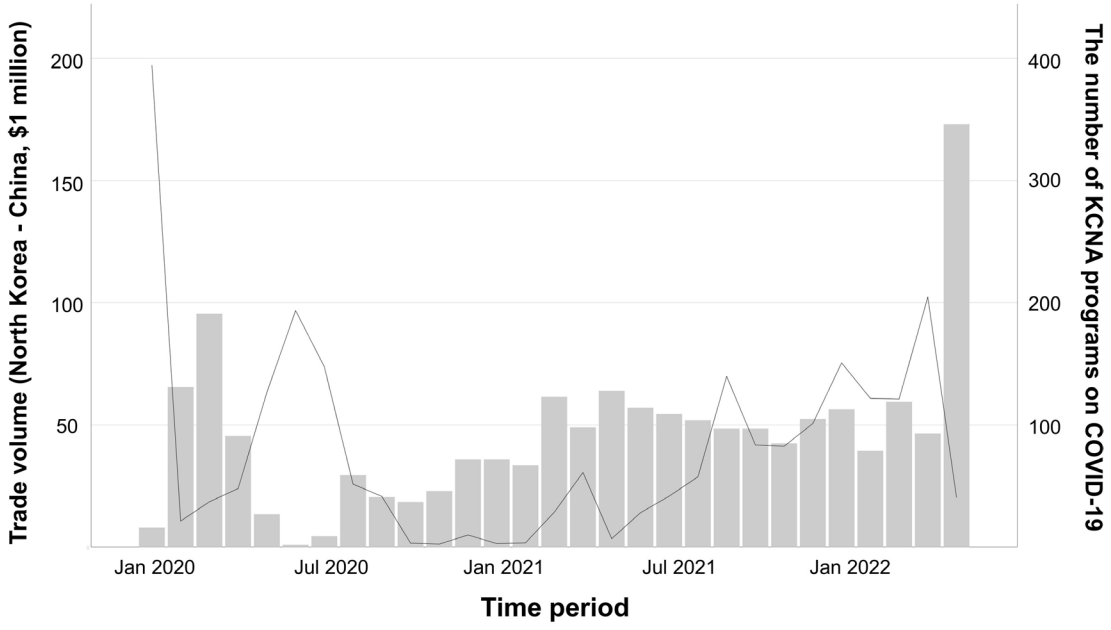

Figure 2 The number of KCNA programmes on COVID-19 broadcast each month (bar graph), compared with trade volume between North Korea and China (line graph). KCNA, Korean Central News Agency.

DISCUSSION

Notable features of COVID-19 programmes in KCNA

Programmes concerning COVID-19 broadcast from January 2020 to May 2022, from the beginning of the pandemic era to the first time period of official cases, were analysed in this paper. Latest figures on COVID-19 worldwide and propaganda materials accounted for a large proportion of programmes throughout the entire period, while educational programmes that offered preventive measures were intermittently included from the beginning of the outbreak. An upsurge in the number of programmes was observed in May 2022, with a relative focus on the clinical aspects compared with the period before the first official acknowledgement of cases. An increase in the frequency of programmes in each subgroup (ie, home-care management, instruction for medication usage and post-COVID-19 conditions), one after another, was observed during the recent period.

Detailed instructions for usage of medication were impressive feature of the programmes in KCNA, the state-run news agency that broadcast programmes to laypeople without medical expertise. The usage of medications with specific dosage guidelines (eg, oral administration, intramuscular or intravenous injection) was explained by some of the medical professionals who appeared in the television programme, mentioning both the generic and trade name. Additional evidence will be required in order to determine whether the instruction provided in the broadcast programme plays only an auxiliary role to the formal prescription from their doctors or the essential explanation to understand the exact usage of self-prescribed medications, however, considering the damaged healthcare system and expanding informal market for medication in North Korea, both interpretations are plausible.[7 20] It is assumed that authorities are aware that drugs not fully provided under the current healthcare system are being purchased unofficially in the marketplace; elaboration on the usage of medications in television programmes can be regarded as an endeavour by authorities to supplement the systematic limitations in healthcare sectors that are aggravated during the pandemic era. Expecting precise discrimination of the generic names or understanding of the detailed adverse drug reactions from the laypeople watching the television programmes may be laborious, however, people may recognise and learn basic instructions for usage of medication from the educational programmes.

Drug overuse, misuse and adverse drug reactions were part of the critical points from the education programme instructing medication usages; medical professionals repeatedly issued warnings to avoid abuse of antibiotics, antipyretics or painkillers. It was suggested that almost half of the cumulative deaths were the result of adverse drug reactions in May 2022 (32 out of 68 deaths), and the recent figures would not be significantly different as only 74 cumulative deaths were reported by authorities at the point of the declaration of victory in August 2022. Despite the extremely low reliability of the statistics with a double-digit death toll, the concern regarding drug abuse and adverse drug reactions in North Korea appears to be significant.

Many North Korean refugees are known to expect the immediate effect of medication, which eventually leads to drug abuse[21]; the medication might likewise be overused by North Korean people, formally prescribed by doctors or self-prescribed, in order to immediately manage the symptoms of COVID-19. One possible scenario of deaths from adverse drug reactions is paracetamol; reports on the patient population in Pyongyang suggested that more than one-third of the patients had fever higher than 39.0°C.[2] The absence of vaccination campaigns may have exacerbated the degree of symptoms after COVID-19 infection and led to overuse of antipyretics including paracetamol without professional guidance. Paracetamol-induced acute liver failure in some unfortunate population may account for some portion of the deaths resulting from adverse drug reaction.[22 23] Antibiotic resistance resulting from overuse of self-prescribed antibiotics can also pose a secondary threat in North Korea, where the burden of infectious diseases remains high.[24]

Therefore, the concern for appropriate usage of medication might accompany humanitarian assistance including medication support. Proper monitoring of drug distribution and patient education should be required after administration of support, however, because the monitoring is regarded as outside interference, the health authorities would refuse the evaluation process. Door-to-door delivery of medication or community doctor visits for the self-quarantined in North Korea have been suggested as an appropriate healthcare project to help people overcome the COVID-19 pandemic, however, there are questions regarding the coverage and sustainability of the services. Conduct of further studies on public healthcare services in North Korea will be required in order to verify the integrity of the system.

Understanding the aims and priorities during the pandemic

The variables exploited in the paper to briefly figure out the aims and priorities of the authorities (ie, the results of quantitative analyses on KCNA and the trade volume between two adjacent countries) mirror the ‘educational endeavours for disease control’ and ‘balancing efforts between epidemiological and economic survival’, respectively. The intentions of the authorities are presumed to be rapidly reflected in their educational endeavours, considering the characteristics of state-run media, compared with the reflection in trade sectors that require complicated collateral administrative procedures. The analysis in the paper revealed that the frequency of the KCNA programmes broadcast concerning COVID-19 was numerically in the opposite direction to the fluctuation of the trade figures between North Korea and China during the early and mid-term of the pandemic. The results indicate the matching aims of disease control by the means of public education and border closures under the hypothesis that the shrinkage of trade volume

may have originated from stricter border closures influenced by the fear of COVID-19, in addition to the effects of long-standing economic sanctions.[4] North Korean exports in the early periods (ie, January 2020 to December 2020) were negatively correlated with the media coverage, while overall trade volume and North Korean imports showed a negative correlation with the broadcast during the early and mid-terms (ie, January 2020 to December 2021).

The difference in the proportions of North Korean exports (11.8%) and imports (88.2%) among overall trade volume (approximately $1.2 billion) during the included periods (ie, January 2020 to May 2022) may provide possible explanations for the time gap in correlations.[19] The intention of the authorities to strengthen the border closures, originated from the concern regarding COVID-19, is estimated to be first reflected in the exports that account for less proportion of the total trade volume. The North Korean imports that account for most of the trade volume are estimated to be affected in relatively long-term periods as the imports (eg, industrial and consumer goods) were directly connected to the livelihood of North Korean people due to the unbalanced industrial structure and struggling economy.[19 25] The figures of both exports and imports as shown in online supplemental figure 2 may provide insights into monthly trends, aside from the significance of correlation.

The unanimous direction of the figures found in the early and mid-term of the pandemic may also substantiate the utility of media analysis to grasp the situation while providing hints to the over-riding concern on disease control. Significant correlations shown in the preliminary analysis provide further possibility of KCNA programmes to be used as meaningful indicators in North Korean studies, while the methodology also demonstrates its strength that the data needed for quantitative analysis of public media can be promptly acquired compared with the figures released from the governmental offices.

However, the correlation between the trade figures and media coverage disappeared with inclusion of recent figures (ie, January 2020 to May 2022). The gradual resumption of trade between the adjacent countries, except for the last month with the official acknowledgement of COVID-19, is estimated to be influenced by viability issues from the economic crisis induced by long-standing border closures and sanctions; the immediate question of life or death appears to have overwhelmed concerns on the virus in recent days. Analysing the emerging disjunction between two sections: (1) educational endeavours for disease control and (2) balancing efforts between epidemiological and economic survival, may be helpful in understanding the ulterior motives of the authorities to survive under multiple threats. Trade figures fluctuated after the first acknowledgement of COVID-19 in May 2022, thus there is a demand for conduct of further studies on the association between two indicators. The consideration of additional variables including pre-existing sanctions or climate problems unfavourable to agricultural outputs in the analysis would provide further insights to understand the relationship.

The trade volume between the two adjacent countries was introduced in the study to peep through the intention and priorities of the health authorities. The index as a secondary indicator of border closures and degree of concern on COVID-19 may provide hints and implications to understand the North Korean policies, but still needs to be interpreted with caution. More evidences and variables, including the specific sectors of trade or contemporary COVID-19 statistics of adjacent countries, are required for an in-depth analysis of COVID-19 managements.

The appearance of COVID-19 variants, for instance, is suggested to have influenced the border closures between North Korea and China.[19] The number of the confirmed cases of Omicron variant in China during the included periods, or the proportion of variant among all confirmed cases, may therefore become one of the key factors to understand the direction of border closures. The data acquisition for variants in China is, however, extremely difficult as reliable information is not provided in public; only partial set of data, including the vaccination statistics or counts of confirmed cases and deaths, can be acquired from the database.[26] The health authorities of South Korea, another country adjacent to North Korea, are meanwhile regularly releasing the official figures on the COVID-19 variants, but the analysis of South Korean figures would be irrelevant in North Korean studies as their border does not ordinarily allow the exchange of human and material resources, ultimately preventing the inter-country spread of the virus.[27] Further information is needed to explain the significance of the variant, or other significant factors, on the North Korean policies and the association between the trade volume and media coverage.

Reliability of COVID-19 statistics in KCNA

The daily number of cases with fever in North Korea was reported in KCNA as a proxy of confirmed cases, although the term 'people with fever' is not equivalent to 'COVID-19 confirmed cases'.[2 5] Clinical guideline from WHO recommends the healthcare providers to collect respiratory specimens for suspect cases, but the limited capacity in North Korea to carry out the procedures in a large scale pressured the health authorities to choose the alternative.[5 28] Screening the fever cases under these limited conditions can still be one of the best options as it fulfils the primary objective from the guideline to find and isolate every suspect COVID-19 case to stop transmission.

Despite the utility in establishing general disease control policies, the application of the proxy and simplification of diagnosing procedures may inevitably lead to statistical and clinical errors owing to shortage of detailed information. Asymptomatic patients with COVID-19 are completely disregarded from the statistics, while the populations suffering from fever due to other infection sources are not provided with proper management. The deaths

of COVID-19-infected people, especially the elderly with underlying disease, can meanwhile be included in the death toll irrelevant to COVID-19 mistakenly or intentionally. The misclassification of the deaths of patients with underlying disease might cause underestimation of the COVID-19-related mortality in the elderly while relatively overestimating the mortality in child population; children under 10 years old were reported to account for 16% of the COVID-19-related deaths in North Korea (interim figures in May 2022).[2] The number and demographics related to COVID-19 cases are therefore debatable; more detailed information needs to be unveiled.

The absence of new confirmed cases in North Korea after the 'declaration of victory against COVID-19' is also questionable; it is rather reasonable to expect sporadic outbreak in a small scale. KCNA as state-run news agency might be using the modified statistics for political purposes, while local healthcare workers and patients with COVID-19 may both conceal the cases to evade the responsibility and penalty. The authorities are currently reported to be encouraging their people to voluntarily participate in preventive healthcare services under the concern of possible COVID-19 resurgence.[29] Further studies on the broadcast direction whether to acknowledge new COVID-19 cases are needed during the possible resurgence periods.

Limitations and implications

The analyses included in the paper are based on the list of the broadcast programmes obtained from the database, however, the actual programme broadcast in KCNA differed intermittently on a small scale from the established television schedules (eg, omitting prearranged programme, rescheduling the broadcast timetable). Monitoring thousands of hours by limited number of researchers in order to confirm the differences in entire 24 448 programmes broadcast from January 2020 to May 2022, including those not related to COVID-19, was physically impossible. It is therefore possible that the frequency of subgroups of each programme classified and reported in the study may show unavoidable differences from the actual programme broadcast, however, the degree of discrepancy was not significant to damage the entire results and influence the trend of the programmes.

The design and data access of the study were conducted from April to June 2022, therefore, data from June to August 2022, the period after the sharp increase in cases of COVID-19 in May to the asserted end of the crisis in August, were not included. Extra analysis of the broadcast programmes allocated to COVID-19-related issues will be required in further studies.

However, findings from the study provide meaningful insight into how the public media was used by North Korean authorities to educate their people in the situation of the COVID-19 pandemic. To the best of our knowledge, it is the first paper to provide a quantitative analysis of the long-term media programmes in order to understand clinical guidelines for COVID-19 in North Korea. Instructions for patients with COVID-19 and their symptoms were elaborated, while the trends of programmes on COVID-19 were also illustrated. A peculiar feature of North Korea is that the intentions of the authorities are fully, rapidly reflected in the public media, emphasises the importance of the study in evaluation of healthcare policies.

The results of the study provide clues that can be used for indirect interpretation of the currently damaged healthcare system and widespread drug abuse behaviours in North Korea, consequently underscoring the necessity of proper monitoring of medication distribution and patient education. The preliminary comparison of the media coverage and trade area helped highlight the priorities and aims of the authorities; the over-riding concern on disease control was observed in the early and mid-term of the pandemic, while the viability issues were estimated to have recently influenced the direction of policies. More evidences are still needed to conduct an in-depth analysis; essential factors such as economic sanctions need to be considered for a detailed approach.

CONCLUSION

North Korean authorities used public media to educate their people on clinical guidelines for COVID-19 during the pandemic era. The detailed instructions provided by the television programmes offered clues to understand the current status of the healthcare system in North Korea. Conduct of additional analyses with recent data might lead to disclosure of further implications regarding the COVID-19 policy in North Korea.

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