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The Evolving Policy Debate on Border Closure in Korea

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Objectives: In this paper, we aimed to investigate the evolving debate over border closure in Korea during the coronavirus disease 2019 (COVID-19) pandemic, to address the main themes associated with border closure, and to discuss the factors that need to be considered when making such decisions.

Methods: We collated and reviewed previously conducted review studies on border closures during infectious disease outbreaks to derive relevant themes and factors.

Results: According to our systematic review on border closures and travel restrictions, the effects of such containment efforts are limited. We suggest considering the following factors when determining whether to impose border closure measures: (1) disease characteristics, (2) timeliness of implementation, (3) transmission delay and the basic reproduction number, (4) globalization and pandemics, and (5) social and economic costs.

Conclusions: Our assessment indicates that the effects of border closures are at best temporary and limited. Alternative measures must be contemplated and implemented to suppress the spread of COVID-19 in particular and infectious diseases more broadly.

Key words: COVID-19 pandemic, Infectious diseases, Control measure, Policy, Border closure

INTRODUCTION

The outbreak of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-COV-2), began in Wuhan, Hubei Province, China in December 2019. Since then, COVID-19 has spread throughout China and to 200 other countries and territories. As of September 16, 2020, according to COVID-19 situation dashboard of World Health Organization (WHO), more than 30 027 287 cases have been reported worldwide. There have been 944 701 associated deaths worldwide, and 367 deaths have been reported in Korea.

In the early phase of an epidemic, the top priority is to contain the outbreak within the source country. Public health measures, also called non-pharmaceutical interventions (NPIs), such as entry screening and quarantine, are immediately implemented to reduce the possibility of infected cases being exported from the area of origin. Once the COVID-19 outbreak in Wuhan was reported, many countries immediately enforced travel-related restrictions, such as border closures, entry or exit bans, visa restrictions, and flight suspensions [1]. On February 4, 2020, Korea banned the entry of foreigners who had been in Hubei Province within the previous 14 days and started entry screening of travelers from other areas of China [2].

The mild border control measures implemented by the Korean government generated a variety of responses. A series of

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statements published by the Korean Medical Association (KMA) demanded border closure for arrivals from all areas of China (Supplemental Material 1). By contrast, public health experts issued a cautionary statement about border closure (joint statement by the Korean Society for Preventive Medicine and the Korean Society of Epidemiology Emergency Committee on the Coronavirus Disease 2019 [COVID-19]), which stated that "restricting the entry of foreigners to Korea needs to be approached carefully and should consider reciprocal agreements between countries…" [3]. The debate over border closure continued in Korea as COVID-19 became a pandemic, given the continuing arrival of cases from many countries other than China. In this paper, we conducted a review of previous systematic reviews to identify the factors that need to be considered when making decisions about border closure measures.

METHODS

The databases (PubMed, Embase, Cochrane Library) were searched until February 2020. Our detailed literature search methods are described in the Supplementary Material 1.

Ethics Statement

This study did not use any human participants; thus, ethical approval was not required.

RESULTS

The key question is whether border closures can effectively suppress an epidemic. Those in favor of travel restrictions emphasize containment at the source. However, existing systematic reviews of travel restrictions and border closures (Table 1) [4-7] suggest that the effects of such containment efforts are limited. In the following sections, we address several themes associated with border closure, including some issues specific to the Korean context.

Transmissibility of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)

The specific characteristics of a disease are important [8]. If a disease progresses rapidly, with high infectivity and a short incubation period, border closure would be ineffective. For example, Ebola has low transmissibility, making border closure a good option, while COVID-19 has higher transmissibility, and transmission by asymptomatic cases has been reported [8,9]. By the time an epidemic is discovered, some cases will have already crossed the border. Prohibition of entry from specific areas can be easily evaded by passing through a third country, unless the full travel history of all entrants for the past several weeks is known, or all entries are blocked. Asymptomatic cases and even some symptomatic cases from non-banned areas

Table 1. Summary of systematic reviews on travel restrictions against pandemic respiratory virus infections

Title and citation	Findings
Non-pharmaceutical measures for pandemic influenza in non-healthcare settings- international travel-related measures (Ryu et al., 2020) [4]	Fifteen studies were included; some stated that travel restrictions could delay local and international spread; One study reported that small Pacific islands prevented pandemic influenza through complete border closure in 1918-19; However, the overall evidence suggests that the effectiveness of international travel-related NPIs for controlling pandemic influenza was limited at, so its implementation needs careful consideration
An integrated review of the limited evidence on international travel bans as an emerging infectious disease disaster control measure (Errett et al., 2020) [5]	The authors reviewed travel restrictions implemented during the spread of four emerging infectious diseases: SARS, MERS, EVD, and ZVD; They found limited evidence for the effectiveness of travel restrictions; any such effectiveness was only short-term
Non-pharmaceutical public health measures for mitigating the risk and impact of epidemic and pandemic influenza (WHO, 2019) [6]	Eleven studies of travel restrictions during influenza pandemics in the community setting were analyzed; One study estimated that a 99% restriction of travel between Hong Kong and mainland China delayed the SARS epidemic peak by about 2 weeks; Restricting other modes of transportation, such as land and sea, would have had less impact (2-3 d) on the epidemic peak; Another study reported that the epidemic peak delay (1-3 wk) depended on the transmission rate (1.4, 1.7, or 2.0) and level of restriction (90% or 99%); One global-scale study stated that travel restrictions could delay global spread by 5-133 days The WHO report noted that most studies were simulation studies or natural experiments, and that larger trials have never been evaluated; Overall, travel restrictions or border closure may slow the spread of disease, but evidence of the effectiveness of travel restrictions is very low quality and thus highly unreliable
Effectiveness of travel restrictions in the rapid containment of human influenza: a systematic review (Mateus et al., 2014) [7]	Studies of the effectiveness of international travel restrictions indicated that specific measures may be more beneficial, such as reducing flight connections rather than widespread restrictions, to import fewer infected travelers; Assessment of the risk of bias indicated a low to moderate risk of bias; In particular, the scarcity of sea and land travel data may lead to overestimation of the impact of air travel bans

NPIs, non-pharmaceutical interventions; SARS, severe acute respiratory syndrome; MERS, Middle East respiratory syndrome; EVD, Ebola virus disease; ZVD, Zika virus disease; WHO, World Health Organization.

may not be suspected, leading to a higher risk of importation of infected cases.

Time of Implementation

Experts suggest that border closure before the importation of infected cases is difficult to accomplish in practice [5,7,10]. The first report of pneumonia-like cases was released by Chinese authorities on December 31, 2019. However, a prior study reported that the first patient developed symptoms on December 1, 2019 [11]. This month-long gap rendered border closure ineffective. The WHO did not institute any border closures or travel restrictions on the basis of those initial reports [10]. Many early patients in Korea were Korean nationals who had visited China, and it was impractical to prevent them from returning home (Supplemental Material 2).

Transmission Delay and the Basic Reproduction Number (R_0)

The shape of an epidemic curve is strongly determined by the basic reproduction number (R_0), which is the expected number of infections from a single infected case. This number is a function of the contact rate among susceptible people, which depends on social, environmental, and geographic factors [12]. Society comprises a dense network within and across borders. Closing the border only creates a boundary in a large network, without changing R_0. While border closure may achieve some delay in the epidemic peak, it will not fully suppress an epidemic [6]. Effective suppression requires reducing the contact rate throughout the network via social distancing. With sufficient social distancing, if the number of imported cases is still so large as to exceed the health system capacity, border closure may become a more valid policy option.

Globalization and Pandemics

Globalization drives national economies and societies, which are increasingly influenced by factors outside their borders. It also has become a dominant force in reshaping public health at both national and international levels. Gro Harlem Brundtland, the former Director General of the WHO, said, "In an independent world, bacteria and viruses travel almost as fast as e-mail and finance flows" [13]. Vulnerability to pandemics is fully embedded within the global socioeconomic structure, so that the economic impact of longstanding border closures may be unacceptable.

Social and Economic Costs

In addition to the direct costs of medical care and control measures, past outbreaks have caused severe widespread societal disruptions and significant economic losses. In 2019, Korea was the fourth-largest trade partner of China [14]. The strong economic and trade ties with China arising through globalization and regional economic integration have increased the trade volume enormously. International travel has become an economic way of life for many Koreans. A cost–benefit analysis of an island nation implementing border closure showed that, after calculating all possible costs associated with healthcare, valuation of life, and tourism, border closure was not cost-effective [15]. The authors concluded that it is practically impossible to implement border closure in a timely manner, such that it is highly likely to fail to serve its purpose, even with a well-organized government.

The Supplemental Material 2 shows the nationality/acquisition source of the first 30 confirmed patients in Korea by date of confirmation, before the start of an explosive wave of cases tied to the Shincheonji Church of Jesus. Border closure involved denying entry to people who were not Korean citizens. However, most of the patients were Korean citizens who had been to China or had been in contact with a patient with COVID-19. It should be noted that 3 patients had already entered Korea before the KMA first called for border closure on January 26, 2020.

Further Considerations

Responses to infectious disease outbreaks have always been deeply intertwined with ethics, politics, and economic interests. In some cases, implementation of NPIs, such as border closures, might be pursued for social and political purposes that go beyond public health evidence. Worsnop [16] stated that in some countries, political incentives to impose border closures outweigh governments' commitment to international cooperation. In other cases, the geopolitical interests of countries serve as a strong force driving decision-making. Ultimately, governments are likely to make decisions that increase public confidence in them.

Concerns may arise if there is an unequal distribution of risks arising from an epidemic. Relatively small businesses, including local healthcare facilities, may lack the reserve capacity to adapt to the shock, which will affect their perception of the benefits and costs of an intervention. This may represent the main reason for the persistent calls for border closure by the KMA.

Opinion polls show that the public tends to overestimate the effectiveness of border closures and other NPIs [17]. Border closures may relieve uncertainty and anxiety for a while, but the public will ultimately have to bear the burden of the ineffective outcomes of these measures. Communication among scientists, political leaders, and the public regarding risk and the effectiveness of such NPIs is crucial in a pandemic setting.

DISCUSSION

Border closures have long been a major topic of debate regarding epidemic response policies. Our assessment indicates that the effects of border closure are at best temporary and limited. Some new modeling studies published during the COVID-19 pandemic have suggested the effectiveness of border closures. However, these results also show that the main effect of border closure is to delay the initial spread and that border closure must be combined with other NPIs [18,19]. Gaining additional time to prepare may be important in some contexts, so the benefits and social costs of these measures need to be further investigated, especially through additional research on responses to the COVID-19 pandemic. In particular, alternative approaches need to be evaluated, such as mandatory testing and post-entry quarantine orders for travelers. We focused on existing systematic reviews, so the recent studies on COVID-19 did not meet the inclusion criteria. This limitation should be addressed and examined in future research.

The WHO and other health authorities have provided specific guidelines on travel-related actions and have consistently stated that imposing border closures would have far more negative than positive consequences [10,20]. However, their guidelines rely on compliance by member states. We expect that countries would be inclined to take similar measures in response to future pandemics, especially when no pharmaceutical interventions are available in the early stage. Global governance and collaboration are fundamental to mitigation and control, the recovery from the current pandemic, and the prevention of future pandemics.

SUPPLEMENTAL MATERIALS

Supplemental materials are available at https://doi.org/10.3961/jpmph.20.213.

CONFLICT OF INTEREST

The authors have no conflicts of interest associated with the material presented in this paper.

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AUTHOR CONTRIBUTIONS

Conceptualization: SJK, JM, HN. Data curation: HK. Formal analysis: JM, HK. Funding acquisition: SIC. Methodology: JM, HN. Project administration: SJK. Visualization: HK. Writing – original draft: SJK, JM, HN. Writing – review & editing: SIC, HK, ST, SJK.

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