American Journal of Internal Medicine
2021; 9(3): 114-120
http://www.sciencepublishinggroup.com/j/ajim
doi: 10.11648/j.ajim.20210903.12
ISSN: 2330-4316 (Print); ISSN: 2330-4324 (Online)

New Waves of COVID-19 in Thailand, Cambodia and Myanmar

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To cite this article:

Attapon Cheepsattayakorn, Ruangrong Cheepsattayakorn, Porntep Siriwanarangsun. New Waves of COVID-19 in Thailand, Cambodia and Myanmar. *American Journal of Internal Medicine.* Vol. 9, No. 3, 2021, pp. 114-120. doi: 10.11648/j.ajim.20210903.12

Received: January 15, 2021; **Accepted**: April 26, 2021; **Published**: May 8, 2021

Abstract: The UK COVID-19-variant-B.1.1.7 was identified in individuals from China and India who entered Cambodia in February 2021 and the first case of Cambodia was reported on February 15, 2021. Since February 2021, the UK COVID-19-variant-B.1.1.7 had spread throughout Cambodia, particularly in Phnom Penh. The objectives of this study are to identify the causes of a spike in COVID-19 cases, track of COVID-19 surges, preparing for a spike or new wave or third wave of COVID-19, how herd immunity to COVID-19 work in the communities, SARS-CoV-2 (COVID-19) variants, and control measures in Thailand and related countries. A comprehensive search was carried out in mainstream bibliographic databases or Medical Subject Headings, including Scien Direct, PubMed, Scopus, and ISI Web of Science. The search was applied to the articles that were published between 2019 and early April 2021. With strict literature search and screening processes, it yielded 29 articles from 340 articles of initial literature database. On April 5, 2021, there was an increase of 250 SARS-CoV-2 (COVID-19)-infected cases related to nightlife establishments in Bangkok, contributing to shutting of the entertainment venues in 3 districts of the capital for at least 2 weeks. A private hospital in Bangkok conducted the drive-through COVID-19-infection screening since April 1, 2021 and revealed that approximately 9% of those tested were infected. The most of the infected individuals those tested at this private hospital had visited the same entertainment venues as the above group. Nightlife venues give noise level that people have to stand close to each other and shout to be heard. Additionally, revelers tend to move from one party to another, potentially spreading the SARS-CoV-2 (COVID-19). Thailand might have been carried into the country from Cambodia, either by migrant workers or Thais crossing the border. When a locally-manufactured AstraZeneca vaccine becomes available, Thailand plans to begin its mass immunization campaign in June 2021. The Thai army was setting up field hospitals with approximately, 3,000 beds in 10 army bases, braced for a possible surge in new COVID-19 patient. In conclusion, due to weak health systems in Cambodia, Myanmar, Indonesia, Laos, the Philippines, and Timor Leste, listed as vulnerable by the United Nations (UN), the COVID-19-variant new outbreak in Cambodia and Myanmar can easily spread this contagiously infectious disease to the ASEAN countries. Calls to form an ASEAN Center for Disease Prevention and Control are urgently needed.

Keywords: COVID-19, SARS-CoV-2, Third Wave, New Wave, Thailand

1. Introduction

SARS-CoV-2 (COVID-19) is classified as a β-CoV of group 2B [1]. The first notification of human COVID-19 occurred in Wuhan city, China and was reported by the World Health Organization (WHO) on December 31, 2019 [1], whereas some experts hypothesized that the earliest case was detected on November 17, 2019 [2]. COVID-19 subsequently has rapidly spread through all continents and has reach the pandemic proportions contributing to declaration the Public Health Emergency of International Concern and global

pandemic on January 30, 2020 and March 11, 2020, respectively [3]. At the whole genome level, genetic analysis of SARS-CoV-2 demonstrated 92% similarity to a bat coronavirus, BatCoV RaTG13 [4]. A previous study at whole genome level revealed that pangolin-CoV was identified to be 91.02% similarity to SARS-CoV-2 (COVID-19) [5]. Pangolin and bat could be natural and intermediate hosts, respectively [4, 5]. Chronic respiratory diseases, hepatic diseases, cardiovascular diseases, malignancy, obesity, hypertension, septic shock, and diabetes are the risk of severe and critical COVID-19, particularly in the elderly [6] that can contribute to acute respiratory distress syndrome (ARDS) requiring mechanical ventilation, renal injury, hepatic dysfunction, and multi-organ dysfunction or failure requiring intensive care support [7]. A previous study demonstrated that infants can have a 7-10% incidence of severe and critical COVID-19 [8].

Characteristically, after infection, antibodies are detected in the blood of individuals, particularly individuals with few or mild symptoms. In patients with varying symptoms of COVID-19 and negative results of reverse-transcriptase-polymerase-chain reaction (RT-PCR) tests, the testing has a significantly clinical role when nasopharyngeal swabs are taken more than 5 days after symptom onset [9, 10]. The rate of RT-PCR detection of SARS-CoV-2 (COVID-19) in COVID-19 patients is 93% in bronchoalveolar lavage fluid, 72% in sputum, 63% in nasopharyngeal swabs, 32% in pharyngeal swabs, and 29% in feces [11], whereas a previous small hospital cohort study demonstrated 15-30% in blood and 14-38% in rectal swabs [12]. A recent meta-analysis of the sensitivity of the COVID-19 (SARS-CoV-2 viral RNA) diagnostic testing in saliva specimens in comparison to the sensitivity of the nasopharyngeal swab (NPS) tests demonstrated that the sensitivity for saliva tests was 91% (CI=80-99%), whereas the sensitivity of the NPS tests was 98% (CI=89-100%) [13]. Saliva could be an alternative valid strategy to serum for detecting antibodies against SARS-CoV-2 (COVID-19).

This study was systematic review and meta-analysis that was aimed to identify the effective methods to rapidly control and prevent the rapid emergence of several new waves of COVID-19, including the primary source of spreading of new waves in the situations of immediately inadequate or unavailable COVID-19 vaccine supply. The significant problems of these issues were that the emerging new waves of COVID-19 pandemic are not effectively and immediately recognized and controlled.

2. Methods of the Study (Search Strategies and Inclusion Criteria)

A comprehensive search was carried out in mainstream bibliographic databases or Medical Subject Headings, including ScienDirect, PubMed, Scopus, and ISI Web of Science. The search was applied to the articles that were published between 2019 and early April 2021. Our first involved performing searches of article abstract/keywords/title using strings of [("COVID-19" or "SARS-CoV-2 ", "COVID-19 Variants" or "SARS-CoV-2 Variants", "New Wave", "Spike", "Third Wave", "Thailand", "Cambodia", "Myanmar", "European Countries"]. After a first approach of search, published articles focusing on human COVID-19 were retained and the information on new wave of COVID-19, COVID-19 variants, COVID-19 spike was extracted for having a crude knowledge involving their themes. Another round of publication search was conducted for adding the missing published articles that were not identified by the first round.

All keywords combinations from one disease type and climatic variable to bind the population of cases under consideration. Search string for disease groups include ["SARS-CoV-2" or "COVID-19" or "Spike" or "New Wave" or "Third Wave" or "Variants" or "Thailand", "Cambodia" or "Myanmar" or "European Countries"]. The initial literature databases were further manually screened with the following rules: 1) non-human COVID-19-related articles were excluded; 2) articles that did not report screening or diagnostic methods related to SARS-CoV-2 or COVID-19 were not considered, such as commentary articles, or editorial; 3) non-peer reviewed articles were not considered to be of a scholarly trustworthy validity; and 4) duplicated and non-English articles were removed. The articles were carefully selected to guarantee the literature quality, which is a trade-off for quantity.

3. Results

With strict literature search and screening processes, it yielded 29 articles from 340 articles of initial literature database. Needed article information was extracted from each article by: 1) direct information including journal, title, authors, abstract, full text documents of candidate studies, publishing year; 2) place name of the study area; 3) study period; 4) research method used; 5) SARS-CoV-2 (COVID-19) variants, and 6) the conclusions made about on SARS-CoV-2 (COVID-19) third wave. From the 29 resulted articles, the primary sources of outbreaks of new waves of COVID-19 in Thailand, Cambodia, and Myanmar could be hypothetically identified and the immediately proper responses were performed.

4. From First Wave To New Second Wave of COVID-19 in Thailand

Thailand had largely controlled the five main clusters (L, S, G, V, and O types) [14] of COVID-19 by mid-2020 [15] with a successful story. A new wave of COVID-19 outbreak was identified in Samut Sakhon, a province at the south of Bangkok, Thailand in December 2020 [15]. Thailand confirmed 315 new COVID-19 cases, the majority of which were local transmission, contributing its total cases to 7,694 cases and 64 deaths since its first reported case last January

2020 [15]. Samut Sakhon reported 541 additional cases of COVID-19 on January 4, 2021 [15]. The new domestic COVID-19 outbreak was hypothetically associated with illegal border migration from neighbouring Myanmar [15]. As of January 4, 2021, the government of Thailand had designed 28 provinces, including Bangkok, as COVID-19 high-risk (red) zones and recommended suspension of some businesses and crowded activities, whereas some ministries and agencies had already issued several new restrictions [15, 16]. Several field or mobile hospitals for admission of the high-risk COVID-19 exposed individuals for quarantine, laboratory testing, and clinical symptom observation had been established in these 28 provinces. The Education Ministry of Thailand had ordered all governmental and private schools and vocational training centers to close down from January 4, 2021 until the end of January 2021 [15]. The Thai Retailers Association had also announced that all shopping malls throughout the country should close at 9 pm. daily, an hour earlier than the usual closing time, whereas the authorities in Bangkok, Thailand had earlier closed entertainment venues, gyms, massage parlours, and nurseries, but keeping open shopping malls, restaurants, and public parks [15].

5. Color-Coded Risk-Classification System

The color-coded risk-classification system that categorized by the government of Thailand (The Center for COVID-19 Situation Administration) consists of four tiers based on local disease activity, ranging from " green " to " red " in order of increasing risk of infection, with high-risk zones being subject to the strictest restrictions (Figure 1). As of January 4, 2021, the localities categorized as " red-zones " included Bangkok, Ang Thong, Chanthaburi, Chachoengsao, Chonburi, Chumphon, Kanchanaburi, Lopburi, Nakhon Nayok, Nakhon Pathom, Nonthaburi, Pathum Thani, Phetchaburi, Phra Nakhon Si Ayutthaya, Prachinburi, Prachuap Khiri Khan, Ranong, Ratchaburi, Rayong, Sa Kaeo, Samut Prakan, Samut Songkhram, Saraburi, Sing Buri, Suphan Buri, Tak, and Trat provinces [16]. The color-coded risk-classification system, zones, and the respective restrictions are as the following [16, 17].

Red: Educational institutions and entertainment venues, pubs, karaoke outlets, and bars are suspended. Crowded activities, such as meetings and seminars can take place only if the organizers have obtained approval from authorities. Convenience centers, supermarkets, exhibition halls, shopping malls, workers' dormitories, and industrial areas may open as long as they adhere to health protocol. Authorities prohibit migrant workers from leaving the areas and have set up checkpoints at entry and exit points.

Orange: Public activities are prohibited. Authorities are allowing small-scale private activities, including those among friends, family, and acquaintances. Officials are limiting operating hours for commercial and industrial facilities. Transporting migrant workers out of the state is banned. Large celebrations are banned, and attendance at parties is limited.

Yellow; Authorities are enacting enhanced surveillance measures. Scaled-down activities are allowed and officials are imposing rules to decrease crowding.

Green: Authorities are permitting small-scale activities and are implementing protocols to decrease crowding.

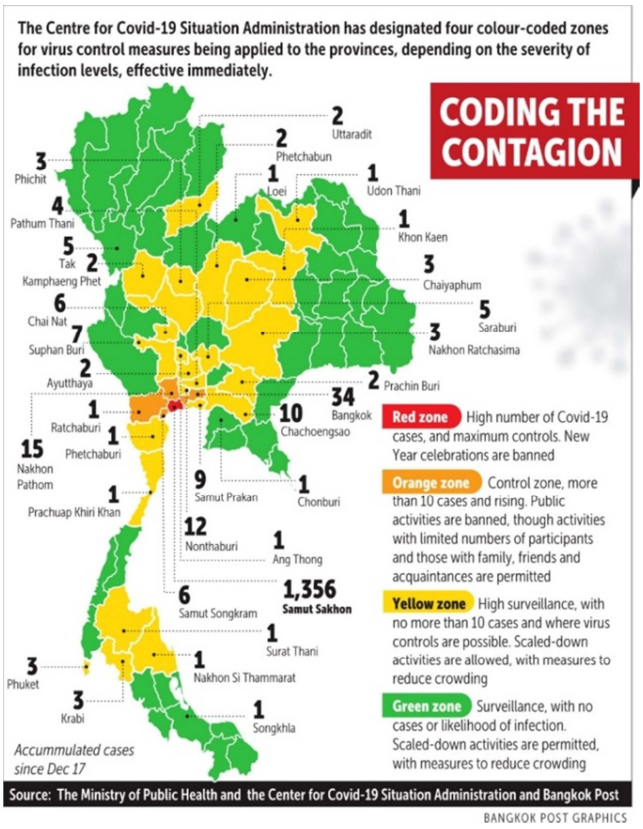

Figure 1. *Demonstrating four tiers based on local disease activity, ranging from "green" to "red" in order of increasing risk of infection, with high-risk zones being subject to the strictest restrictions, as of December 31, 2020.*

During the new second wave of COVID-19, a nationwide state of emergency remains in place through January 15, 2021 to facilitate the implementation of COVID-19 control measures [16]. The authorities in several locations enforced commercial controls on top of the central government-mandated measures. Officials in Bangkok allowed food establishments to serve dine-in-customers only 06.00-19.00 daily, though they could still cater to take-away orders during the other hours. Buriram required arrivals from Bangkok and other high-risk areas to isolate at their residence or a designated facility for 14 days [16]. Additional localities may implement stricter control measures in the coming weeks if local COVID-19 activity increases [16]. Travel-Restrictions-Limited-inbound-tourist-flights are operating. Cargo, emergency, and repatriation flights and government aircraft can continue operating. Thai authorities are allowing travelers from 56 locations to enter the country without visas. Passengers must still test negative for COVID-19 within 72 hours before the trips, provide evidence of a quarantine

facility booking, and isolate for two weeks at the designated facilities upon arrival. Officials have increased the length of visas from 30 to 45 days [16]. The 56 locations are Andorra, Australia, Austria, Belgium, Bahrain, Brazil, Brunei Darussalam, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Indonesia, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Liechtenstein, Lithuania, Luxembourg, Malaysia, Maldives, Mauritius, Monaco, Netherlands, New Zealand, Norway, Oman, Peru, Philippines, Poland, Portugal, Qatar, San Marino, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, Ukraine, UAE, the UK, the USA, and Vietnam [16]. People from al other locations must still obtain a special tourist visa to enter Thailand; these travelers must also quarantine at designated facilities for two weeks upon arrival [16].

6. From Second Wave To New Third Wave of COVID-19 in Thailand

On April 5, 2021, there was an increase of 250 SARS-CoV-2 (COVID-19)-infected cases related to nightlife establishments in Bangkok, contributing to shutting of the entertainment venues in 3 districts of the capital for at least 2 weeks [18]. A private hospital in Bangkok conducted the drive-through COVID-19-infection screening since April 1, 2021 and revealed that approximately 9% of those tested were infected [19]. The most of the infected individuals those tested at this private hospital had visited the same entertainment venues as the above group [19]. This year (2021), Thailand is likely to confront a steep increase in numbers of COVID-19 cases because people are becoming complacent about the risk of COVID-19 infection and letting their guard down. Nightlife venues give noise level that people have to stand close to each other and shout to be heard. Additionally, revelers tend to move from one party to another, potentially spreading the SARS-CoV-2 (COVID-19) [18]. During the forthcoming 2021 Songkran holidays, a lot of effort, money, and time will go into curtailing the spread of COVID-19 infection, when millions of people will travel across the country to visit their home provinces. There will be no ban on people travelling to visit their elderly relatives, except travelling to party [18]. The third and fourth waves of COVID-19 may occur, whereas it could take the country at least 2 years to achieve herd immunity [18].

7. From First wave To New Second Wave of COVID-19 in Myanmar

Myanmar dramatically demonstrated an increase in the number of COVID-19 cases in the second wave on August 16, 2020 in Rakhine State, compared to the first wave of COVID-19 that reported its first case on March 23, 2020, whereas Yangon has become a major epicenter in the COVID-19 second wave [20]. Interestingly, a more infectious strain with G614 mutation of SARS-CoV-2 (COVID-19) has been identified in Myanmar [20]. ASEAN (Association of Southeast Asian Nations: South-East Asia Region and Western Pacific Region) countries, including Thailand are highly interconnected to each other and the rest of the world via trade and migration [20]. Due to weak health systems in Myanmar, Cambodia, Indonesia, Laos, the Philippines, and Timor Leste, listed as vulnerable by the United Nations (UN) [20], the COVID-19 new outbreak in Myanmar can easily spread this contagiously infectious disease to the ASEAN countries [20]. Calls to form an ASEAN Center for Disease Prevention and Control are urgently needed [20].

8. SARS-CoV-2 (COVID-19) Variants

Challen *et al* indicated that B.1.1.7 variant might be related to increased mortality that supplements to the central questions of the ability of an old version of the spike glycoprotein of SARS-CoV-2 (COVID-19) to produce protective antibodies against newer emerging variants [21]. The current variants of concern, lineages B.1.351, B.1.1.7, and P1 affect the function of the spike protein and other SARS-CoV-2 proteins and can alter interaction with hACE2 [22]. The first three COVID-19 vaccines with expressing spike protein and a progressing national rollout have authorization of emergency use in the United Kingdom (UK) and demonstrated protection against COVID-19 [23-25] and decreased transmission after vaccination in the preliminary report [26].

9. Discussion

On January 4, 2021, Samut Sakhon reported 541 additional cases of COVID-19 [15]. Illegal border migration from neighbouring Myanmar was hypothetically related to the new domestic COVID-19 outbreak, defined as new second wave of COVID-19 in Thailand [15]. As of January 4, 2021, the government of Thailand had designed 28 provinces, including Bangkok, as COVID-19 high-risk (red) zones and recommended suspension of some businesses and crowded activities, whereas some ministries and agencies had already issued several new restrictions [15, 16]. On April 7, 2021, Thailand confirmed the local presence of the highly transmissible SARS-CoV-2 (COVID-19) variant B.1.1.7 first identified in the United Kingdom (UK) [27, 28] that has been identified in more than 100 countries and contributes to fuel new waves of COVID-19 infections worldwide [27]. The main source of this new third wave of the COVID-19 outbreak hypothetically was in Bangkok's Thong Lor entertainment venues [28], which could take longer (one or two months) to contain, depending on the control measure implementation [27]. The currently spreading UK- COVID-19-variant-B.1.1.7 throughout Thailand might have been carried into the country from Cambodia, either by migrant workers or Thais crossing the border [28]. The UK COVID-19-variant-B.1.1.7 was identified in individuals from China and India who entered Cambodia in February 2021 and the

first case of Cambodia was reported on February 15, 2021 [28]. Since February 2021, the UK COVID-19-variant-B.1.1.7 had spread throughout Cambodia, particularly in Phnom Penh [28]. As of April 8, 2021, Cambodia has reported 2,915 confirmed-COVID-19 cases and 22 COVID-19-related deaths according to the worldometer website [28]. On April 8, 2021, Thailand reported 405 new COVID-19-infected cases, in an outbreak that has reached 20 provinces [27]. Due to rapid spread of the latest outbreak (new third wave) to provinces far from Bangkok has contributed to the COVID-19-taskforce authorities announcing that they will shut down all entertainment venues in 41 provinces, including Bangkok for at least two weeks, beginning on April 9, 2021 [28]. The employers were asked to allow staff working from home and urged against non-essential travel [27]. When a locally-manufactured AstraZeneca vaccine becomes available, Thailand plans to begin its mass immunization campaign in June 2021 [27]. Approximately, 300,000 individuals will be immunized, mostly healthcare workers [27]. Some Thai COVID-19 experts are puzzled at how the UK COVID-19 variant evaded the country's strict quarantine system, which has assisted keeping overall cases to a relatively low 30,310 and 95 deaths [27]. The Thai army was setting up field hospitals with approximately, 3,000 beds in 10 army bases, braced for a possible surge in new COVID-19 patients [27].

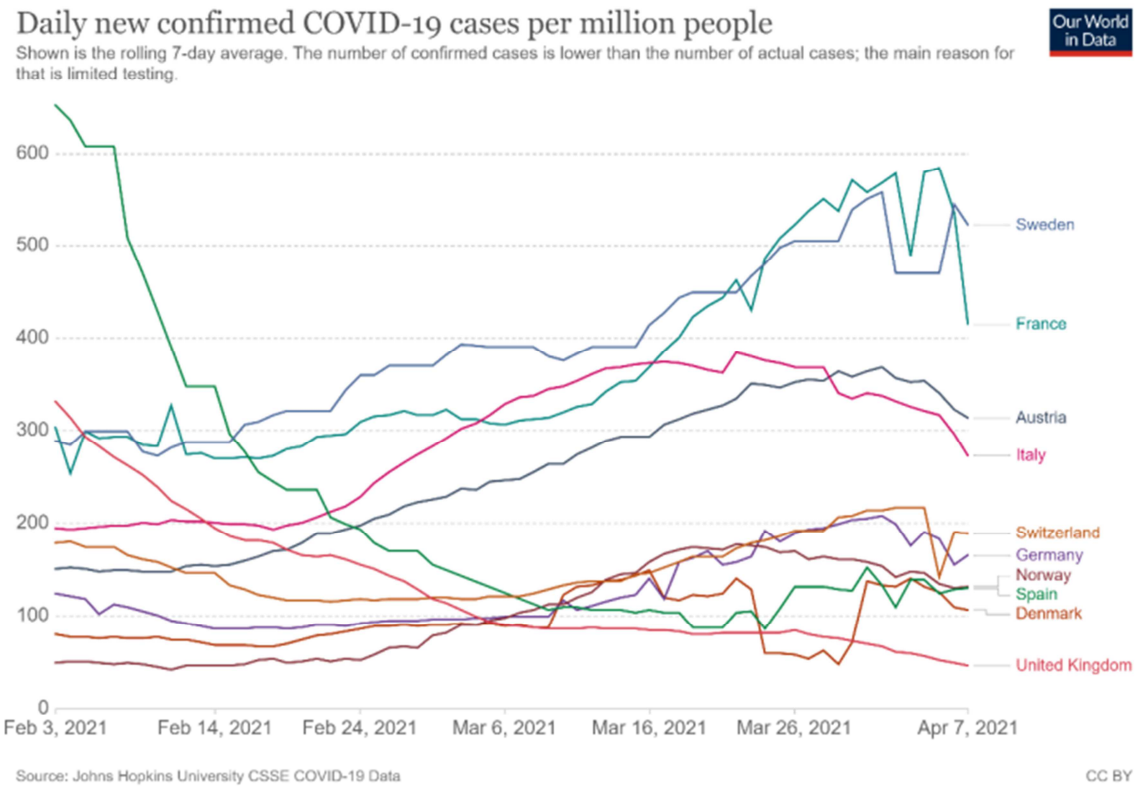

Figure 2. *Demonstrating daily new confirmed COVID-19 cases per million people in the European countries, as of April 7, 2021 [29].*

(Source: The Local. Sweden's news in English. COVID-19 third wave: which countries in Europe have the tightest restrictions? 7 pages. Available at: https://www.thelocal.se>covid-19-across-europe-have-... (accessed on April 9, 2021))

For considering the new 2021-COVID-19 pandemic in Europe (Figure 2), Germany extended existing control measures, including keeping cultural, leisure and sporting facilities shut through to April 18, 2021. During the Easter holidays between April 1, 2021 and April 5, 2021, all private gatherings were capped at two households of up to five people, plus children under 14 and supermarkets will remain closed, only opening their doors on Easter Saturday [29]. France has run a national strategy for the majority of the past year (2020), has decided to impose regional restrictions, putting 16 of the country's 96 mainland departments on what being termed "lockdown light". Other hard-hit departments will likely follow in the coming days or weeks [29]. Across the whole of France a 7 pm-6 am curfew remains in place and cafes, theatres, bars, cinemas, restaurants, and tourist sites were closed. The French government hopes that the regionalized "lockdown light" will be enough to relieve the pressure on hospitals in the worst hit areas whereas the much-maligned French vaccine belatedly gathers speed [29]. In Italy, the whole country has been tightened restrictions since April 5, 2021, with roughly half of the country a medium-risk "orange zone" and the rest a high-risk "red zone" [29]. On April 9, 2021, Switzerland decided to extend the majority of the country's lockdown measures for fighting against the "third wave" of COVID-19 [29].

Unlike a lot of other European countries, Denmark is in a phase of easing restrictions and has just announced a plan to lift several rules currently in place over the next two months [29]. In Spain, where COVID-19 restriction are mainly decided on a regional basis, there has been a general easing of the rules across the country in recent weeks as a result of decreasing COVID-19 infection rates overall [29]. Lighter measures include allowing travel between municipalities/provinces and better opening hours and capacity limits for shops, restaurants, and bars [29]. England is currently at the starting of a four-step plan to ease lockdown restrictions [29]. After a strict post-Christmas lockdown enforced to ease pressure on overrun hospitals. Schools are open and if all goes to plan, pubs will open their outdoor areas next month (May 2021) [29]. The plan could see all legal limits on social contact lifted by June 21, 2021, if strict conditions are met. Northern Ireland, Wales, and Scotland also have their own plans to ease restrictions [29].

10. Conclusion

Due to weak health systems in Myanmar, Cambodia, Indonesia, Laos, the Philippines, and Timor Leste, listed as vulnerable by the United Nations (UN), the COVID-19 new outbreak in Myanmar can easily spread this contagiously infectious disease to the ASEAN countries. Urgently, calls to form an ASEAN Center for Disease Prevention and Control are needed.

Abbreviations

COVID-19: Coronavirus Disease 2019, SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus type 2, UK: United Kingdom

Objectives of the Study

The objectives of this study are to identify the causes of a spike in COVID-19 cases, track of COVID-19 surges, preparing for a spike or new wave or third wave of COVID-19, how herd immunity to COVID-19 work in the communities, SARS-CoV-2 (COVID-19) variants, and control measures in Thailand and related countries.

Authors' Contributions

Dr. Attapon Cheepsattayakorn conducted the study framework and wrote the manuscript. Associate Professor Dr. Ruangrong Cheepsattayakorn and Professor Dr. Porntep Siriwanarangsun contributed to scientific content and assistance in manuscript writing. All authors read and approved the final version of the manuscript.

Competing Interests

The authors declare that they have no competing interests.

Funding Sources

The authors disclose no funding sources.

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