

Private Hospitals' Parking: Health Care's Debated Contribution in Traffic Congestion of Dhaka City

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Abstract

Parking and Traffic Congestion can be synonymous if not handled efficiently. In the ever-growing metropolises like Dhaka, where private hospitals prevail in a greater number and act as a major traffic generator, efficient parking management is undoubtedly momentous along with its protuberant health care facilities. This paper particularly aims at investigating the existing parking set-up of the major private hospitals of Dhaka city by means of parking demand-supply analysis. The overarching methodological approach adopted for this research is case study method. The required database was collected from parking space inventory and parking usage survey by patrol, conducted on both weekdays and weekend throughout a period of eight hours, each covering both the morning and evening peak periods. As a key finding, this study revealed that overall parking demand is always higher than the available supply in most of the cases. However, the unique methodological approach and outcomes of this extensive research work can act as a baseline for further research activity intending the quantification of the parking as well as traffic congestion problem in urban expanses and effectiveness of potential solutions.

Keywords: *Traffic Congestion, Parking Management, Health Care Facilities, Parking Demand and Supply.*

1 Introduction

The parking problem is one of the burning issues in transport study for any kind of establishments situated adjacent to the Major thoroughfares. Efficient movements of the vehicle, as well as the effectiveness of adjacent road, are greatly affected by the insufficient provision of parking. The unprecedented increase in the number of private cars, the unplanned road infrastructure and illegal tenure of footpath have also fueled the impacts adversely.

Parking demand is created through various types of land uses varying from commercial shopping complexes to private hospitals. Failure to meet parking demand of people in a city leads to on-street parking and subsequent traffic congestion. Most of the private hospitals in Dhaka city have so far insufficient expanse of indispensable parking space. Consequently, it results in haphazard on street parking and thereby hinder the smooth operation of the urban transportation system.

Labaid Hospital, a major private hospital in Dhaka city was the study area for this extensive research work. It is located in Dhanmondi, just next to Mirpur road which is considered one of the busiest roads in Dhaka with major networks to other key locations within the city. As a consequence, the illegal on-street parking nearby this hospital badly affects the traffic condition in Mirpur road along its surrounding area. The identical scenario can be an observation for other private hospitals of Dhaka city. Finding their location adjacent to a major thoroughfare, they act as a major traffic generator and their improper parking space and traffic management is somehow responsible for deteriorating the overall traffic condition of the capital. Thus the research has been conducted to explore the existing parking supply and demand characteristics of *Labaid Hospital*.

The methodological approach adopted for this study can further be replicated to identify the accumulated impact of imbalanced parking demand and supply of other major private hospitals in Dhaka on city's acute traffic

bottleneck. Furthermore, the outcomes can be used to provide targeted solutions by addressing specific problems in the parking predispositions.

2 Literature Review

Rahman *et al.* (2011) identified Parking demand as a function of vehicle ownership, trip rates, modal split, duration (how long motorists park) and geographic location. Islam (2004) indicated on-street parking as the main cause of congestion in Motijheel commercial area, Dhaka. Moreover, it was concluded that there is a huge lack of parking space for Para-transit which deteriorates the situation. Chowdhury (2006) extended the study of Islam (2004) and portrayed how the unavailability of parking space in a hospital becomes a contributor of traffic congestion generator rather than mitigating the impact.

Edwards (2014) indicates that parking requirement for a hospital is dependent on the numbers bed available for the patient. As a final outcome of the study, it was found that approximately 2.17 car spaces per hospital bed are required. Building Construction Act (1996) and Parking Policy for DMDP Area (2002) both laid out legislative measures and detailed standards regarding parking space in Bangladesh. According to the Building Construction Act, 1996 all the building within the jurisdiction of RAJUK will have their own parking provision as presented in Table 1.

Table 1. Minimum parking space requirement for different types of buildings in Bangladesh

Building type	Size of the building	Minimum space required for parking
Residential	For every 300 sq. meter of the building	23 square meter
Educational institute	For every 200 sq. meter of the building	23 square meter
Market place	For every 100 sq. meter of the building	23 square meter
Hospital	For every 300 sq. meter of the building	23 square meter

(Source: Building Construction Act, 1996)

The parking space will have to be at least twenty-three (23) square meters for single vehicle parking. This figure varies with the size of the building or number of building users (Building Construction Act, 1996). Again the “Parking Policy for DMDP Area, 2002” provides some recommendations for managing the “Parking Demand” and “Parking supply”.

- Restrictive parking shall be adopted in areas where the demand exceeds the available parking spaces.
- Both the off-street and on-street parking should be provided (Parking Policy for DMDP Area, 2002).

3 Research Methodology and Data

The scale of the survey is a key dilemma as regards assembling any database on existing parking facilities. According to MAPC (2010), parking surveys basically falls into one of the two categories namely site-specific parking survey and area specific parking survey. The first category of parking survey, as the name implies, is conducted for a small specific land use to determine the localized parking supply and demand. The second one considers all available parking spaces in an area and opens the possibility of shared parking among different land uses. Since a particular study area has been selected for this study, data has been collected through site-specific parking surveys.

The required database was collected both from primary and secondary sources by means of Field survey and/or literature works subsequently during October, 2014. Primary data includes the width of road and footpath, length of curb, type of parking provisions (on-street and/or off-street), parking supply (no. of lots provided), parking signs, parking pattern (existing layout) etc. collected by means of parking space inventory and parking usage survey by patrol. Data was collected in both weekdays and weekend including observing parked vehicles at 30 minutes intervals through a period of eight hours, covering the morning and evening peak periods. The secondary database collected from different relevant books, research works and websites primarily serve as an important basis for already studied information related to the research work. The parking demand and supply conditions of *Labaid Hospital* have been illuminated through six significant measures of parking – parking accumulation, parking volume, parking load, parking turnover, average parking duration and parking index.

4 Results and Discussion

4.1 Existing Parking Inventory of *Labaid Hospital*

The provision of parking at *Labaid Hospital* includes both on-street and off-street parking. On-street parking befalls at both sides of the road in front of *Labaid Hospital*. There is no legal provision of on-street parking at *Labaid Hospital*. Parking charge is applied only for off-street parking. Though there exists incremental parking charge but in reality, it is not implemented. In realism, a flat parking charge of BDT 30 is imposed. For the first hour, the parking charge for car and microbus is BDT 30 and extra BDT 10 for parking vehicle in the designated parking space for the whole day long. Moreover, there is an additional provision for motorcycle parking adjacent to the building wall (Field survey, 2014).

4.1.1 Off-Street Parking Provision

There are three designated parking spaces for off-street parking in this hospital as shown in Table 2).

Table 2. Existing off- street parking supply at *Labaid Hospital*

Name of the parking lot	Parking Capacity	Parking alignment
Labaid Specialized Hospital	120	90-Degree parking
Labaid Cardiac Hospital	70	90-Degree parking
Labaid Diagnostic Hospital	75	90-Degree parking

(Source: Field survey, 2014)

Table 3. Existing and theoretically required parking supply at *Labaid Hospital*

Name of the hospital	Total floor area (square meter)	Number of floors	Existing Basement area (square meter)	Required Parking area (square meter)
Labaid Cardiac & Diagnostic Hospital	9302	6	1550	713
Labaid Specialized Hospital	7233	6	1205	555

(Source: Field survey, 2014)

According to the Building Construction Act (1996) parking space will have to be at least 23 square meters for each 300 square meters of the total hospital building area. So from the above calculation (Table 3) it can be concluded that sufficient off-street parking space is available in *Labaid Cardiac Hospital* as per parking standard.

4.1.2 On-Street Parking Provision

Apart from three designated off-street parking lots for parking provision, there is no designated on-street parking provision in this hospital. So vehicles are parked on two sides of the road between *Labaid Specialized* and *Labaid Cardiac Hospital* buildings. From the total width around 20 feet carriageway width has been used by illegal on-street parking. At the front side of the *Labaid Specialized Hospital* vehicles are parked in a single or double row just along the Mirpur road. From Mirpur road about 10 feet carriageway width has been used by illegal on street parking. Both perpendicular and parallel parking have been evident in this area. Though on street parking is restricted in this place, the rules are not even upheld.

4.2 Parking Demand and Supply Analysis

In the study of UIDaho (2013), the following formula is used to calculate the total traffic load. So the total traffic load of our study area has been also calculated using the identical formula as stated in Table 4.

$$\text{Parking load (Vehicle - hour)} = [\text{Total number of vehicles parked} * \text{average parking duration}]$$

The capacity is the actual provision of parking space whereas supply is the relative provision of parking spaces over a time. The available parking spaces (designated off- street parking space) in our study area are found 265 in number. Again the parking capacity (supply parameter) is calculated as 241 “space-hour” by multiplying available parking spaces with the average duration (.91 hours) of parking. It denotes that almost 241 vehicles can be parked on the day with available 265 spaces.

Table 4. Parking demand calculation

Parking	Total parked vehicle	Average parking duration (hours)	Parking load(vehicle-hour)
Off-street	429	.91	390.39
On-street	421	.91	383.11
Total			773

(Source: Field survey, 2014)

Demand supply ratio has been calculated as 3.21 which denotes that total demand is around three times greater than available supply over the study period. So the only existing designated off street parking is not adequate enough to meet the demand. As a consequence indiscriminate on street parking occurs in front of the roads of *Labaid Hospital*.

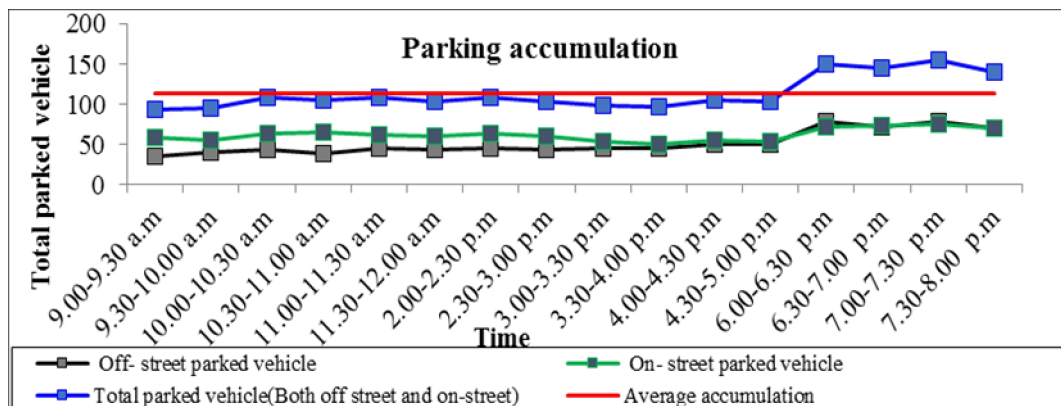


Figure 4. Parking accumulation in *Labaid Hospital*

The above analysis measures the Parking accumulation which gives the information about parking demand for both off-street and on-street parked vehicle. From the accumulation graph of total parked vehicle, it is observed that the highest number of parked vehicle is found between 6:00 pm-8:00 pm. It is also noticeable that the lowest demand for parking is during 9:00 am-10:00 am and 2:00 pm- 4:00 pm. The average parking accumulation is 114.125 vehicles per 30 minutes; which means in every 30 minutes 114.125 vehicles are expected to present as the parking demand.

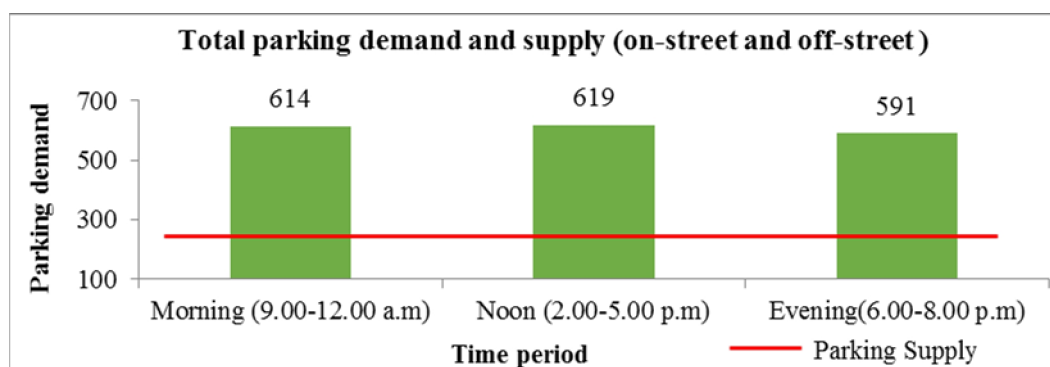


Figure 5. Comparison of parking demand and supply at different periods of time

The analysis demonstrates that total parking demand always exceeds the available parking supply both in the case of on street and off street parking. The basic reason behind this is that there exists no designated or legal provision of on-street parking space in the study area. As a result, the available off-street parking space is solely considered as parking capacity. *Labaid Hospital* has adequate parking space considering the required parking space according to Building Construction Act, 1996. But the available parking space is not adequate to meet the current demand for parking. Again as the demand-supply ratio is high average parking duration for each vehicle can be shortened to cope with the existing demand.

4.2.1 Vehicle-Hours of Occupation

The average duration of off-street and on-street parking is represented in Figure 6. About 50% Vehicle's average duration of parking is 30 minutes. This is because most of the people come to visit their relative patients for a short time. The average vehicle-hour occupation is 0.9135 hour/vehicle. It indicates that on an average one vehicle is expected to stay 55 minutes on the designated off- street parking area.

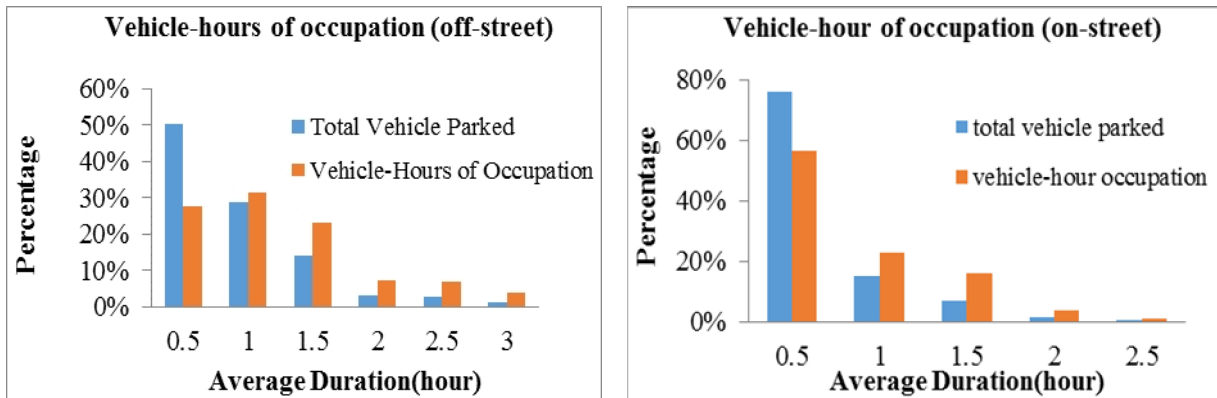


Figure 6. Vehicle-hour of occupation of different vehicle in off-street and on-street parking

4.2.2 Parking Volume and Turnover

Total parking volume over a period of eight hours is 429 vehicles. So, the average volume of vehicular parking is 53.625/hour. That means on an average in every hour 53 new vehicles come into this hospital. Again, there exist 265 available off- street parking space in this hospital. So, parking turnover is 1.62 (429/265) vehicles per space over a time period of 8 hours. It indicates that every space is used by 1.62 vehicles over the time period. This turnover figure represents that available parking spaces are not used efficiently.

4.2.3 Parking Index and Spillover

Parking index indicates the efficiency of parking. It gives an aggregate measure of how effectively the parking space is utilized. The amount of average capacity used is about 19.6 percent. As total parking demand (Off-street) never exceeds parking supply (Off-street); so, there exist no spillover in off- street parking in the study area. As an overall finding, it is found that off- street parking spaces are not used efficiently.

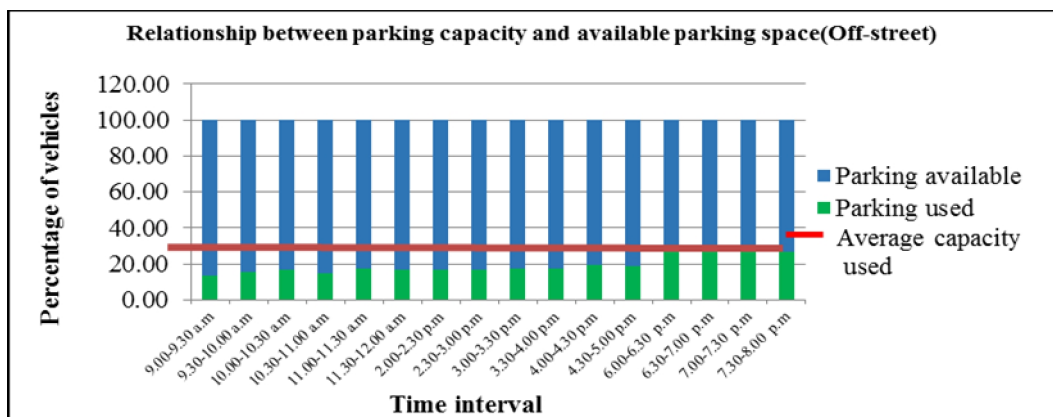


Figure 7. Parking index and spillover

4.2.4 Volume- Capacity Ratio

The average road width (single lane in front of *Labaid Hospital*) of Mirpur road is 52 feet. Among them, one lane remains occupied for on-street parking which reduces effective road width to 40 feet. The reduced width is one of the major reasons behind congestion in this area. To observe the impact of reduced width volume capacity ratio has been calculated as depicted in Table 5. From the study of Haque *et al.* (2011), the existing traffic volume on the Mirpur road has been found 1595 PCU/hr. As per Greater Dhaka Metropolitan Area Integrated Transport Study a standard of 12 feet per lane road width and a capacity of 1400 PCUs/hour for each lane is assumed to compute the change in capacity (DITS, 1994).

Table 5. Volume- capacity ratio of road with and without on-street parking

Effective Carriageway Width (feet)	No. of lane (assuming 12' per lane width)	Standard Capacity per lane (PCU)	Capacity (PCUs/hour)	Service Volume (PCUs/hour)	(V/C) Ratio
40	3.33	1400	4662	1595	0.34
52	4.33	1400	6062	1595	0.25

(Source: Field survey, 2014; Haque *et al.*, 2011)

From Table 5, it can easily be depicted that volume capacity ratio has changed significantly (40%) due to existing on-street parking. So, on-street parking has an important impact on the reduction of effective road width and further consequent traffic congestion.

5 Conclusion and Recommendation

Parking demand management has become a burning issue all over the world. With rapid unplanned urbanization, the number of privately owned vehicles is also increasing alarmingly. In the world's most densely populated city like Dhaka, space for parking is some kind of luxury. This job becomes tougher when most of the car parkers are idling on the parking space because of low parking charges and lack of parking controls. Again, the shortage of off- street parking leads to on-street parking. The scenario is very common in front of the private hospitals and commercial centers. Various innovative policy measures such as- restriction, pricing, fixation of time duration etc. should be practiced to minimize this problem. Parking policy should be strictly maintained and the regularly updated according to the emerging changing situation.

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