How did the Impact of the 2nd Wave of COVID-19 on Parking Characteristics at Non-Referral Hospitals? Case Study: Permata Cibubur Hospital, Indonesia

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Abstract

The health industry is vital in this modern era, including providing hospital facilities in various places. However, the Corona Virus Disease (COVID-19) pandemic has changed people's habits in using health services. Community visits to hospitals changed when the first wave of COVID-19 occurred in March 2021 and the second wave in June 2021. Parking facilities as part of hospital services are part of the affected by this pandemic condition. The purpose of this paper is to determine changes in parking demand in the before, first wave, and second-wave phases of COVID-19. The research method is carried out by conducting surveys and calculating parking characteristics. The analysis shows that parking demand decreased during the first wave and then increased again during the second wave. The first-wave parking index decreased by 44.90% compared to before the pandemic and increased by 112.24% during the second wave.

Keywords
First-wave, Hospital, Pandemic impact, Parking Demand,Second-wave.

1. Introduction

The Corona Virus Disease (COVID-19) pandemic has drastically changed the pattern of public visits to hospitals. Quite some people have become reluctant to make hospital visits during this pandemic. Concerns arise because many assumptions that transmitting infectious diseases from human to human is effortless to occur in hospitals. In addition, several countries have reported clusters of cases in hospitals with infections caused by respiratory viruses, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)(Shim et al., 2021).People can transmit the spread of the virus in hospitals without symptoms. This condition makes people have excessive worries when visiting the hospital.

The Covid-19 pandemic has also had an impact on non-referral Covid-19 hospitals. The coronavirus outbreak has caused a decrease in outpatient visits and non-COVID-19 inpatients. This condition resulted in a decrease in the occupancy rate(Patel et al., 2021).The pandemic has changed the behavior of the hospital community in medical services and patient behavior. To reduce the risk of transmitting the virus to patients or healthcare workers in their practice, providers are postponing elective and preventive visits, such as annual physical exams. Where possible, they also convert in-person visits to telemedicine visits. The decline in visits and changes in the pattern of health services occurred globally, as shown in Figure 1 sourced from the commonwealth fund (Mehrotra et al., 2021). When the pandemic started around the 12th week (early March 2020), the number of hospital visits dropped drastically but increased again as the pandemic progressed and returned to near normal at the end of 2020. In Indonesia, the beginning of the pandemic in March 2020 was considered the first-wave pandemics. Then there was an increase in COVID-19 in June 2021 which was considered the second wave.
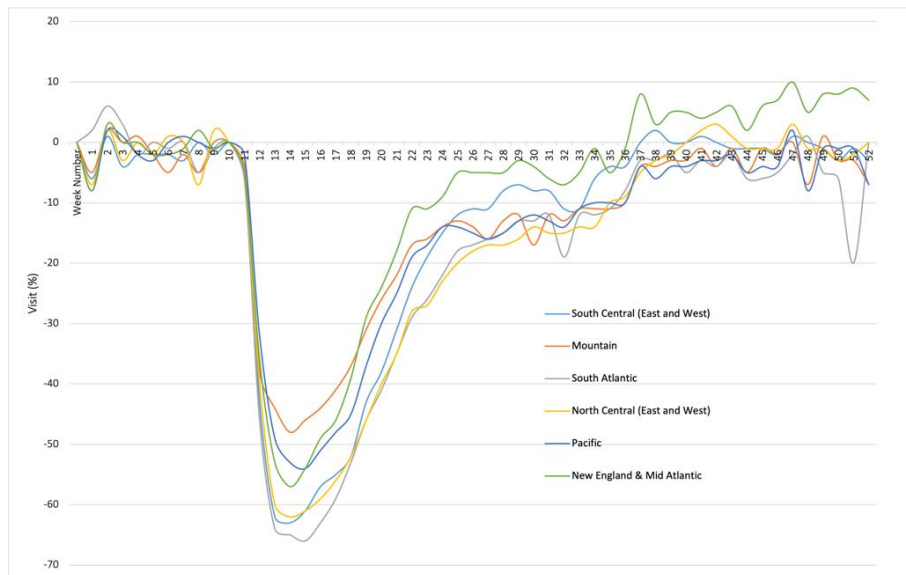
Figure 1.Percent change in visits from baseline

The tendency to increase the use of vehicles to the hospital can increase the need for parking facilities. The increasing number of vehicles in the hospital becomes a problem if the hospital management cannot provide parking facilities for these vehicles. Generations from activity centers are not accommodated by the available off-street parking facilities, which can cause overflow onto the road. One of these problems is caused by on-street parking. Such parking conditions can cause congestion due to reduced road capacity and disruption of road functions. To avoid this problem, hospital management can anticipate this condition (Dave, Joshi, Ravinder, & Gore, 2020). Overflow of parking on the road will result in disruption of the smooth flow of traffic. In addition, there are no off-street parking facilities, so that parking generation automatically utilizes the road for parking. The entry and exit of vehicles will disrupt the flow of traffic on roads whose bodies are used as parking lots so that long queues of vehicles cause congestion.

Although not all hospitals are COVID-19 referrals, it is still necessary to make preparations for a surge in patients. Several private hospitals have served Cibubur, Indonesia, as a densely populated area. However, from the existing hospital, there is no COVID-19 referral hospital. This condition occurred during the COVID-19 second wave, which caused the demand for hospital services to increase significantly. Therefore, the need for parking spaces in this hospital is a problem that must be addressed as quickly as possible so as not to create social problems. Various efforts, concepts, and characteristics of parking spaces have been applied to overcome them, but this parking problem is still a complicated problem to overcome. The complaints that are most often encountered from this parking problem are the lack of available parking spaces, unsafe parking spaces, and the absence of parking spaces provided. This paper aims to analyze trends regarding parking demand in non-referral hospitals in the time span before, first wave, and second wave of COVID-19.

2. Literature Review

Parking is the immobile state of a vehicle that is temporary because the driver abandons it. Every motorist tends to find a place to park his vehicle as close as possible to the place of activity or activity (Dave, Joshi, Ravinder, Gore, 2019). So that places where an activity occurs, such as a hospital, require a parking area. The construction of several buildings or places of public activity often does not provide sufficient parking areas, resulting in the use of part of the width of the road for vehicle parking.

2.1 Hospital Services during COVID-19 pandemic

Hospitals are the primary reference and service for the community during this pandemic. All parties depend on their health and safety from the threat of the virus to hospitals and doctors. However, customers have concerns if they have to make direct contact with medical personnel at the hospital. Facing these conditions, the parties tried to find a solution by making various service efforts with new methods. Homecare and telemedicine are the mainstay products of the hospital today. Of course, online and homecare services indirectly reduce the number of visits to the hospital. Home care services can provide comfort because health workers can serve patients directly without having to worry about being exposed to the virus in the hospital(Grabowski & Mor 2020).

Based on some data obtained from research in the United States, there was a significant decrease in hospital visits at the beginning of the pandemic. Despite the surge in COVID-19 cases at the end of 2020,

outpatient visits per week were stable over the last three months of 2020 and unchanged from the baseline week of March.

1. However, the pattern over the previous four years (blue line) shows that the number of visits usually increases during the winter months. The number of weekly visits in 2020 was 5 percent to 6 percent below this typical pattern, suggesting a cumulative decline in visits(Mehrotra, et al., 2021).
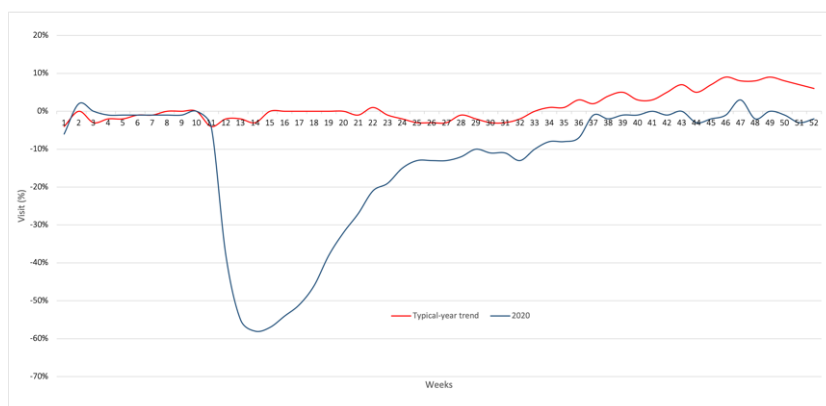

Figure 2. Percent change in visits from baseline

The use of telemedicine facilities during the covid pandemic is the safest choice because there is no direct interaction with other people (Punia et al., 2020). This change in pattern certainly dramatically affects the movement and transportation patterns of hospital customers. As in-person visits dropped during the early phase of the pandemic, telemedicine visits rose rapidly. Since the peak in mid-April, telemedicine use steadily fell into October before increasing again in November and December, rising from 6 percent of visits to just over 8 percent of visits(Mehrotra et al., 2021).
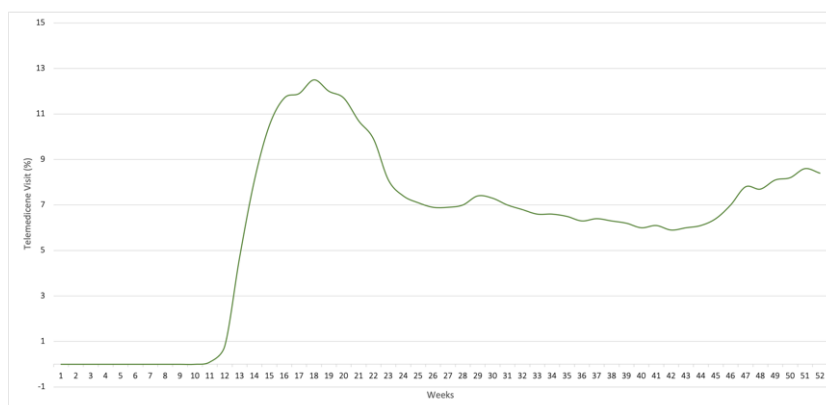

Figure 3. Telemedicine percent change in visits from baseline

Telemedicine is one of the strategies to prevent the spread of COVID-19 in many countries because telemedicine is the provision of health services using electronic communication technology. Patients and medical personnel do not need to meet in person in one place but still communicate through an application(Ohannessian, Duong, & Odone, 2020). Telemedicine consists of several forms, namely online consultation, screening, and chatbots. With various telemedicine methods, patients can report their symptoms and get advice and direction regarding their illness. The advantage of telemedicine, apart from being a solution for patients to get treatment during the COVID-19 outbreak, is that it is cheap, easy to access, and provides comfort for patients. Meanwhile, medical personnel can make services effective and efficient.

2.2 Parking Characteristic

In regulating parking, it is not only technical interests that are a concern but also concerns about beauty issues(Yen & Mulley, 2021).In general, parking control or management is to prevent traffic barriers and reduce accidents. In addition, proper parking can place the vehicle effectively and efficiently. On the other hand, the beauty of the environment with the right parking arrangement can create an effective and efficient road use mechanism, especially on roads where traffic jams occur. (Yan, Levine, & Marans, 2019). Therefore information about proper parking characteristics can be used as the basis for good parking planning. The parking

characteristics are parking accumulation, parking index, parking duration, parking turnover, and parking volume.

Detailed information about parking characteristics is needed to determine the number of vehicles parked on the available land at a particular time interval. This data can be obtained by counting the vehicles that have used the parking lot plus the incoming vehicles and minus the outgoing vehicles. Parking conditions and situations are very much needed by hospital management to determine and arrange further hospital services (Ramesh, Ramesh, Ramesh, & Rajasekaran, 2021). During the COVID-19 pandemic, the movement patterns of patients and visitors at the hospital became more critical than during normal conditions. Separation of patients with COVID-19 symptoms must be separated from patients with other complaints. The arrangement of the movement pattern must be made in a neat and directed manner starting from the parking arrangement.

The first information that must be known is the change in parking volume which can be calculated by adding up the vehicles that use the parking area at a specific time(Willis & Sembiring, 2021). Furthermore, hospital management must ensure the capacity of parking spaces during a pandemic. Capacity can be calculated by calculating the capacity of vehicles in the available parking area (Poliak, Poliakova, Zhuravleva, & Nica, 2021). Then, of course, this capacity must be adjusted to a configuration that meets the Health protocol. Of course, this parking pattern is expected to have more capacity, but the ease of driver comfort in maneuvering into and out of the parking space is less when compared to the smaller angle parking pattern. Another data that must be considered is the rate of vehicle turnover in the parking area or more often called turnover. The information is obtained from the number of vehicles that have used the parking lot at a particular time divided by the available parking space (Dave, Joshi, Ravinder, & Gore, 2020).The last is to make sure the parking index is still within the allowed threshold. The parking index is the number of vehicles parked in the parking area with the number of available parking spaces.

2.3 Parking management during new normal

The COVID-19 pandemic has conquered most areas of the earth, including Indonesia. Most economic activity practically stopped, and various industrial sectors stopped moving (Susilawati, Falefi, & Purwoko, 2020).In a short time, many companies lost revenue. Some had to go out of business, and that meant eliminating all their workers. Others had to lay off some of their employees. The bitter choice of the company's management will undoubtedly reduce the economic capacity of the community. One of the local government's transportation policies related to COVID-19 is the restriction of vehicle movement in big cities like Jakarta. Transportation sector policies during a pandemic must aim to find a point of balance(Gong et al., 2021).The continuity of the parking business as a derivative business was also directly hit, with the closure of several tourist areas, shopping centers, offices, and restaurants so that parking services stopped. The data obtained shows a decrease in income between 75% - 90%, and the decline in income will worsen when the local lockdown is implemented in several areas such as Greater Jakarta, Greater Bandung, Surabaya, Makassar, and several other cities.

Since the COVID-19 pandemic hit the world in early 2020, the transportation sector has been most affected. To address this, the government has provided incentives and subsidies for this sector. Meanwhile, the government also issued regulations for controlling transportation and implementing health protocols in transportation. (Muley, Ghanim, Mohammad, Kharbeche, 2021).The control issued can also reduce vehicle movement while reducing the use of commercial parking lots. Of course, these various conditions must be addressed so that all sectors involved can run well. Further efforts are needed to continue the parking business(Blattner, Karmia, & Walter, 2021).

The basic principle to slow the pace of the COVID-19 pandemic is social distancing or social restrictions. This situation can be interpreted as actions to reduce contact between humans to stop or reduce the transmission rate of disease through primary activities such as work, school, recreation, and socializing. Therefore, the policy for parking management operations in the new-normal era should adjust other policies in controlling COVID-19(Gupta, Abdelsalam, & Mittal, 2020). Parking management during the COVID-19 pandemic must adhere to the principles of the effectiveness of social restrictions and the certainty of the continuity of shared health. In the end, transportation policies are only part of the national strategy in dealing with the COVID-19 pandemic and must synergize with other sectors.

3. Research Method

This research is located at the COVID-19 non-referral Hospital at Cibubur. The consideration for choosing this location is because Permata Cibubur Hospital is strategically located on the outskirts of Jakarta. The survey was conducted during the COVID-19 second wave in July 2021. At the same time, other data were obtained from previous research, namely before COVID-19 in early 2020 and the first wave in April 2020. The location of the research can be seen in figure 4.

Furthermore, this study was conducted observations or field observations include various matters relating to observing physical conditions and activities at the research site. Furthermore, interviews were also conducted,

namely the activity of asking questions through interviews to obtain information through direct question and answer with respondents or informants. The last is activity documentation in collecting and reviewing some information from periodicals, books, document literature, photographs, newspapers, electronic media, and statistical references
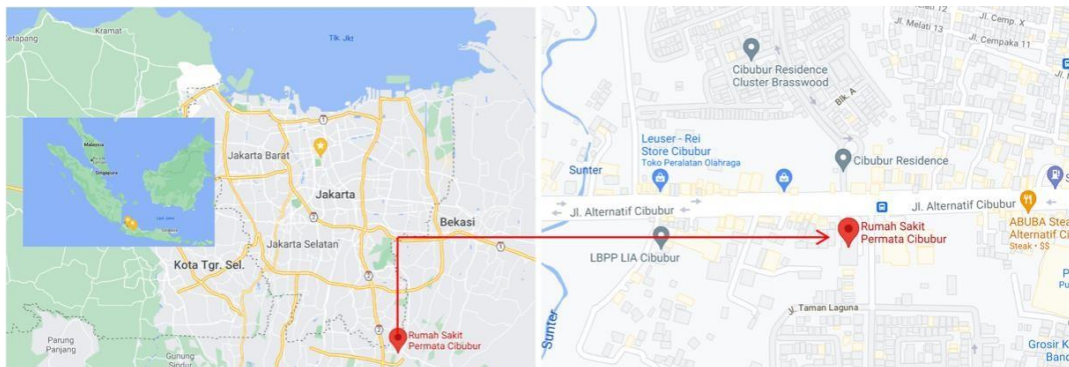

Figure 4. Location of case study

The data processing and analysis method used in this research is a descriptive qualitative analysis by paying attention to the results of field surveys regarding parking duration, accumulation, parking volume, parking capacity, parking index, parking space use, and parking space requirements. In addition, standards and guidelines for planning and operating parking facilities are also used.

4. Result and Discussion

The survey was conducted during the COVID-19 Pandemic second wave, namely in July 2021. The survey was carried out directly at the parking location on Monday, Wednesday, and Saturday for 24 hours. To determine the tendency of parking characteristics, interviews were also conducted with several parking officers and users. In addition, other parking data are obtained from parking management which manages parking services at Permata Hospital. All the resulting data will be described in the following sections.

4.1 Hospital in Cibubur Area

Currently, there are many hospitals in Cibubur. Therefore, residents who need health services can choose according to their individual needs. Hospitals in Cibubur have a variety of services. Most of them are located along the Transyogi road, which knit Depok, Bekasi, and Bogor Regency. The ranks of hospitals in Cibubur that residents can choose Meilia Hospital, Permata Cibubur Hospital, Mitra Cibubur Hospital, Eka Hospital, Growing Up Mother & Child Hospital, and Drug Rehabilitation Hospital. There are no government hospital services in this area, so private hospitals are highly relied upon by the community. Most of the hospitals operating in Cibubur are hospitals with a relatively vast national network.

Cibubur area is a relatively dense residential area with residents primarily working in Jakarta. The need for health services is high enough that there are quite a several hospitals that provide similar services. Most of the hospitals at Cibubur are general hospitals that were established in early 2000. Most of the hospitals offer superior quality and sophisticated Laparoscopy, Arthroscopy, and ICU services. In addition, the hospital in Cibubur also offers other health services such as specialist and general services and other supporting services. All hospitals have been certified by the Hospital Accreditation Commission (KARS). Along with these primary services, the hospital must also provide supporting services such as parking. This condition is due to the majority of people using hospital services using private vehicles.

Permata Cibubur Hospital is a private hospital that has been operating since early 2000. This hospital is a non- referral COVID-19 Hospital but has become one of the leading choices for the community in getting services during this pandemic. Initially, the hospital was engaged in maternal and child health services. Then it developed into a general hospital that has an inpatient installation. As for women's special services, a building is prepared with the designation of the women's wing. There are around 120 inpatient places at Permata Cibubur Hospital to support patients who need treatment facilities at the hospital. These facilities include ordinary inpatient rooms, Intensive Care Units, Neonatal Intensive Care Units, Pediatric Intensive Care Units, and special wards for healthy newborns or those who require light therapy in the perinatology room.

Provision of adequate parking facilities is necessary for hospitals so that the flow of vehicles entering and leaving will not cause conflicts on the surrounding roads. Parking requirements are usually in line with the area and function of a building. Likewise, the need for hospitals, the bigger the hospital and the more facilities offered (paramedics, number of beds, doctors, etc.), the greater the number of visitors and the greater the

number of parking spaces needed. The observational data at the study site is then processed and analyzed according to the purpose of this paper, namely the parking characteristics of parking volume, parking accumulation, parking duration, parking capacity, parking index, and parking turnover rate.

4.2 Parking volume

Parking volume is the number of vehicles parked at the study location for a certain period. In this case, the calculation is grouped every 1 hour. Knowing the volume of parking vehicles from a parking facility can determine the amount of parking space needed to accommodate the volume of parking vehicles that occur. The larger the volume of vehicles, the need for parking space will also increase. This paper's calculation of parking characteristics is separated into two categories of vehicles, namely light vehicles (LV) and motorcycles (MC).

The parking area available at Permata Cibubur Hospital is 10,000 m2 with a capacity of 150 LV and 148 MC. Therefore, the parking capacity provided by the hotel management is still sufficient. The parking volume that occurred before the first-wave and second-wave of COVID-19 can be seen in figure 5. Parking volume in the first wave of COVID-19 decreased significantly compared to parking volume before COVID-19. The possibility is that hospital service users are exposed to the virus when visiting the hospital. From the three phases, it can be seen that the visiting hours are the highest parking volume every day.
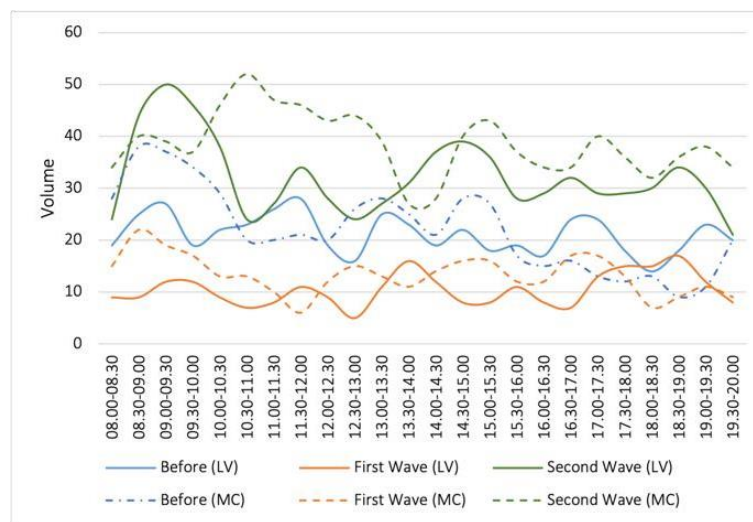

Figure 5. Volume parking average

The MC parking volume has the same characteristics as LV. First, there was a decrease in parking volume during the COVID-19 first wave compared to before. Then there was a significant increase during the COVID-19 second wave in June 2021. In the COVID second wave, the peak of the highest parking volume was 53 MC at 10.00 to 11.00. This data shows that it is suspected that most of the visitors to hospital services come at that time. Meanwhile, the lowest volume occurred between 13.00 and 14.00, with an MC volume of 27 vehicles.

Based on figure 5, it can be seen that the parking volume in the COVID-19 first wave has decreased significantly. This phenomenon is in line with research conducted in several other countries. This condition is driven by the decline in the number of hospital visitors as usual. The visitors then choose to use telemedicine as a substitute for health services. However, during the COVID second wave, there was an increase in parking volume. This phase is presumably because the need for care services has increased along with the limited number of existing Covid referral hospitals. So that non-COVID-19 patients look for alternative hospitals with COVID-19 services as well. As previously mentioned, Permata Cibubur is not a COVID-19 reference.

4.3 ParkingCumulative

Parking accumulation describes the number of vehicles entering the parking lot in a certain period, where parking accumulation is the number of vehicles in the parking lot at any time with a specific period. Parking accumulation is strongly influenced by the number of vehicles entering and leaving the parking area at a particular time. If the number of vehicles entering the parking area increases while the number of vehicles leaving the parking area increases, the accumulated value will be significant. The maximum accumulation of vehicles in this study can be seen in figure 6 below.
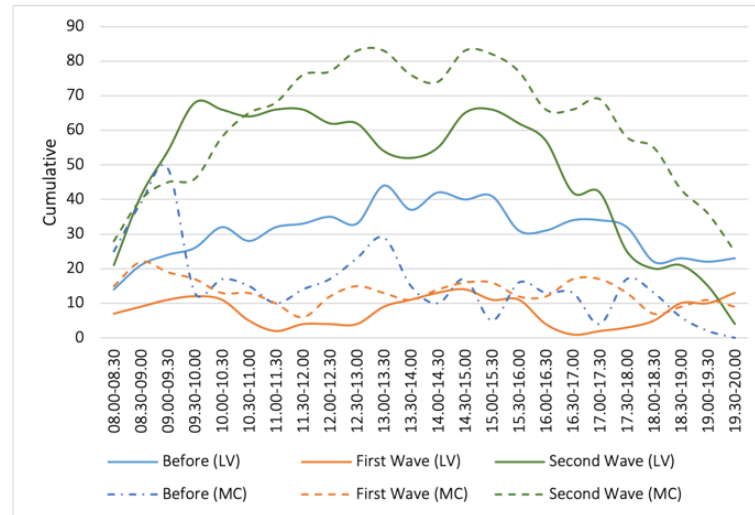
Figure 6.Parkingcumulative

The increase in parking accumulation is due to an increase in the number of people visiting the hospital. It can be seen from figure 7 that the highest cumulative is in the morning for LV and in the afternoon for MC. Until now, the available parking capacity is still sufficient. However, the circulation and parking layout still have to be reorganized because the parking lot selections are always gathered at the exact location. The circulation of vehicles and their drivers must be a serious concern because if there is a crowd, it poses a high risk of spreading the virus.

4.4 Duration of Parking

Parking duration is the actual length of time a vehicle is in the parking space. Parking duration is obtained by calculating the difference between the time each vehicle exits and the vehicle enters. The duration calculation can be done manually by recording the entry and exit times of a vehicle. However, technology is now being used in almost all modern parking services, including the parking lot of this study. To get the parking duration for each vehicle, it uses log data entry and exit of vehicles recorded automatically and stored on the server. In addition, artificial intelligence in the parking business has facilitated parking management in identifying the type of vehicle, duration, and layout of parking patterns that occur.
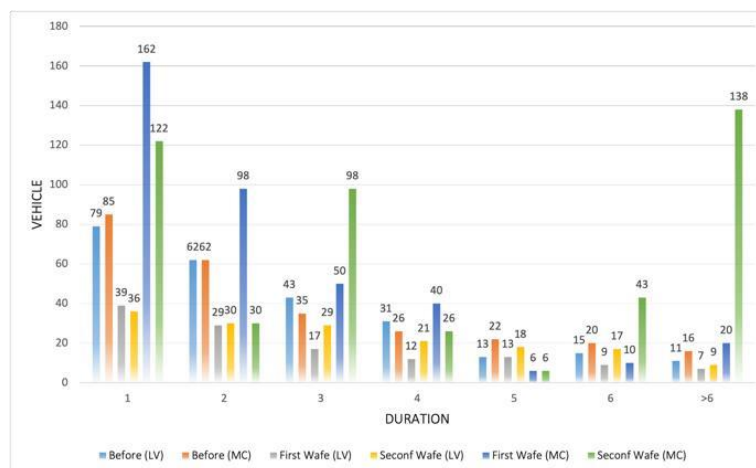

Figure 7.Parking duration

Based on the study results above, it was found that the average parking duration for Permata Cibubur Hospital visitors is 2-4 hours with 30-minute intervals. The parking duration average in each phase does not have a significant difference. This duration is most likely because visitors carry out almost uniform activities. Modern services in hospitals have reduced the time required by the community. The faster the hospital service, of course, the more parking duration will be reduced. This situation does not apply to inpatients because they have to stay in the hospital for more than 24 hours according to their respective health conditions.
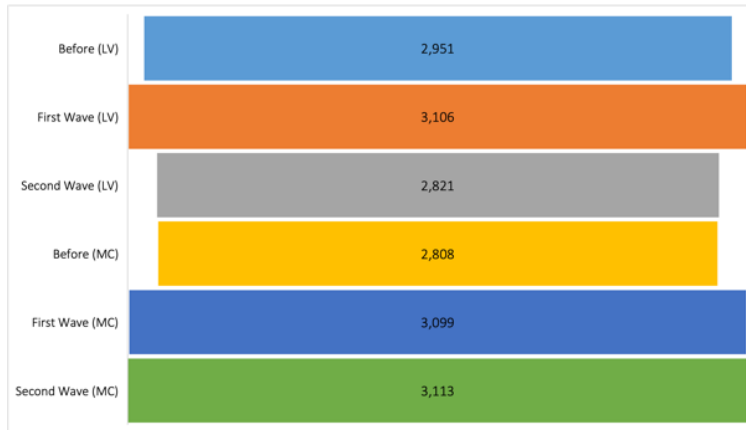
Figure 8.Averageparking duration

Figure 8 above shows the average duration of LV and MC parking in more than 3 hours. This condition shows that the majority of hospital visitors have long-term needs. Infield observations, visitor activities were dominated by consultation with doctors and inpatients. The highest average parking duration is 186.6 minutes. Thus, the parking user occupies the parking space for more than 3 hours. From the duration of parking usage, it can be assumed that the users are medical personnel and hospital visitors.

4.5 Parking capacity and parking index

Parking capacity can be interpreted as the maximum number of vehicles parked in a parking area under certain conditions and times. Parking space capacity is a value that states the total number of vehicles, including parking loads, namely the number of vehicles per certain period which usually uses units per hour or per day. In table 1, it can be seen that the average parking capacity is around 50 vehicles/hour.

Table 1. Average of parking capacity

	Duration Average	Parking Space	Capacity
Before (LV)	2,951		50,84
First Wave (LV)	3,106	150	48,30
Second Wave (LV)	2,821		53,18
Before (MC)	2,808		53,06
First Wave (MC)	3,099	149	48,08
Second Wave (MC)	3,113		47,87

Furthermore, it is necessary to analyze the parking index, another measure to express the percentage of parking space usage. The analysis was carried out over 1 hour, which was calculated at the end of the period. Based on the calculation, the parking index can be obtained in the illustration figure 9. The vehicle parking index based on the calculation is still below the capacity. However, this condition should not make hospital management careless. From now on, proper, modern and environmentally friendly parking facilities must be designed. This condition must be a severe concern so that when there are more hospital visitors and pass the parking index, hospital management will have no difficulty.
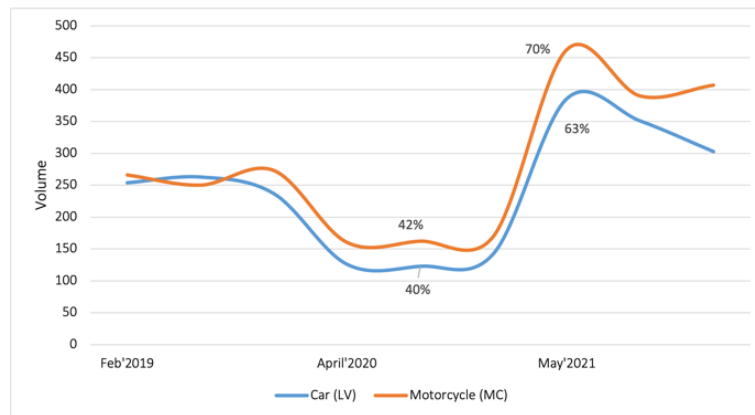
Figure 9.Parking index

Figure 9 above shows that during the first wave in April 2020, the parking index decreased by 40% for cars and 42% for motorcycles. Meanwhile, during the second wave in June 2021, the number of vehicles increased by 63% for cars and 70% for motorcycles. The decrease in the number of vehicles parked at Permata Cibubur hospital was due to the COVID-19 pandemic in Indonesia. Furthermore, there was an increase again during the second wave. There was an increase in visitors, allegedly because most of them were looking for non-referral COVID-19 hospitals. The parking index in the first wave decreased by 44.90% compared to before the pandemic and increased 112.24% during the second wave. The trend of changes in the parking index that occurred in this case study has similarities with visits to non-referral hospitals that occur in the world.

5. Conclusion

The conclusion obtained from this study is that the characteristics of parking at non-referral COVID-19 hospitals are unique. During the COVID-19 first wave pandemic, there was a significant decrease in parking volume. Furthermore, when entering the second wave phase, the parking volume again increased and was higher than before the pandemic. In addition, there is a change in the parking index during the first wave -44.90% and 112.24% during the second wave. The change in the parking index is in accordance with the phenomenon of the number of visits to the hospital during the pandemic.

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