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Parking Characteristics in Malaysia Public Hospitals

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Abstract. Parking in public hospitals has been a significant issue for public, authorities and parking operators running the facility within the hospital compound. In view to the fact that private vehicles are the preferred mode of choice for commuting in Malaysia, the issue could not get any better. This paper attempts to evaluate parking characteristics in public hospitals in Malaysia. Parking characteristics at six public hospitals in Peninsular Malaysia were investigated. Secondary data were obtained from Ministry of Health. License Plate methodwas used to collect parking demand data as a primary data for a period of 12 hours at public hospitals.Parking duration, parking turnover and parking index were determined to investigate parking scenario at each respective study sites. It was found that long parking hours was a nature in public hospitals with average parking duration of almost 4 hours/veh. Higher parking turnover rate was also observed for public bay area. The average parking index for all hospitals was also more than 100% in which it exceeding the capacity. The actual parking demand was found to be higher than the provided parking space at all public hospitals under investigation and it is also far below the specified various guidelines except for EPU guideline.

Keywords: Parking Demand, Public Hospital, Parking Duration, Parking Turnover, Parking Index

1. Introduction

The problems of getting a car park had been a great concern to general public, authorities and policy makers especially at public hospitals. Based on a publication by Ministry of Health, the total annual visit for outpatient attendances and admissions in government hospital summed up to the figure of 23,231,994 visit which obtained all over Malaysia [1]. This figure itself shows the substantial turnover to the hospitals for the available parking facilities provided.The question of how to solve parking demand issues in public hospitals has been the topic of discussions among public and transport planners. Excessive number of parking increases development cost and encourages private vehicles dependency while limited number of parking causes congestion and increases the risk to public.Documented Transportation Demand Management (TDM) practices are mostly come from countries that contrast markedly with Malaysia[2-5], which has a higher car ownership and lack an organized public transport system [6-7]. In a study conducted by Chuen, et al. [7], Klang Valley recorded 83% trips made through private vehicles in 2010.

The absence of parking demand data as a basis for analysis in infrastructure management is the main reason why parking issues in public hospitals remain unsolved. Therefore, this study attempts to evaluate parking characteristics in public hospitals in Malaysia. The study bridges the gap of

knowledge on parking characteristics in public hospitals in Malaysia, hence it could help respective authorities to plan appropriate solutions for it.

2. Methodology

The study was conducted at six public hospitals in Peninsular Malaysia. In this study, the first stage of the work involved putting together the available secondary data for land use under study, which is public hospitals. The number of beds, number of staff, and existing number of parking provided at hospitals are instances of information obtained from Ministry of Health Malaysia.

The second stage of the work involved the process on collecting the primary data which is the actual parking demand data. This is the most important part of the study since thereis no currently relevant available statistical data in Malaysia. Parking study was conducted to obtain the parking demand in the hospitals. License Plate method was carried out for 12 hours (7am – 7pm) with 30-minute interval. For the data collection, the parking facilities were subdivided into zones, where team of enumerators were designated at each location. The License plate survey method carried out at site by using portable video recorder (Handycam). This method gives advantage over the conventional in-situ plates number note-taking; it gives recorded prove for subsequent validation (if the need arises), as well as expedite the data collection process, where enumerators can cover bigger study area (Figure 1).

Figure 1. License Plate Survey Method within the public hospitals compound

Then, the data were extracted from the video recording to obtain parking demand and parking duration. Parking turnover and parking index werethen calculated and tabulated for all hospitals under investigation. This informationgives out better understanding on the parking behaviour based on the available public parking and allocated parking for staff in overall context.

Secondary data obtained from Ministry of Health were then used in the estimation of parking requirement for various parking requirement guidelines. The parking requirement based on the estimation from various parking guidelines and parking norm such as Economic Planning Unit (EPU) [8], Institute of Transport Engineer (ITE)[9], Federal Department of Town and Country Planning (JPBD) [10], Ministry of Health (MOH)[11] were then compared to the parking supply and actual parking demandto see the trend of parking requirement based on different guidelines.

3. Data Analysis And Findings

Figure 2 and 3 show total daily trip generation and hourly parking demand respectively for six public hospitals.
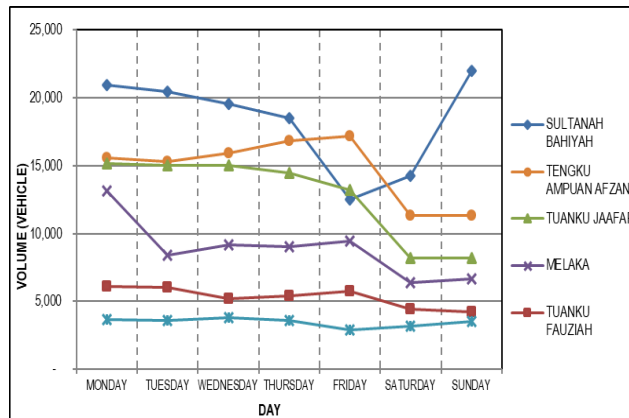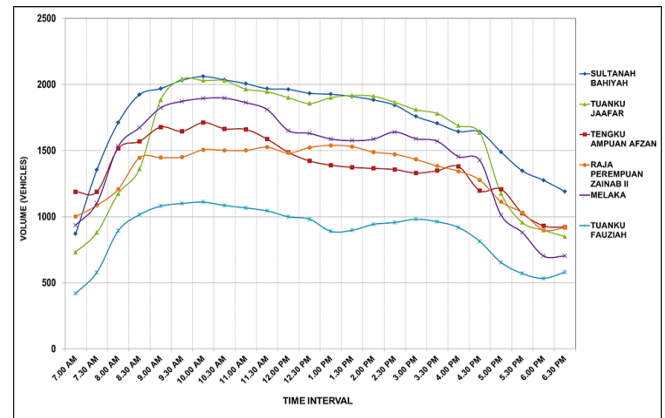

Figure 2. Total Daily Trip Generation

Figure 3. Hourly Parking Demand Trend

As shown in Figure 2, the highest total daily trip generation was observed on the first working day for all public hospitals under investigation (note that Sunday is a first working day for Kedah state). The trip generation decreases when approaching weekend. Taking into consideration the relation of highest trip generation day with parking activity, parking demand study was then further carried out.

Parking survey method using guideline from Institute of Transportation Engineers (ITE) was adopted in data collection procedure. Parking spaces within the hospital compounds were divided into few parking zones. In this study, the parking survey methodwas modified by substituting the paper and pen site inventory method with the use of portable video recording device. By using this method, the enumerators can cover more parking areas within the same given time interval, while reducing the potential site error when recording/noting the plate numbers in-situ. This method as well provides the visual evidence from the data collection process for further validation/subsequent checking. License plate number of vehicles was be observed at regular 30-minutes interval for the day duration. From the site survey, morning period recorded the highest parking demand during the day as shown in Figure 3.

Average parking duration is the ratio of total vehicle hours (parking load) to the number of vehicles parked (parking volume) (Equation 1). Parking load is obtained by multiplying the number of vehicles occupying the whole parking area at each time interval with the time interval which expressed as vehicle hours [12]. Parking turnover is the ratio of the total number of parked vehicles accommodated during a given period in a specified area to the total number of parking spaces in that area (Equation 2). Parking duration and parking turnover were calculated for public bay only, staff bay only, and overall for both public and staff bays as shown in Table 1.

$$Parking\ Duration\ = \frac{Parking\ Load}{Parking\ Volume} \qquad \text{Equation 1}$$

$$Parking\ Turnover\ = \frac{Parking\ Volume}{Number\ of\ Parking\ Bays} \qquad \text{Equation 2}$$

Table 1. Parking Duration and Parking Turnover at Public Hospitals

Hospital	*Actual Number of Parking	Average Parking Duration (hours/veh)			Average Parking Turnover (veh/12 hour)		
		Public Bay	Staff Bay	Overall	Public Bay	Staff Bay	Overall
Hospital Sultanah Bahiyah, Kedah	1500	3.30	5.42	3.57	4.70	1.75	3.87
Hospital Tengku Ampuan Afzan, Pahang	989	3.50	4.63	3.74	5.56	1.69	3.73
Hospital Tuanku Jaafar, Seremban	1841	3.33	4.12	3.47	4.55	2.02	3.74
Hospital Melaka	1439	3.28	4.98	3.45	6.02	1.51	4.62
Hospital Raja Perempuan Zainab II, Kelantan	1113	3.90	6.51	4.49	4.96	1.67	3.42
Hospital Tuanku Fauziah, Perlis	658	3.18	5.08	3.48	6.61	1.75	4.60
Average (Daily)		**3.41**	**5.12**	**3.70**	**5.40**	**1.73**	**3.99**

*Based on actual parking counted at site

Table 1 above shows that the average parking duration and parking turnover for overall bays is almost 4 hours/vehicle and 4 vehicle/12 hour respectively.Higher turnover rate is observed at public bays which varies between 4.55 and 6.02 veh/12 hour with average turnover is 5.40 veh/12 hour. Higher turnover value indicates that a greater number of vehicles could be accommodated during the specific time period with the available parking bays due to shorter parking span by public vehicles. For staff only bays, turnover values are smaller and vary between 1.51 and 2.02 with an average value of 1.73. This smaller value shows that staff vehicles are parked for longer period of time and allows only small number of vehicles to be accommodated in a specific time period with limited number of bays.

Parking index gives an aggregate measure of how effectively the parking space is utilized. The parking index quantifies that whether the capacity of existing parking spaces is still sufficient in accommodating the parking demand(Equation 3). Table 2 shows parking index for both types of bays at each study site.

$$Parking\ Index = \frac{Parking\ Load}{Parking\ Capacity} \times 100 \qquad \text{Equation 3}$$

Table 2. Parking Index at Hospitals

Hospital	Parking Index		
	Public Only	Staff Only	Overall
Hospital SultanahBahiyah, Kedah	129%	79%	115%
Hospital TengkuAmpuanAfzan, Pahang	162%	65%	116%
Hospital Tuanku Jaafar, Seremban	105%	54%	86%
Hospital Melaka	121%	61%	103%
Hospital Raja Perempuan Zainab II, Kelantan	161%	94%	123%
Hospital TuankuFauziah, Perlis	175%	74%	133%
Average (Daily)	**142%**	**71%**	**113%**

From Table 2, it is obvious that for staff only bays the parking index is below 100% for all study sites whereas, for public only bays all the sites experiences parking index greater than 100% at each of the study sites. In overall the parking index for each studied hospital other than Hospital Tuanku Jaafar, are still greater than 100% which show overall parking deficiency.

Then, based on variables obtained from Ministry of Health and parking requirement guidelines from EPU, JPBD, MOHand ITE, parking supply (provided parking) and parking requirement estimation for the public hospitals were plotted.

Figure 4 below shows ITE guideline leads the trend, followed by MOH guideline and JPBD guideline, while EPU guideline bound to be the lowest trend lines among all. The provided parking at hospitals is shown higher than the numbers required by EPU guideline, but lower than recommended by JPBDand MOH itself.Figure 4 below also shows the information on the actual parking demand during peak hour, overlaid onto the graph of provided parking by hospitals and parking requirement for specified parking guidelines.
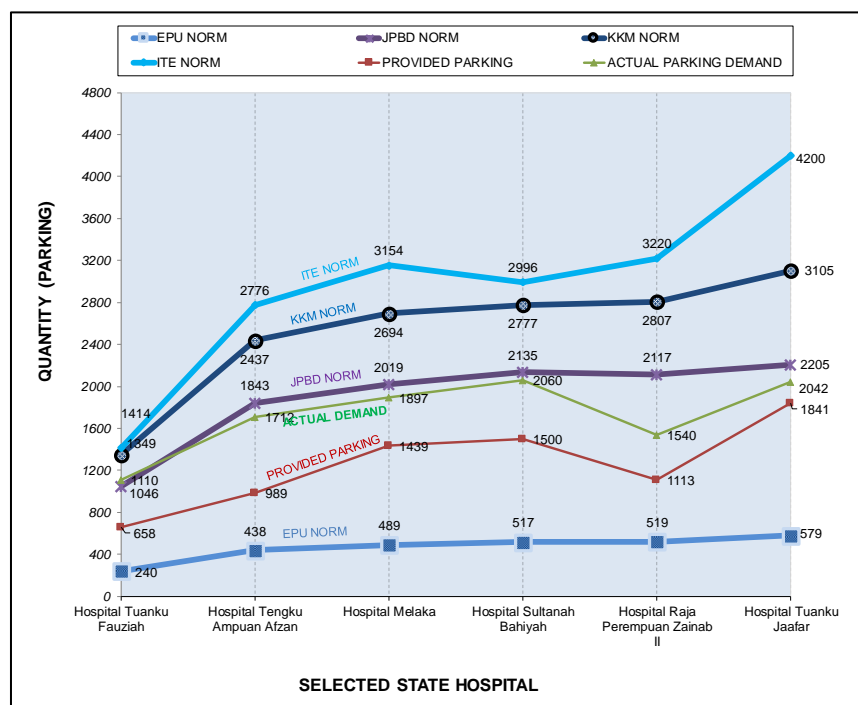

Figure 4. Parking Supply-Demand Trends and Parking Generation from Various Guidelines

With the current situation, as shown in Figure 4peak hour parking demand is found to be higher than the provisioned parking.Comparing all the parking requirement from various guidelines with the provided parking and actual parking demand in peak hour, the actual parking demand is above the actual parking provided and in close trend with JPBD guideline.

4. Conclusions And Discussions

Findings in this study show the nature of long parking-hours at the public hospitals with average parking duration of 3.7 hours/vehicle is observed throughout the study area. The average parking turnover of 3.99 vehicles/12 hours obtained in this study explained the nature of high occupancy at parking bays at these hospitals. Average overall parking index of 113% and average parking index for public bay of 142% shows parking deficiency at the time of the study was carried out especially at public bays area.

As seen in Figure 4, the actual numbers of parking space provided by the hospitals are well below the required amount by JPBD, MOH and ITE. The only parking requirement exceeded over is the EPU

guideline, which is ranked as the lowest in parking provision criteria. This could be the reason why shortage of parking is always been an issue for hospital visitors.

The findings in this study provide parking supply and demand scenario within the public hospitals. It can be concluded that the provided parking is below the actual parking demand and far below the parking requirement estimation by various guidelines specified in this study except for EPU guideline.There could be many reasons to the shortcoming; one of the reasons being is the lacked available land to provide the parking spaces.Currently, many parking problem issues are solved on an *adhoc* basis. Hospital Tuanku Jaafar, Seremban has multi-storey car park facility and it provides better average parking index of 86% in overall. However, the provision of multi-storey car park may not necessarily solve parking deficiency issue. A typical supply-based approach which provide additional parking as the solution to capacity problems does not work in the long run. Parking is an integral part of urban transport systems and a proper integration of other transportation systems could help solve the parking problems within the public hospitals. Various traffic and infrastructure management scenarios can be simulated to see possible beneficial solutions to the parking issues in public hospitals.

Acknowledgement

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