

Potential Dancer Resistance to Covid-19 Exposure (Preliminary Study in Malang Regency, East Java Province, Indonesia)

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ABSTRACT

Biomechanics studies in dance can be used as a means to control health, fitness and training. The dance is always performed in the accompaniment of music. Then the combined benefits of the elements of motion and music sound are thought to produce a strengthening effect on the dancer's physiological condition, including on the body's immune power. This study aims to examine the possibility of the dancers' community resistance to Covid-19 exposure, which is obtained from routine dancing activities. This preliminary study is a descriptive study of data on the development of Covid-19 exposure cases in several districts in the Malang Regency during April 2020. The selected area is sub-districts adjacent to the airport and toll road access. The analysis is based on the alleged correlation between dancing culture in the community and the level of case development for the potential risk of local transmission of the same virus. Results show that a temporary conclusion can be drawn that the 3 subject areas known as active areas of traditional art in the form of folk dance, show a trend towards the development of Covid-19 which is slow. This might be related to better body fitness, which is formed from traditional dance routines. However, it is still necessary to wait for the results of the mass PCR test to be carried out by the Regional Government so that the exposure status of the ODP, PDP and ODR categories can be ascertained. It also still needs to be ascertained by a history of dancing activity from patients in all of these categories to ensure testing the hypothesis of this study.

Keywords: Dance Biomechanic, Music, Physiological Benefit, Immune System, COVID 19 Resistance

1. INTRODUCTION

Dance has a complex correlation with social, cultural, economic, ideological, political, legal, security and national resilience aspects [1]. Biomechanics studies in dance can be used as a means to control health, fitness and training [2]. Dance has elements of motion and breathing exercises. This movement and exercise can increase the efficiency of the work of organs such as the heart, lungs and others so that it is beneficial for physical fitness [3]. The Baris dance movement from Bali [3, 4] and the Poco-poco dance from North Sulawesi have been adopted into a gymnastic movement [4, 5]. Poco-poco exercise can reduce body weight due to sweating, increase heart rate and triglyceride mobilization, which is indicated by increasing levels of HDL cholesterol [4]. Abroad, the adoption of dance movements is also carried out for Latin dance to become Zumba aerobics [6] and the Capoeira martial arts movement [7]. 2 weeks of Zumba exercise can increase HDL cholesterol levels [6].

Separately, the response to the sound of music depends on the type. Classical music is generally associated with human physiological and psychological conditions [8].

Classical music played on the piano was statistically proven to significantly reduce mean arterial blood pressure, heart rate and respiratory rate during ophthalmic surgery [9]. Music therapy has also been shown to have a significant positive effect on pain, physical comfort, fatigue and energy, anxiety and relaxation, period and length of treatment exposure, mood, spirituality and quality of life [10]. However, for Javanese people, the Javanese style is proven to be more effective ($p < 0.05$) in reducing pain and anxiety in mothers who are about to give birth [7]. This shows that cultural background is thought to have an influence, so that traditional music has begun to be studied as a medium of therapy [11, 12].

The coronavirus pandemic called Covid-19 has spread very rapidly since appearing in Wuhan China in the last quarter of 2019. Globally, data per April 1st, 2020, from WHO states that 203 countries have been affected with a total number of cases of 750,890, of which 36,405 have died [13]. This virus is a family of viruses that cause various types of flu, of which several other variants have also become international outbreaks. This should make this type of virus a must-watch.

It is suspected that resistance to exposure to the covid-19 virus arises from a strong immune system, which only healthy people have. The healing process also works better in people who have good immunity resistance. In general, a good immune system comes from people who regularly exercise. The dancers fall into this category

1.1. Our Contribution

The author's contribution to this study is to provide a hypothetical perspective of new studies on the physiology of dance. In this case, the activity of dancing is not just an activity carried out on the basis of a hobby for fun, or an academic study and fine arts, but also a cross-disciplinary study material that can be applied and directly beneficial to society. Although still in its infancy, this study points to the potential for substantiation of the hypothesis that dancing activity may have a direct effect on immune system resilience. In the conditions of the Covid 19 pandemic, a good immune system resilience will be able to prevent transmission of the virus or reduce the risk factor for severity when exposed.

1.2. Conceptual framework

Since the outbreak of the corona case, many research and reviews related to the problem have been carried out. Reviews of studies are mostly carried out on aspects of causes (origins), epidemiology, causes, clinical manifestations and diagnosis, preventive and control measures, and vaccines [14, 15, 16, 17, 18, 19], potential factors that affect re-epidemics. [20], therapeutic strategies [21], therapeutic neutralizing antibodies and vaccines [22, 23], treatment with traditional Chinese medicine [24], and the development of mental health services [25]. Whereas research studies have been carried out to predict the spread in China [26], the transmissibility of the virus by a mathematical model simulation [27], epidemiological and clinical characteristics [18], the incubation period of the virus [28], psychological response and its associated [29], pediatric cases. in Korea [30], clinical features of pediatric patients in Wuhan [31], effects of social support and quality of rest for medical staff caring for patients in China [32], cardiovascular implications of sufferers [19], and potential drug Lopinavir [33].

The results of reviews and research related to Covid-19 are still mostly focused on the description of the virus, symptoms, spread, patient management and treatment. Covid-19 generally affects the respiratory tract, lungs and heart. The recovery aspect of sufferers after exposure to the virus has not been studied but could be a potential study in recovery steps in the future. Treatment, clinical treatment to vaccines are starting to be studied and developed. Traditional medicine (in this case Chinese) also has the potential to be a form of patient care. Psychological aspects were also found to play a role in treatment.

The research framework for the combined signal of dance movements and musical sounds (Figure 1) with the object of study by the Banyuwangi Gandrung Dancer results in the finding that the Gandrung dance has elements of motion that meet the criteria for cardio exercise to strengthen the performance of the heart. These findings

give rise to the hypothesis that one type of dance may have specific therapeutic aspects for specific physiological systems in the human body, including the immune system. Dancers are people who regularly perform dancer activities. Thus it is suspected that dancers have developed a good physiological system as an unconscious benefit of their dancing activities.

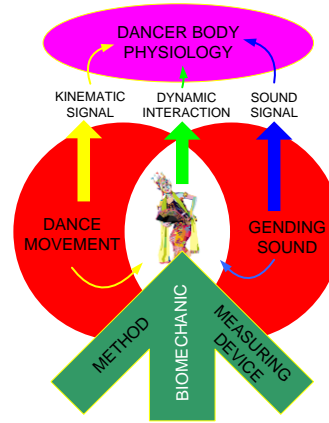


Figure 1 The physiological research framework of Gandrung dancers.

2. STUDY METHODOLOGY

2.1. Finding Data

The study data is data on the number of Covid 19 sufferers for several categories in Malang Regency. Data is taken from the official data of the Malang Regency Covid Task Force for 1 month, which is between March 29th - April 27th, 2020. The data categories are divided into 4, namely: (1) ODP (people under observation), (2) PDP (patients under care), (3) Confirm (positive patients infected with the Covid 19 virus), and (4) ODR (people at risk). Data recording was taken at the sub-district level, but not all sub-districts were used as the study object area. The selected districts are those located in the areas most at risk of transmission and which have prominent characteristics of dance activities. Data descriptions in the form of time-based graphs were used to compare the level of risk in each district and correlated with descriptions of dance activities in those districts.

2.2. Choosing The Target Area

Figure 2 is the initial data used as a research reference, based on the availability of open data. From this map, 7 districts were selected that met the criteria. The national airport is located on the border of Singosari and Pakis Districts. The provincial toll gate is located in the Lawang, Singosari and Pakis Districts. Poncokusumo, Jabung and Tumpang sub-districts are the entrances to Bromo Tourism Park, while Karangploso District is the entrance to Batu Tourism City.



Figure 2 Baseline position [34]

3. DISCUSSION

Figure 3. shows the accumulation of case developments in the Malang Regency during April 2020. ODP (People under Surveillance) category, are those who have a history of travel from the red area Covid-19 exposure, both local, national, and international. Confirms were those who tested positive were exposed to the PCR swab test. PDP (Patients in Care) are those who show symptoms of Covid-19 and do not have PCR results yet. ODP and PDP categories are required to undergo home quarantine unless emergencies arise. ODR (People at Risk) is a new category that marks those who have a history of closeness with positive patients with Covid-19, have no symptoms, and have not done a PCR test or Rapid Test.

This graph is the earliest recorded data since the emergence of the Covid 19 case in the Malang Regency. It appears that the chart line continues to climb upwards although it is not steep. Based on case references from various countries and the theory of outbreak behavior, the number of cases will continue to increase until the peak exposure is reached, then begin to decrease. The growth pattern of cases in Malang Regency has not been evaluated but it has been mentioned that they are among the top 10 cities in East Java with the most positive cases of Covid 19. Thus, it can be said that the condition of virus exposure in the Malang Regency is at the intensive level of worrying.

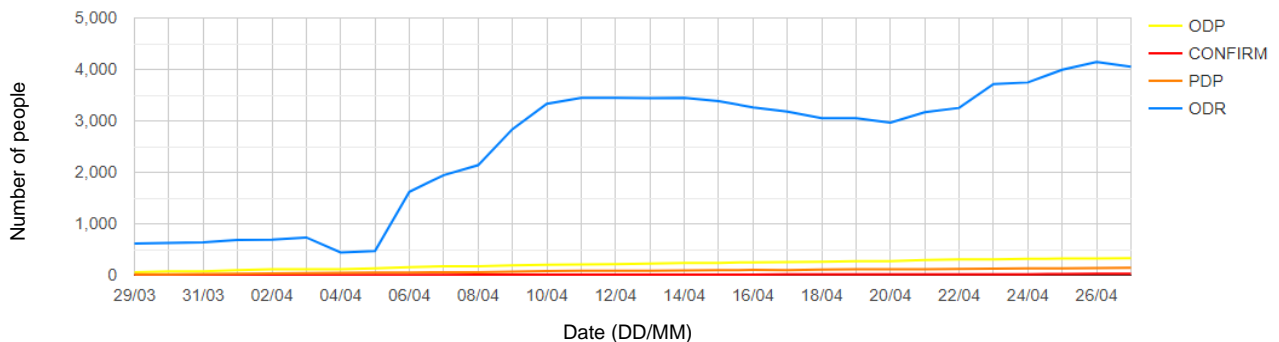


Figure 3 Case development of Covid 19 at Malang Regency. Update : April 27th, 2020 at 16:10:46 [34]

The graph in Figure 4 shows that positive cases of Covid-19 did not appear in 3 areas. Those areas are the entrance to Bromo Tourism which is an international level tourist area. These three areas are generally ranked lowest in the development of cases for all categories, even if they are referenced in 33 sub-districts throughout Malang Regency. These regions are areas that are actively holding traditional performances in the form of folk dances and traditional rituals. There is a large dance studio that is a reference for traditional Malangan art in Tumpang District. Primary and secondary schools in this area generally teach traditional dance as a compulsory extracurricular activity. Other areas do not do much of these artistic activities, except Karangploso District, which begins to hold Harvest Parties regularly in the form of festivals.

By seeing the number of ODR in the 7 districts is quite large, even Poncokusumo has the highest number among the study areas, it can be said that all of these study areas have a high potential for exposure to the virus. That the 3 sub-districts where toll gates are located have previously had positive confirmed patients is considered reasonable, as these areas are the entry points for migrants. However, the 3 entrance areas to Bromo tourism are also not quiet areas, while Karangploso is also the entrance to the tourist town of Batu, which is never empty of newcomers, especially on weekends. So the absence of positive cases for up to a month at the start of the outbreak shows the resilience of the area's community from exposure to the outbreak. If it is related to social activities, the main difference is the activity of dancing. This indicates the

potential for dancing as an activity that strengthens the resilience of the community who performs it.

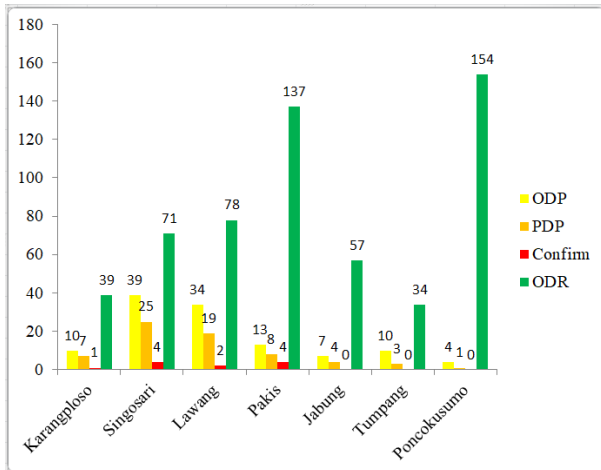


Figure 4 A month development Covid 19 case in the study area

The data dated April 27 is the latest data before the Government sends thousands of PCR Reagent packages for the Covid-19 test to all referral hospitals in East Java Province, including Malang Regency. With this test package, soon the distribution of this virus will be confirmed in the community soon. The number of actual virus exposure will increase rapidly. At the time of submission of this article, the number of virus exposure (positively confirmed) conditions in the Malang Regency is shown in Figure 5. The total case for all districts in Malang Regency is shown in Figure 6.

Figure 5 shows that virus exposure in Malang Regency is quite controlled, in the sense that the curve line can be kept sloping, which indicates that the number of cases has not increased sharply. From Figure 6 it can be seen that in 3 sub-districts, namely Singosari, Lawang and Pakis, the number of cases recorded was the highest. Once again,

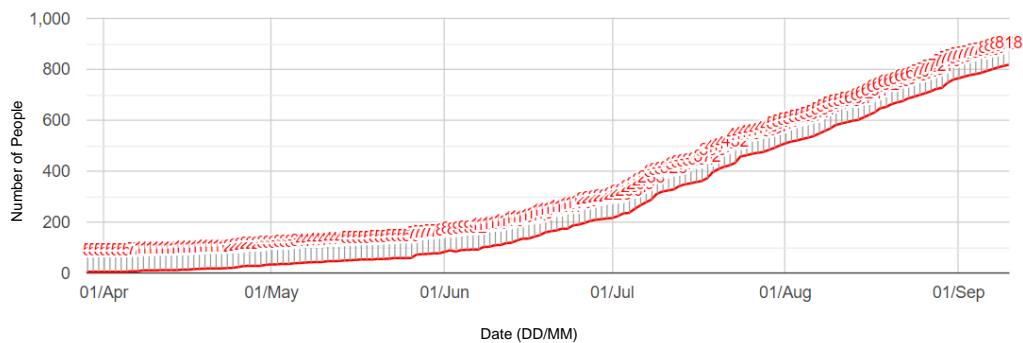


Figure 5 Case development of Covid 19 at Malang Regency. Update : September 10th, 2020 at 14:09:30 [34]

these 3 sub-districts are the locations of toll gates, the main gates to enter Malang Regency. Karangploso, Dau, Kepanjen, and Pakisaji are in the next sequence with a range of 50 cases. These four areas are the areas where government offices are located and the border with a famous tourist area. The dancer sub-districts, namely Tumpang, Poncokusumo and Jabung, had a total number of cases under 25 people. So the potential for the dancer sub-districts to be called a district that has a high resistance to exposure to the Covid 19 virus is being strengthened.

As previously mentioned, biomechanical studies state that dance is a means of controlling health, fitness and training [2]. Physical fitness can be obtained from the elements of motion and breathing exercises in dance, through increasing the efficiency of the performance of the heart and lungs [3]. Covid-19 generally affects the respiratory tract, lungs and heart. Severe damage occurs to the heart, even if the patient has previous congenital heart disease, the risk of death may occur [35]. It was reported that 5 of the first 41 patients in Wuhan had severe myocardial injuries, four of whom had to be admitted to the ICU. According to a report by the Chinese National Health Commission, some patients actually complained of heart palpitations and chest stiffness, such as those with coughs and severe flu, before being identified as Covid-19. Of the total patients who died, 11.8% were suspected of having heart damage. Referring to the results of the study of the Banyuwangi gandrung dancers which show that the gandrung dance has elements of motion that meet the criteria for cardio training to strengthen the performance of the heart and the dynamic nature of mask dances in the study area is similar to the gandrung dance, it can be assumed that the potential for resistance can come from the physiological heart. This requires more detailed verification.

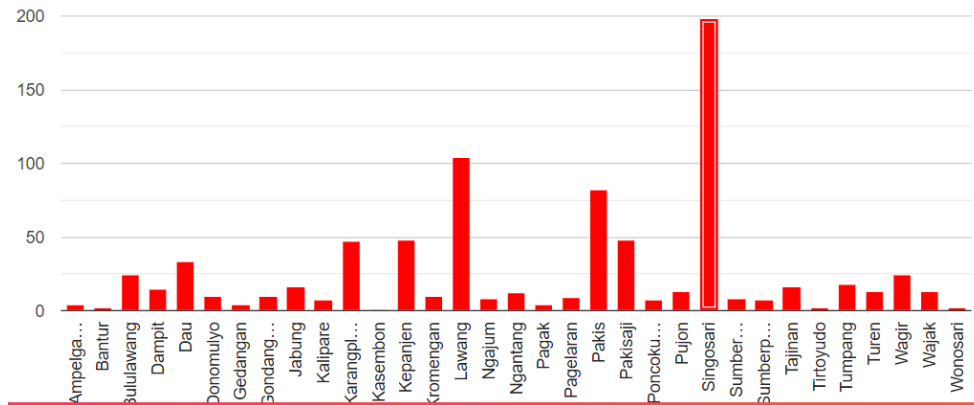


Figure 6 Total case per district of Malang Regency. Update : September 10th, 2020 at 14:09:30 [34]

4. CONCLUSION

With the closeness of the level of risk originating from the movement of human traffic related to transportation facilities and crowds (tourism), a temporary conclusion can be drawn that the 3 areas known as active areas of traditional art in the form of folk dance show a trend towards the development of Covid-19 which is slow. This might be related to better body fitness, which is formed from traditional dance routines. However, it still needs to be ascertained by a history of dancing activity from patients in all of these categories to ensure testing the hypothesis of this study.

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REFERENCES

[1] Sugiyanto, "Dimensi Kajian Ilmu Keolahragaa," *Sport Sci.*, vol. 1, no. 1, pp. 1–9, 1977, [Online]. Available: <https://eprints.uns.ac.id/1977/1/158-288-1-SM.pdf>.

[2] Y. Koutedakis, E. Owolabi, and M. Apostolos, "Dance Biomechanics A Tool for Controlling Health, Fitness, and Training," *J. Danc. Med. Sci.*, vol. 12, no. 3, pp. 83–90, 2008.

[3] K. Riyanta, F. Anggreini, M. Hindom, A. Putra, and I. Weta, "Pengaruh Latihan Tari Legong Terhadap Kebugaran Fisik Mahasiswi Semester VI dan VIII Fakultas Kedokteran Universitas Udayana," Denpasar, 2010.

[4] A. Ratu and J. Rampengan, "Perubahan Kadar Kolesi'erol High-Density Lipoprotein Setelah Senam Poco-Poco," *Bul. Penelit. Kesehat.*, vol. 32, no. 1, pp. 43–48, 2004.

[5] D. Irianto, "Evaluasi Senam Poco-Poco Sebagai Latihan Untuk Meningkatkan Kebugaran," *J. Olahraga*, vol. 10, no. April, pp. 1–14, 2004.

[6] R. Pantouw, D. Wongkar, and S. Ticoalu, "Pengaruh Latihan Zumba Terhadap Kadar Kolesterol High Density Lipoprotein Darah," *J. e-Biomedik*, vol. 2, no. 2, pp. 557–561, 2014.

[7] D. Yuniarno, "Pengembangan Senam Aerobik Bernuansa Gerakan Capoeira Pada Perkumpulan Capoeira Kabupaten Kediri," Universitas Negeri Malang, 2010.

[8] N. Anoe-grajekti, "Perempuan Seni Tradisi: Kontestasi dan Siasat Lokal," 2011.

[9] N. Finahari, G. Rubiono, and G. Soebiyakto, "Comparing the Spectral Profiles of the Javanese Gending with The Classical Music as The Therapeutical Music," *Biomed. Eng. UB*, vol. 2, no. 1, pp. 19–23, 2016.

[10] C. J. Payton and R. M. Bartlett, "Biomechanical evaluation of movement in sport and exercise: The British association of sport and exercise sciences guidelines," *Biomech. Eval. Mov. Sport Exerc. Br. Assoc. Sport Exerc. Sci. Guidel.*, pp. 1–218, 2007, doi: 10.4324/9780203935750.

[11] K. E. Volkerding and C. J. Ketcham, "Biomechanics and Proprioceptive Differences during Drop Landings between Dancers and Non-

- Dancers,” *Int. J. Exerc. Sci.*, vol. 6, no. 4, pp. 289–299, 2013.
- [12] F. H. Rauscher, G. L. Shaw, and K. N. Ky, “Listening to Mozart enhances spatial-temporal reasoning: towards a neurophysiological basis,” *Neurosci. Lett.*, vol. 185, no. 1, pp. 44–47, 1995, doi: [https://doi.org/10.1016/0304-3940\(94\)11221-4](https://doi.org/10.1016/0304-3940(94)11221-4).
- [13] G. Pemerintah RI, “Situasi Terkini Virus Corona (Covid-10),” *Gugus Tugas Percepatan Penanganan Covid-19*, 2020. <https://www.covid19.go.id/> (accessed Apr. 02, 2020).
- [14] Y. R. Guo *et al.*, “The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak - an update on the status,” *Mil. Med. Res.*, vol. 7, no. 1, p. 11, 2020, doi: 10.1186/s40779-020-00240-0.
- [15] S. P. Adhikari *et al.*, “Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: A scoping review,” *Infect. Dis. Poverty*, vol. 9, no. 1, pp. 1–12, 2020, doi: 10.1186/s40249-020-00646-x.
- [16] Y. Yi, P. N. P. Lagniton, S. Ye, E. Li, and R. H. Xu, “COVID-19: what has been learned and to be learned about the novel coronavirus disease,” *Int. J. Biol. Sci.*, vol. 16, no. 10, pp. 1753–1766, 2020, doi: 10.7150/ijbs.45134.
- [17] J. Li *et al.*, “The epidemic of 2019-novel-coronavirus (2019-nCoV) pneumonia and insights for emerging infectious diseases in the future,” *Microbes Infect.*, vol. In Press, no. Accepted 11 Februari 2020, p. 7 pages, 2020.
- [18] J. Pang *et al.*, “Potential Rapid Diagnostics, Vaccine and Therapeutics for 2019 Novel Coronavirus (2019-nCoV): A Systematic Review,” *J. Clin. Med*, vol. 9, no. 3, p. 623, 2020.
- [19] K. Shen *et al.*, “Diagnosis, treatment, and prevention of 2019 novel coronavirus infection in children: experts’ consensus statement,” *World J. Pediatr.*, doi: <https://doi.org/10.1007/s12519-020-00343-7>.
- [20] Z. Sun, K. Thilakavathy, S. S. Kumar, G. He, and S. V. Liu, “Potential factors influencing repeated SARS outbreaks in China,” *Int. J. Environ. Res. Public Health*, vol. 17, no. 5, pp. 1–11, 2020, doi: 10.3390/ijerph17051633.
- [21] N. Yang and H. M. Shen, “Targeting the Endocytic Pathway and Autophagy Process as a Novel Therapeutic Strategy in COVID-19,” *Int. J. Biol. Sci.*, vol. 16, no. 10, pp. 1724–1731, 2020, doi: 10.7150/ijbs.45498.
- [22] G. Zhou and Q. Zhao, “Perspectives on therapeutic neutralizing antibodies against the Novel Coronavirus SARS-CoV-2,” *Int. J. Biol. Sci.*, vol. 16, no. 10, pp. 1718–1723, 2020, doi: 10.7150/ijbs.45123.
- [23] C. Liu *et al.*, “Research and Development on Therapeutic Agents and Vaccines for COVID-19 and Related Human Coronavirus Diseases,” *ACS Cent. Sci.*, 2020, doi: 10.1021/acscentsci.0c00272.
- [24] Y. Yang, M. S. Islam, J. Wang, Y. Li, and X. Chen, “Traditional Chinese Medicine in the Treatment of Patients Infected with 2019-New Coronavirus (SARS-CoV-2): A Review and Perspective,” *Int. J. Biol. Sci.*, vol. 16, no. 10, pp. 1708–1717, 2020, doi: 10.7150/ijbs.45538.
- [25] W. Li *et al.*, “Progression of Mental Health Services during the COVID-19 Outbreak in China,” *Int. J. Biol. Sci.*, vol. 16, no. 10, pp. 1732–1738, 2020, doi: 10.7150/ijbs.45120.
- [26] C. Fan *et al.*, “Prediction of epidemic spread of the 2019 novel coronavirus driven by spring festival transportation in China: A population-based study,” *Int. J. Environ. Res. Public Health*, vol. 17, no. 5, pp. 1–27, 2020, doi: 10.3390/ijerph17051679.
- [27] T. M. Chen, J. Rui, Q. P. Wang, Z. Y. Zhao, J. A. Cui, and L. Yin, “A mathematical model for simulating the phase-based transmissibility of a novel coronavirus,” *Infect. Dis. Poverty*, vol. 9, no. 1, pp. 1–8, 2020, doi: 10.1186/s40249-020-00640-3.
- [28] S. A. Lauer *et al.*, “The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application,” *Ann. Intern. Med.*, vol. 2019, 2020, doi: 10.7326/m20-0504.
- [29] C. Wang *et al.*, “Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China,” *Int. J. Environ. Res. Public Health*, vol. 17, no. 5, 2020, doi: 10.3390/ijerph17051729.

- [30] J. Y. Park, M. S. Han, K. U. Park, J. Y. Kim, and E. H. Choi, "First pediatric case of coronavirus disease 2019 in Korea," *J. Korean Med. Sci.*, vol. 35, no. 11, pp. 1–7, 2020, doi: 10.3346/jkms.2020.35.e124.
- [31] D. Sun *et al.*, "Clinical features of severe pediatric patients with coronavirus disease 2019 in Wuhan: a single center's observational study," *World J. Pediatr.*, 2020, doi: 10.1007/s12519-020-00354-4.
- [32] H. Xiao, Y. Zhang, D. Kong, S. Li, and N. Yang, "The Effects of Social Support on Sleep Quality of Medical Staff Treating Patients with Coronavirus Disease 2019 (COVID-19) in January and February 2020 in China," *Med Sci Monit*, no. 26, p. e923549, 2020, doi: 10.12659/MSM.923549.
- [33] M. Dayer, S. Taleb-Gassabi, and M. Dayer, "Lopinavir; A Potent Drug against Coronavirus Infection: Insight from Molecular Docking Study," *Arch Clin Infect Dis.*, vol. 12, no. 4, p. e13823, 2020, doi: 10.5812/archcid.13823.
- [34] P. Malang, "Situs Resmi Satgas COVID 19 Kabupaten Malang," 2020. <http://satgascovid19.malangkab.go.id/official.html> (accessed Sep. 10, 2020).
- [35] C. et al Huang, "Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China," *Lancet*, no. 395, pp. 497–506, 2020.