

Mapping the High Risk Populations Against Coronavirus Disease 2019 in Padang West Sumatra Indonesia

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Abstract – Rapid outbreaks of coronavirus in 2019 (COVID-19), arising from acute coronavirus 2 (SARS-CoV-2) acute respiratory syndrome infections, have recently become a public health emergency. As one of the cities affected by COVID-19. The city of Padang found the highest case of COVID-19 in the province of West Sumatra and had a high risk of COVID-19 infection with a high rate of elderly population and comorbidity diseases, namely diabetes, hypertension and tuberculosis. The purpose of this study is to mapping the distribution of high-risk populations to COVID-19 events in Padang City. This type of research is quantitative descriptive. Systematic data searches conducted for vulnerable groups to COVID-19 were obtained from the Padang City health profile database in 2019 and <https://dinkes.padang.go.id/> to update the latest case of COVID-19. The research analysis unit was an administrative region according to the sub-district. The distribution of comorbidity was carried out using GIS analysis techniques using Arc-GIS 10.5 software. Padang City was recorded as the most widespread cluster of positive cases of COVID-19 in West Sumatra Province with a total of 99 confirmed positive cases, Padang Barat District with a total of 28 cases. The high risk population distribution data towards COVID-19 is the highest elderly in Kuranji District with a total of 9722, hypertension, diabetes mellitus, and tuberculosis highest in Koto Tangah District, with 11329, 4441 and 2583 cases. Conclusion The highest COVID-19 case in Padang city is not in the sub-district that has a high-risk population infected with COVID-19, but the sub-district must be monitored for those with high-risk population. The elderly population and comorbidities, hypertension and diabetes mellitus, tuberculosis are risk factors for COVID-19 infection. COVID-19 is a new disease that has become a pandemic. This disease must be wary of because of relatively rapid transmission, has a mortality rate that cannot be ignored,

Keywords – COVID-19, high risk, Padang City, SIG.

I. INTRODUCTION

The end of 2019 was marked by the emergence of an outbreak caused by a novel coronavirus, a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), originally reported in Wuhan, China. [1] More than 200,000

laboratory confirmed cases and nearly 10,000 deaths in more than 100 countries have been reported to date, [2] leading the World Health Organization on March 11, 2020 to characterize the infection, later named coronavirus 2019 (COVID-19), as a pandemic.[3]

Coronavirus is a collection of viruses from the subfamily Orthocoronavirinae in the Coronaviridae family and the order of Nidovirales. This group of viruses that can cause disease in birds and mammals, including humans. In humans, coronaviruses cause generally mild respiratory infections, such as colds, although some forms of disease such as; SARS, MERS, and COVID-19 are more lethal. [4]

In the current conditions, the corona virus is not an outbreak that can be ignored. If seen from the symptoms, ordinary people will think it is only limited to ordinary influenza, but for medical analysis of this virus is quite dangerous and deadly. Currently in 2020, the development of the transmission of this virus is quite significant because its spread is worldwide and all countries feel its effects including Indonesia [4].

It turned out that after identifying and analyzing data from various sources that emerged showed an increase in the relationship and mortality in COVID-19 patients in high risk groups with various comorbidities. [5] Older COVID-19 patients with other comorbid conditions such as hypertension, diabetes, heart and lung disease, will be more susceptible to infection and have a higher mortality rate than the general population without these comorbidities. [6]

Comorbidity is a concomitant disease that illustrates the condition that there are other diseases experienced besides the main disease (for example, diabetes, hypertension, cancer). Huang, et.al first reported the clinical features of 41 confirmed patients, showing 13 (32%) of them had underlying diseases, including cardiovascular disease, diabetes, hypertension, and chronic obstructive pulmonary disease. [7] Wang, et.al reported the findings of 138 cases of COVID-19 results showing that 64 (46.4%) of them had comorbidities. The most important part, patients who were treated in intensive care units (ICU) had a higher number of comorbidities (72.2%) than those who were not treated in ICU (37.3%). [8]

Globally, Indonesia occupies number 26 of all countries in the world with positive cases of 11,587 and dies of 864. West Sumatra As one of the provinces in Indonesia affected by COVID-19 including the 10 highest case provinces with positive cases 203 and died 15 where Padang is an epicenter highest spread of COVID-19.[9]

As one of the cities most affected by COVID-19 in West Sumatra Province, the city of Padang has a high comorbidity rate. Based on the health profile of Padang City in 2019, the distribution of cases of comorbid sufferers is found in all districts in Padang City. [10] Therefore, it is necessary to

look into the population of these COVID-19 patients and other aspects with related comorbidities, so that at least they can reduce the impact of their severity and death rate by taking appropriate measures to do mapping.

The mapping of public health problems manually has begun to be abandoned, since the development of digital mapping technology is widely used in health institutions [11]. GIS (Geographic Information System) is a computer system based on geography that can be used to analyze data. Mapping distribution using GIS with the aim of obtaining new information about the mapping picture of a disease or health problem so that it is easy to analyze. the intervention of the spatial pattern of the city of Padang is able to provide a very good quality improvement area. [12] Now along with the development of technology, through GIS using Arc GIS software [13] which has been developed with the relative weight and importance of each factor, [14] GIS can be utilized in the world of health to map the distribution of high-risk populations and see linkages with COVID-19 cases.[15]

II. RESEARCH METHOD

This research was conducted in the city of Padang, West Sumatra Province, Indonesia. This type of research is quantitative descriptive. Systematic data searches conducted for groups vulnerable to COVID-19 were obtained from the Padang City health profile database in 2019 and <https://dinkes.padang.go.id/> to update the latest case of COVID-19.

The research analysis unit is the administrative area according to the sub-district. The population and sample of research are 11 districts in the city of Padang. Mapping the distribution of vulnerable groups is carried out using GIS analysis techniques using Arc-GIS 10.5 software followed by data processing into data with computer software, through proportional risk determination of transmission and qualitative measurement. [16]

III. RESULT AND DISCUSSION

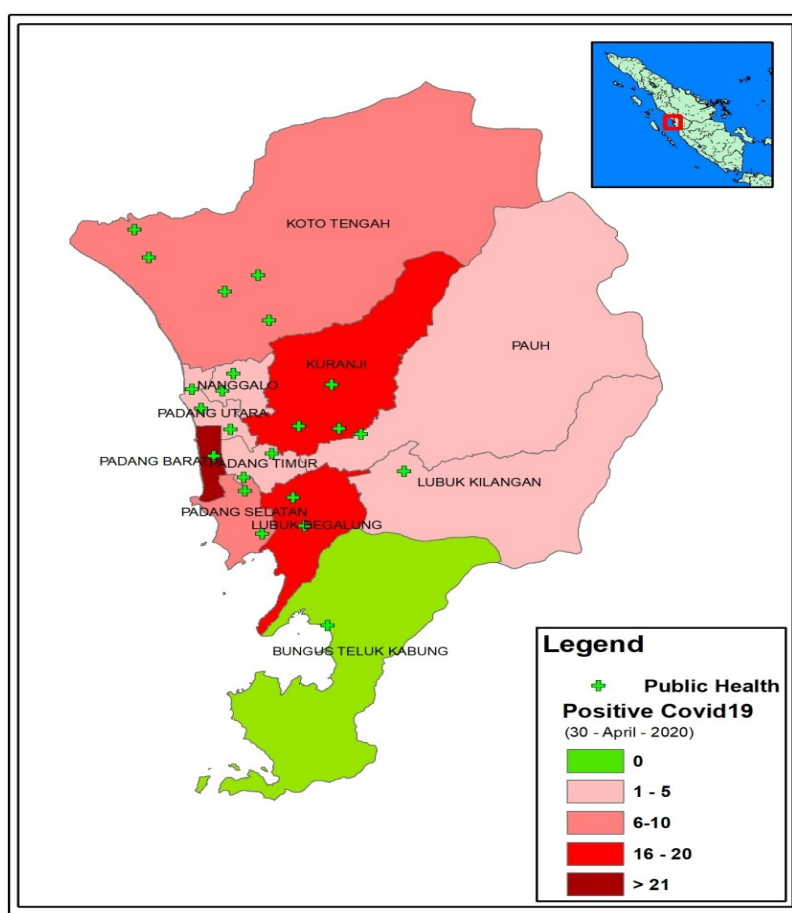
The city of Padang is the capital of the province of West Sumatra, which geographically, is at longitude 100°05'05" – 100°34'09" EL and latitude 00°44'00" - 01°08'35" SL. It has an area of 69,496 ha [17] which borders Padang Pariaman Regency, Solok Regency, Pesisir Selatan Regency and Sumatera Indonesia. According to Government Regulation No.17 of 1980 the area of Padang City is 694.93 km² or equivalent to 1.65 percent of the area of West Sumatra Province, which consists of 11 Districts and has

104 villages with the widest subdistrict is Koto Tengah which reaches 232.25 km² [10]

Based on the Projection of Indonesian population 2010-2035 by the Central Statistics Agency, then processed by the Center for Data and Information of the Ministry of Health of the Republic of Indonesia and the City of Padang Health Office. This projection number becomes the target of health development in Padang City. In 2019, the target population is 950,871 people, the male population is more than the female population with an average number of lives / households is 4.5 people. The highest population is in Koto Tengah District, 186,485 people and the lowest population

is in Bungus Teluk Kabung District with a population of 26,152.[10]

This virus can be transmitted from human to human and has spread widely in China and more than 190 other countries and territories. [2] On March 12, 2020, WHO announced COVID-19 as a pandemic. [3] As of March 30, 2020, there were 3,059,642 cases and 211,028 deaths worldwide. [18] While in Indonesia 10,118 cases have been confirmed with positive COVID-19 and 792 deaths.



Pict 1. Map of COVID-19 Distribution in Padang City

Tabel 1. Data Distribution of COVID-19 Events and High Risk Populations Against Covid-19 Events in Padang City

Districts	Head Of Family	Population Density /km ²	category	Elderly	Hipertensi on	Diabetes Mellitus	Tuberculosis	Suspect Covid-19	Probable Covid-19	Positive Covid-19
Padang Timur	87014	9768	Hight	2504	4094	1459	1955	4	7	5

Padang Utara	77692	880 1	Hight	4720	4147	1380	1390	6	8	5
Nanggalo	65046	768 3	Hight	3646	887	684	1048	1	1	1
Padang Barat	49545	658 6	Mediu m	4536	1477	432	1113	10	35	28
Padang Selatan	64951	599 9	Mediu m	7111	3886	1121	1397	2	7	7
Lubuk Begalung	12239 0	404 5	Mediu m	5981	3823	1500	2221	7	21	18
Kuranji	14635 4	264 5	Mediu m	9772	4898	2168	2472	1	20	16
Koto Tengah	18648 5	848	Low	8144	11329	4441	2583	1	20	10
Lubuk Kilangan	56202	663	Low	3227	6212	973	1273	4	6	4
Pauh	69040	515	Low	2634	2093	1120	663	3	6	5
Bungus Teluk Kabung	26152	252	Low	1682	966	310	825	1	2	0

The city of Padang is currently recorded as the most widespread cluster of positive cases of COVID-19 in West Sumatra Province with a total of 99 positive confirmed cases. Padang City has two sub-districts as the most widespread epicenter of COVID-19, Padang Barat District with a total of 28 confirmed cases and Lubuk Begalung District with a total of 18 confirmed cases.[19]

The following is a map of the distribution of COVID-19 events in the city of Padang, April 30, 2020.

Map of Population Distribution at High Risk of the Covid-19 Event in Padang

Distribution data of high-risk populations with various comorbidities obtained from the profile of the City of Padang, which were observed, the elderly, hypertension, diabetes mellitus, and tuberculosis. The highest elderly age figures in the City of Padang were found in Kuranji District with a total of 9722, for hypertension, diabetes mellitus, and the highest tuberculosis was found in Koto Tengah Subdistrict, with total cases of hypertension 11329, diabetes mellitus 4441, and tuberculosis 2583.

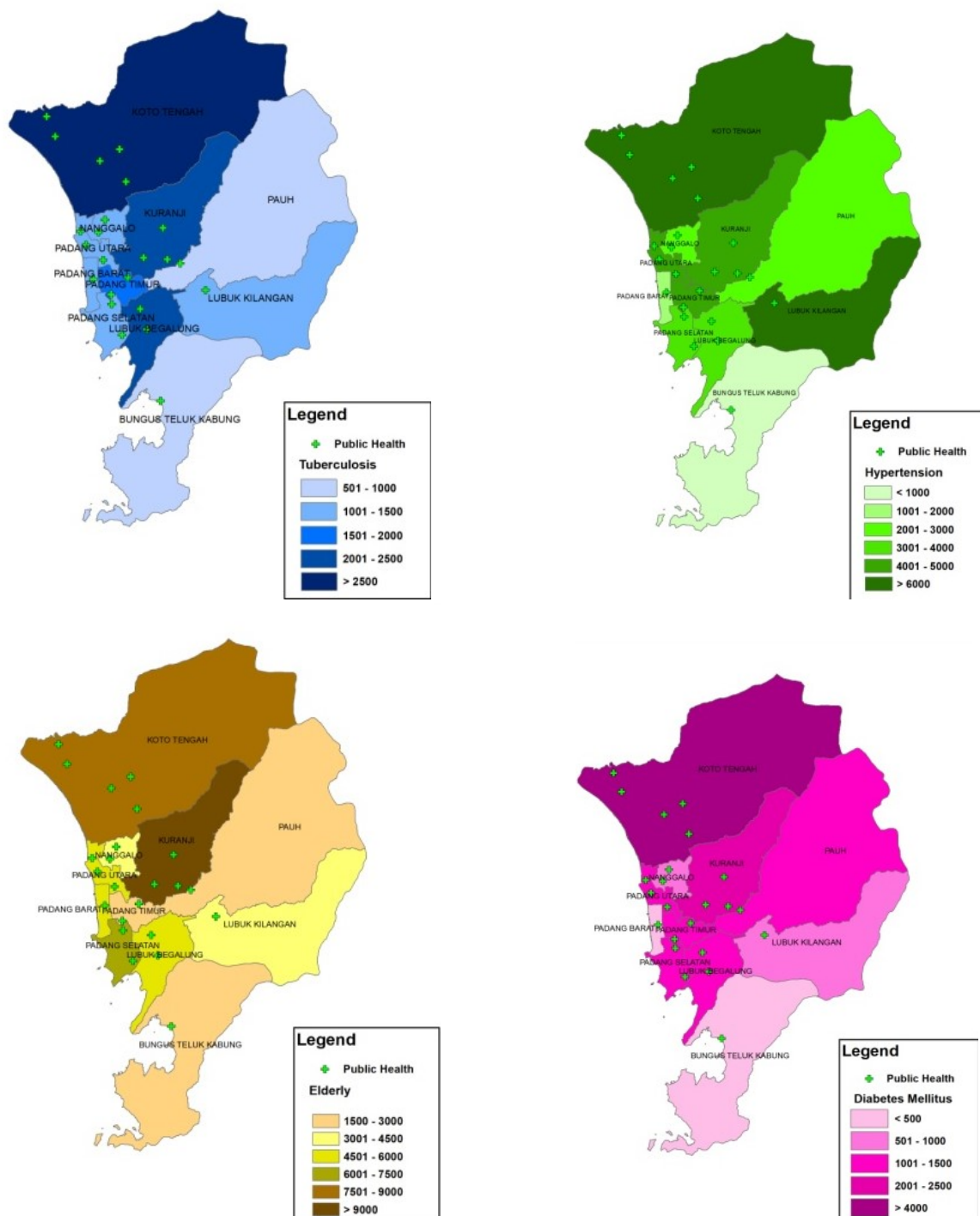
The following is a map of the distribution of vulnerable groups to the COVID-19 incident in Padang City in 2020.

Based on existing data, even though the highest COVID-19 case in Padang city is not in the sub-district that has a high-risk population infected with COVID-19, but the sub-district must be monitored against those with a high risk population. The elderly population and those with comorbid

hypertension and diabetes mellitus, male sex, and active smokers are risk factors for SARS-CoV-2 infection. More sex distribution in males is thought to be associated with a higher prevalence of active smokers. In smokers, hypertension, and diabetes mellitus, an increase in ACE2 receptor expression is suspected.[20][21]

Diaz JH [22] suspects that users of ACE inhibitors (ACE-I) or angiotensin receptor blockers (ARBs) are at risk of experiencing more severe COVID-19. Regarding this allegation, the European Society of Cardiology (ESC) confirms that there is no conclusive evidence to conclude the positive or negative benefits of drugs of the class ACE-i or ARB, so users of both drugs should continue their treatment. [23] However, meta-studies analysis conducted by Yang, et.al. [24] showed that COVID-19 patients with a history of respiratory system diseases including tuberculosis would tend to have more severe clinical manifestations.

Older age was reported as a major risk factor related to the high death rate of COVID-19. This is because as you age, the body will experience a variety of physiological and immune decline due to the aging process. [25] Some other risk factors established by the Centers for Disease Control and Prevention (CDC) are close contact, including living with a COVID-19 patient and a history of travel to the affected area. Being in one environment but not in close contact (within a 2 meter radius) is considered a low risk [26].



Pict 2. Map of Population Distribution at High Risk of COVID-19 Events in Padang City

The stability of SARS-CoV-2 in inanimate objects does not differ much compared to SARS-CoV. [22] Experiments carried out by Van Doremalen et al. showing SARSCoV-2

is more stable in plastic and stainless steel (> 72 hours) than copper (4 hours) and cardboard (24 hours). [27]

This happened in the Epicenter in the city of Padang, [28] Pasar Raya Padang region included in the administrative work area of the West Padang sub-district which had found dozens of positive cases of COVID-19 and the Pengambiran area in the Lubuk Begalung sub-district brought by one of the migrants from the province. Jakarta, which is the red zone region with the highest COVID-19 cases in Indonesia. [29] The same incident reoccurred where the first case occurred On December 31, 2020, a disease diagnosed as pneumonia with an unknown causative agent was reported to have occurred in China earlier than the market in Wuhan which is now known as COVID-19.

The City Government of Padang, closes activities in the Padang Raya Market for the next five days starting on Monday (20 // 4/2020) to Friday (4/24/2020). The policy is an effort to break the chain of distribution of COVID-19 by cleaning with disinfectant all areas of the Padang highway market during the closure. West Sumatra provincial government follows all the rules of the Large-Scale Social Restrictions (PSBB) that exist in the rules that apply in the Regulation of the Minister of Health (Permenkes) RI Number 9 of 2020. and the Minister of Health Regulation (Permenkes) RI Number 9 of 2020 concerning PSBB guidelines. The Province of West Sumatra has imposed a Large-Scale Social Restrictions (PSBB) starting April 22, 2020 until now it is still being extended. This PSBB rule applies at the provincial level which covers 19 regions including the city of Padang. [30]

COVID-19 is a newly discovered disease therefore knowledge of its prevention is still limited. The key to prevention includes breaking the chain of transmission by isolation, early detection and basic protection. [31][32]

Early Detection and Isolation. All individuals who meet suspect criteria or have had contact with patients who are positive for COVID-19 should seek treatment at a health facility immediately. [33] WHO has also made a risk assessment instrument for health workers who treat COVID-19 patients as a guide for further action recommendations. For high-risk groups, it is recommended to stop all patient-related activities for 14 days, check for SARS-CoV-2 infection and isolation. In the low risk group, they are encouraged to carry out daily self-monitoring of temperature and respiratory symptoms for 14 days and seek help if the complaint is severe. [34] At the community level, mitigation efforts include restrictions on travel and mass gatherings at major events (social distancing). [35]

Hygiene, Handwashing, and Disinfection. WHO recommendations in dealing with the COVID-19 outbreak

are basic protection, which consists of washing hands regularly with alcohol or soap and water, keeping a distance from someone who has symptoms of coughing or sneezing, performing ethical coughing or sneezing, and seeking treatment when having complaints according to the suspect category. The recommended distance to maintain is one meter. [32] Patients with a suspicion of COVID-19 should also be spaced at least one meter away from other patients, given surgical masks, taught to cough / sneeze, and be taught hand washing.[36]

Hand washing behavior must be implemented by all health workers at five times, before touching the patient, before performing the procedure, after exposure to bodily fluids, after touching the patient and after touching the patient's environment. Water is often referred to as a universal solvent, but washing your hands with water alone is not enough to get rid of the coronavirus because it is an RNA virus with a lipid bilayer envelope. [37]

Soap can remove and break down hydrophobic compounds such as fat or oil. [37] In addition to using water and soap, ethanol 62-71% can reduce viral infectivity. [38] Therefore, cleaning hands can be done with alcohol-based hand rub or soap and water. Alcohol based is preferred when the hands are not visibly dirty while soap is chosen when the hands look dirty.[34]

Avoid touching the face especially the face, nose or mouth with the surface of the hand. When the hands are contaminated with a virus, touching the face can be an entry portal. Finally, make sure to use one-time tissue when sneezing or coughing to avoid spreading droplets.[32]

Preparing for endurance There are various efforts from various literatures that can improve the body's resistance to respiratory infections. Some of these include quitting smoking and alcohol consumption, improving sleep quality, and consuming supplements.

Quitting smoking can reduce the risk of upper and lower respiratory infections. Smoking decreases the protective function of airway epithelium, alveolar macrophages, dendritic cells, NK cells, and the adaptive immune system. Smoking can also increase microbial virulence and antibiotic resistance.[39]

Sleep deprivation can also have an impact on immunity. Sleep disturbance is associated with increased susceptibility to infection characterized by impaired mitogenic lymphocyte proliferation, decreased HLA-DR expression, upregulation of CD14 +, and variations in CD4 + and CD8 + T lymphocyte cells. [40]

One supplement that has been found to be beneficial is vitamin D. A systematic meta-analysis and analysis has shown that vitamin D supplementation can safely protect against acute respiratory infections. This protective effect is greater in people with 25-OH vitamin D levels less than 25 nmol/L and who consume daily or weekly without bolus doses. [41]

Probiotic supplementation can also affect the immune response. A Cochrane review found better administration of probiotics than placebo in reducing episodes of acute upper respiratory infections, duration of infection episodes, use of antibiotics and school absences. But the quality of evidence is still low. There are studies that have large heterogeneity, small sample sizes and poor method quality. [42]

Zinc deficiency is also associated with decreased immune response. A meta-analysis of zinc supplementation in children shows that routine zinc supplementation can reduce the incidence of acute lower respiratory tract infections. [43]

IV. CONCLUSIONS

COVID-19 is a new disease that has become a pandemic. This disease must be wary of because of relatively rapid transmission, has a mortality rate that cannot be ignored, and the absence of definitive therapy. In the city of Padang found the highest case of COVID-19 in the district of West Padang whose epicenter in the Padang highway market. Even though the case of COVID-19 in the city of Padang was the highest not in the district that had a high risk population infected with COVID-19 but the sub-district had to need to be monitored those with high-risk populations. The elderly population and those with comorbid hypertension and diabetes mellitus, tuberculosis are risk factors for COVID-19 infection.

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