

Exploring the Impact of On-street Parking in Chittagong City, Bangladesh

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Abstract

Urban mobility and on-street parking management is a vital challenge in the big cities of developing countries like Chittagong City of Bangladesh. This research explored the on-street vehicle parking situation and its impact on the city dwellers in Chittagong City. Primary and secondary data were processed through descriptive and analytical statistics. The study found that there were very few parking facilities and unplanned urban management for the parking spaces are the main reasons for on-street parking. As an effect, severe traffic congestion, the road gets narrower and the footpath crisis is very common and the drivers are unsatisfied when they drive their vehicles. Passengers are suffering from public transport scarcity transport and women, who cannot avail of overcrowding vehicles and try to avoid it to save from physical harassment. Street neighborhood residents are also the victim of noise pollution, air pollution, accident, and blocked off their business as well as overcrowded people. The tendencies of a rule violation, lack of proper administrative monitoring are the vital reasons behind it. Hence, further investigation and a structural policy are needed to formulate by the city authorities to overcome this situation.

Keywords: On-street Parking effects, Passengers, Neighborhood residents, Driver, On-street Parking Management

1. Introduction

Rapid and unplanned urban population growth in Bangladesh has created many problems. As a result, city administration and the dwellers face many challenges to manage and cope with these. Car parking on the urban street is one of the vital issues which we confront almost every day. It is becoming a critical concern in handling the transportation coordination meanwhile it distresses the complete user-friendliness of a town (Tanzim and Miah, 2016). It is a very common scenario that all types of vehicles (light and heavy) are parked on the street in the big cities of Bangladesh. Besides, faulty traffic signaling systems, inadequate manpower, and narrow road spaces, and the overtaking tendency of drivers create pro-longed traffic congestions (Mahmud et al. 2012).

After capital city Dhaka, Chittagong is the second most congested city due to limited public buses, occupied pedestrian ways by hawkers and shopkeepers, lack of off-street parking, etc. It was found in a study the average travel speed is 10 to 15 K.P.H. throughout the day dropping below 10 K.P.H. during the peak hour due to severest traffic congestion (Hossain, & Imam, 2018). Overuse, long-term, or all-day parking creates a high demand for parking and reduces the roadway capacity & speed of the vehicle. Factually, the city streets are overloaded with present traffic capacity and reached in a state of forced movement and severely congested. And nowadays addition of new problem on-street parking that creates bottlenecks and decreases the effective width of the road; especially in front of different activity centers i.e. shopping centers, educational institutes, hospitals, etc. in Chittagong City (Rahman et al. 2020).

Parking is the function of stopping and intercepting a vehicle and departure it disused. Parking on individual or both sides of the street, however, is commonly permitted. Lack of parking provision along with the improper facility location encourages vehicles to be parked on the street (Banu et al. 2016). Besides, a lack of socio-cultural knowledge in designing road infrastructure and traffic control, drivers are encouraged to street parking (Vesper, et al. 2010). The stream, administration, and assessment of parking directly impact the realization of transport and land-use consequences. Upright parking management is dynamic for the benign and competent process of the road web, supporting the financial progress of a town/ metropolitan and commercial centers as well as enlarged community vehicle use (Council, A. 2015). Transport requires parking space to stop for it's being a place

that people make a special trip or to visit. Parking conveniences besides packages are of substantial prominence in traffic flow manufacturing. Furthestmost people to municipal and province commercial cores are retrieved mainly by cars. The capability of these zones depends on the accessibility of appropriate parking services adjacent to or simply reachable to preferred terminuses, particularly off-street parking conveniences (Russell and Anthony 1999).

On-street parking is defined as parking on the public way and often unrestricted however at some locations roadside controls may be imposed also designated by bays and charges may or may not be taken (Kadiyali, 2006). On-street parking can be advance distributed into street and street-side parking lots. Off-street parking lots discuss distinctive parking lots, parking garage, or parking construction exterior the red contour (Hossain and Ayon 2013). Off-street parking lots can similarly be alienated into outside parking lots and inside parking lots (Roess, 2011). On-street parking is the act of drivers stopping and parking their vehicles in a place restricted by law regulations or in an unauthorized manner. Illegal parking is always one of the serious traffic problems in cities around the world when the number of motor vehicles is increasing (Cullinane and Polak, 1992). It could lead to reduced traffic speeds, traffic volume/capacity loss (quality of traffic flow), delays or local congestions, changes in modal choice, loss of revenue from valid parking spaces, a decline in respect for the law compliance, streetscape, and even to accidents. Also, drivers and pedestrians fall in worse conditions with a poor safety road network due to on-street parking because it reduces visibility and pedestrians cross the roads without following zebra crossing (Nguyen, 2013). Furthermore, parking behavior and parking policy simultaneously contribute to a possible increase or decrease in traffic congestion and, parking problems in the area of residence (Balcombe and York, 1993). Hence, an effective or absence of parking policy results in illegal on-street parking (Mahmud et al. 2012).

Besides, as the vehicle runs in the street as a result parking demand is obvious. The demand for parking is the amount of parking that would be used at a specific duration, room, and cost. Parking demand can change with transportation, land use, and neighborhood demographics and density may change by geographical location. Along with these, it differs from the behavioral characteristics of the parking demand for various trips, locations, and diverse urban areas (Chakrabarty and

Mazumdar, 2010). The convenience of parking space typically depends on the reachable and proper setting as well as the cost of the plot. Too little parking or poorly designed or located parking can result in parking spillover to adjacent areas, lead travelers to choose alternate destinations, and/or inhibit development (Transport Research Board, 2003). In this connection, Chowdhury et al. (2014) focused on their study on the demand and supply of parking system analysis in the Agrabad Commercial Area in Chittagong City, Bangladesh. The study determined illegal on-street parking is increased day by day and the on-street parking has some ill-effects like overcrowding, coincidences, contamination, an obstacle to fire-fighting actions, etc. which are directly involved with the urban neighborhood.

Parking supervision is comprised of numerous strategies and programs that consequence in the more well-organized practice of parking assets (Litman, T. 2020). An appropriate on-street parking management approach and actions very often explain the traffic mobbing difficult. It also relieves shifting claims from on-street to off-street. These schemes can comprehend time restrictions, suitable estimating, and/or enhanced application. Besides, the expansion of substitute ways is mentioned. Rotterdam is a decent case of ever-changing on-street parking to off-street parking (Pressl and Rye 2020). Traffic managers must consider that the travel behavior of customers in admittance to the urban epicenter, involves entree to the several actions with fast then convenience, which meaningfully reduces the phase and charge of transportable with the communal passage scheme (Padon and lamtrakul, 2019). Decent on-street parking controlling can expiration the on-street parking chaos. The situation allows the streets to purpose further efficiently and to be healthier placed. It brands them safe and also is indispensable for every busy area of every town (Barter, 2016). Good parking management can help free up valuable public space, making our cities more attractive; support the local economy; reduce vehicle traffic; improve congestion, road safety, and air pollution; moreover generate revenues to invest in sustainable mobility and urban improvements (Auwerx et al. 2019).

Hence, the literature review revealed that on-street parking gets narrower the roads which have a significant impact on traffic congestion. It is one of the vital causes of traffic mobility deterioration in the cities of developing countries and which are directly and indirectly hamper

the economic development and urban growth directions as well as the lifestyle of the urban neighborhood. The selected study area, Chittagong City is the economic hub and commercial capital of the country and the main seaport. More than 80 percent of export and import were done through this port city (Begum, 2003). As a result, traffic congestion plays a very negative role in the economic development of the city. On-street parking is one of the barriers to increase the movement of vehicles in the city. In this background, this study investigated the on-street parking scenarios, causes and effects, and management issues of on-street parking in Chittagong City, Bangladesh, and the study findings will add an import value how to solve the on-street parking in the city.

2. Materials and Methods

The study has been conducted using both qualitative and quantitative methods. The qualitative methods helped to distinguish the impacts of on-street parking thoroughly. However, the quantitative techniques were helpful to assess the judgment of the respondents regarding on-street parking effects in Chittagong City. The mixed type of questionnaire has been designed flexibly to gather both qualitative and quantitative information. Even though the study was mainly based on the primary data, available relevant reports and studies were reviewed to form a realistic basis for the present research.

2.1 Sites for respondent's survey

Based on the research objectives, three important sections of the road of Chittagong City have been selected for this study. They are Muradpur to Shah Amanat Bridge, which is the main gateway of Bandarban and Cox's Bazar district to Chittagong City; Muradpur to Kalurghat Bridge, which is also the main entry point of some Upazilas of Rangamati and Chittagong district and Muradpur to Hathazari road is the entry point of Rangamati and Khagrachari as well as some Upazilas of Chittagong district (see in [Figure 1](#)). Besides, these three roads also connect the rest of the countries with three hill districts, Cox's bazaar district as well as Myanmar. Along with these, a huge number of vehicles are parked on the street on these three roads every day and traffic congestion is a very common scenario on these three roads. Considering these vital points of these three roads were selected for the data collection sites and records have been composed concluded site-specific studies.

2.2 Data collection

The collection of primary data was made with the help of a structured questionnaire survey among drivers, passengers, and neighborhood residents where they were available on the street. Besides, key informant interviews(KII) were held with the vehicle owners association leaders, drivers association leaders, motor workers association leaders, shopping mall associations leaders, urban planners, traffic police officers, and academicians, etc. Along with these, small group discussions (SGD) were conducted on the important junctions/ stoppages where day-long mass gather prevails and the discussants who instantly present in the study sites., secondary data were accumulated from online journal articles, research reports, books, etc.

2.3 Sample Size

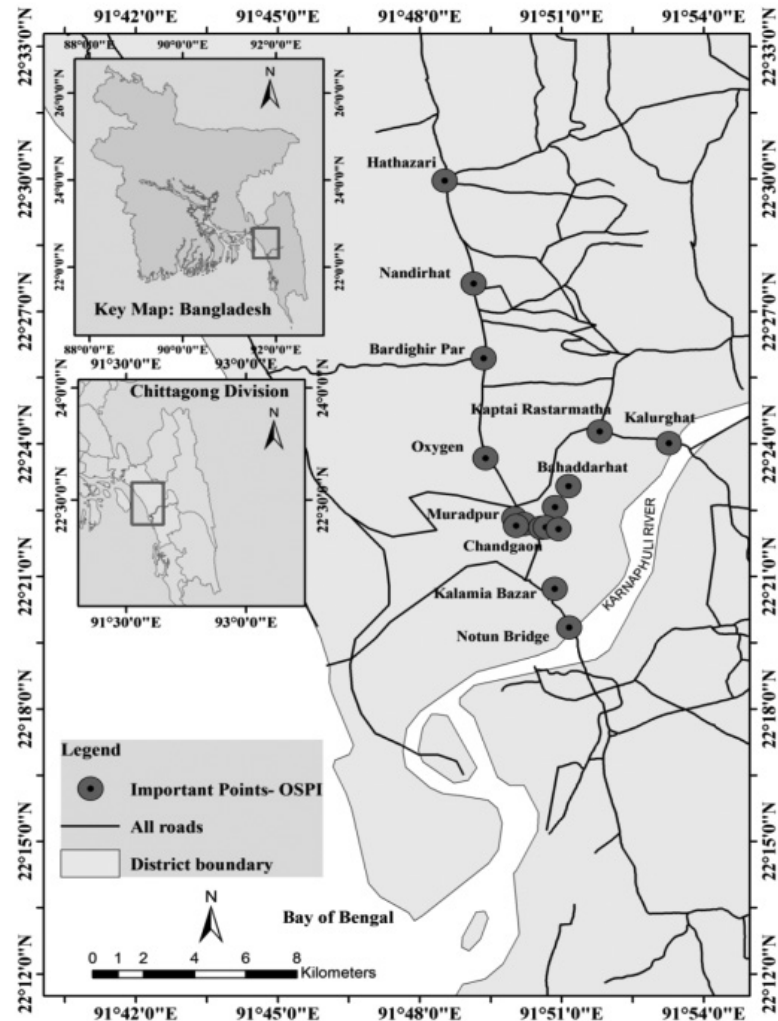
Primary data sample size was designed following the quota sampling technique. Although the sample size is small five categories of respondents were directly involved in the study issue and it helped for triangulating the validity of the respondents' judgments. Table 1 shows the primary data collection sample size.

2.4 Data analysis

Descriptive and analytical analysis (quantitative data) was done by the IBM SPSS (24 trial version) and qualitative data were analyzed through qualitative statements, description, and explanation. In brief, the methodology followed in this research was inductive, with cause and effect analysis in a deterministic way.

And the effects of on-street parking are beside the analysis of variance (ANOVA) test. Figure 1 shows the location of the study area and important junctions of roads where most of the traffic congestion observed and extremely on-street parking is visual. For the research methodology was shown on Figure 2.

Figure 1. shows the location of the study area.



Sampling sites	Drivers	Passengers	Residents	KII	SGD	Total
Muradpur to Hathazari	17	17	17	5	2	58
Muradpur to Notun bridge	17	17	17	5	2	58
Muradpur to Kalurghat	16	16	16	5	2	55
Total	50	50	50	15	6	171

Table 1. Primary data collection sample size (Source: Authors' calculation, 2019)

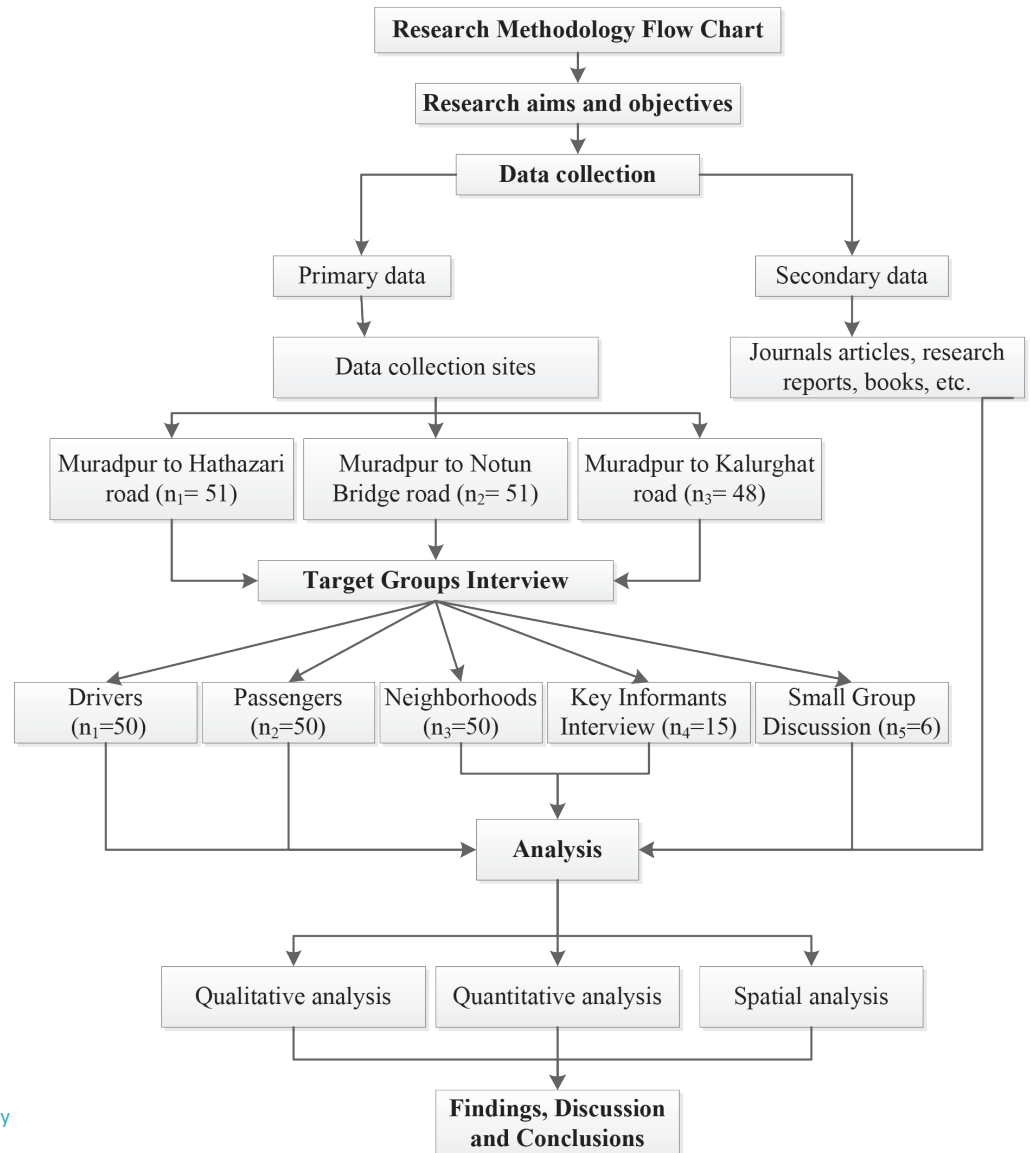


Figure 2. Research methodology flow chart

3 Findings and Discussions

3.1 Usual area of parking

The essential for a better mechanism of parking has advanced as a result of growth in motor traffic and predominantly in the possession and usage of secluded cars. When evaluating a strategy to accomplish high-quality expansion, a design-lead attitude is taken to the facility of car-parking space that is well-integrated with a high-quality communal dominion and paths that are pedestrian, cycle, and

vehicle-friendly. In this regard, in most developing countries like Bangladesh, access to particular parking spaces is rare; drivers practically have to find alternative ways to park their vehicles. In most cases, it is illegal but very few times it may be legal. This study found that usually most of the vehicles are parked on the street (65.38%) and the rest of the vehicles are parked in front of the shopping mall (16.66%), petrol pump (13.33%), and open spaces (4.63%) respectively.

Hence, most (95.37%) vehicles are parked on the street in Chittagong City, and in Beijing, it was found 70% (Yan-ling, et al., 2016). Here it should be mentioned that parking in front of shopping is also on-street parking and in the petrol pump is similar to on-street parking. However, in a spatial context, there is some variation also found among the three sites of study areas. In the Hathazari to Muradpur road, on-street parking behavior is very high due to low land on both sides of the roads, and on Muradpur to Notun Bridge road; on-street parking behavior is comparatively low because of having a few shopping malls and also has some vacant land near the roadsides (see in Figure 3). On the other hand, Muradpur to Kalurghat road, on-street parking is at a moderate level as a result of has some planned residential and heavy industrial areas.

3.2 Problems faced while driving

Drivers face many obstacles while driving vehicles on the street. Among various problems in driving, parking is one of the vital issues in developing countries' cities. It could be said that there is very little access to particular parking facilities in many cities in developing countries like Bangladesh. As a result, traffic congestion is common and the drivers are not happy when they drive their vehicles. The current study also found several types of problems in the field survey while drivers drive the vehicles. It demonstrates that most of these problems forced the drivers to stop their vehicles on the street. Drivers' point of view, the problems those drivers face while they drive were traffic police harassment (88.24%), traffic jam (70.59%), lack of parking facilities (41.18%), and accidents (17.65%), etc. correspondingly. Figure 4 shows the drivers who face problems while driving in Chittagong City.

Along with these, noise and air pollution, mental unrest, etc. issues were exposed while drivers drive the vehicles (15.49%) respectively.



Figure 3. On-street parking and traffic congestion in Chittagong City

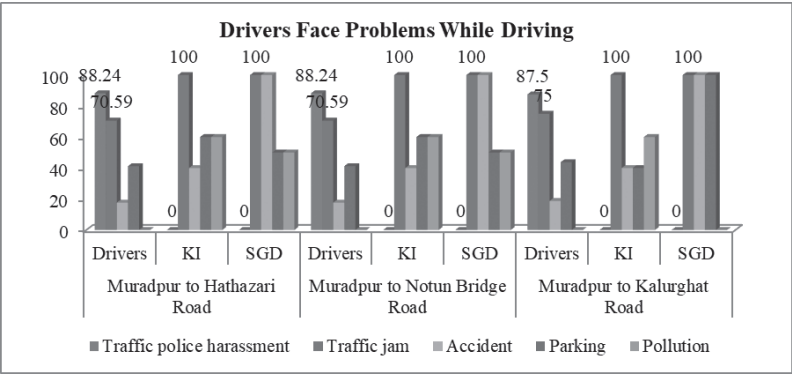


Figure 4. Problems faced while driving in Chittagong City

3.3 Reasons for on-street parking

Public and private transports make a vast volume of vehicles movement in the urban areas although private vehicle denotes further than two-thirds of entirely the voyages approved available in great municipalities in city zones. The great volume of traffic in municipal regions indicates the presence of cramming which is one of the most significant difficulties for transport engineers. Among various causes, bottlenecks are one of the utmost shared details for congestion consequence and on-street unlawful parking. There might be

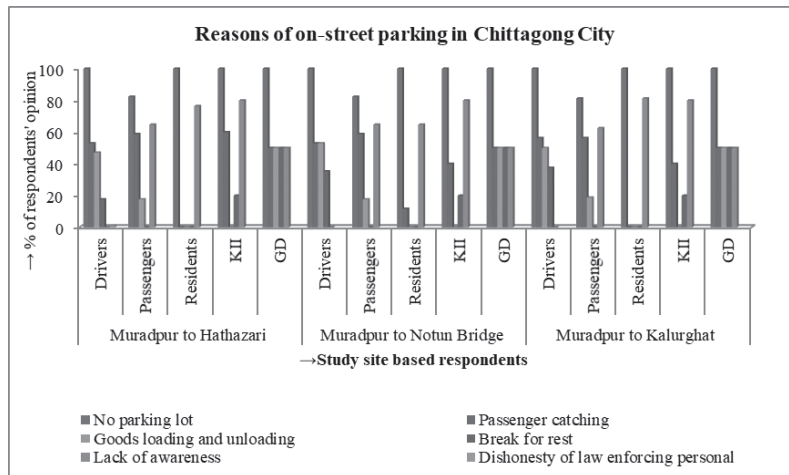


Figure 5. Reasons for on-street parking

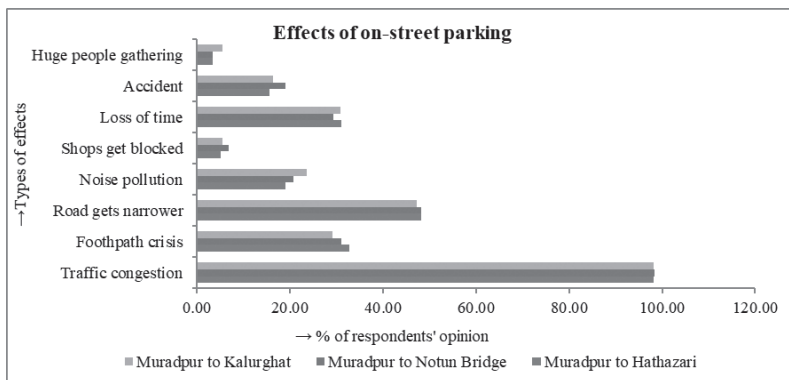


Figure 6. Effects of on-street Parking

various reasons for on-street parking in Chittagong City. The study found that no parking space (94.74%) is the main cause of on-street parking in Chittagong City. Besides, other reasons for on-street parking were passenger catching or dropping (39.77%), lack of awareness (driver and passengers) (49.12%), goods loading and unloading in the middle of the road (21.64%), dishonesty of traffic police (intentionally harassing drivers for illegal money as well as negligence of law enforcing) (22.23%), break for taking rest (12.28%), accordingly.

Drivers from all of the study sites' opined no parking space is the main reason for on-street parking and a majority of the passenger, KI, and SGD discussants also supported the opinion of drivers. Hence, creating parking space and implementation is a crying need in ensuring to prevent on-street parking. Figure 5 demonstrates the reasons for on-street parking in Chittagong City.

3.4 Effects of on-street parking

On-street parking is permanently one of the severe traffic complications which might lead to compact traffic hustles, traffic capacity/capability loss (quality of traffic flow), interruptions or resident congestions, changes in modal choice, damage of revenue from legal parking spaces, deterioration in esteem for the decree agreement, streetscape and level to accidents, etc. The research revealed that traffic congestion (98.18%) is very common and it's the major effect of on-street parking in Chittagong City. All types of respondents (drivers, passengers, and neighborhood residents) have acquiesced to this issue. Along with this, other types of on-street parking effects were found roads become narrower (47.27%); footpath crisis (29.09%); noise and air pollution (23.64%), shops get blocked (5.45%), loss of time (30.91%), accident (16.36%) and huge people gathering (5.45%), etc. correspondingly. Figure 6 reveals the effects of on-street parking in Chittagong City.

In considering the site-specific effects of on-street parking, the study showed that traffic congestion is the major effect in all three sites of the study areas and it was agreed by all types of respondents as well. Then roads become narrower and loss of valuable time were two more vital effects of on-street parking and it was equally found in two study sites and slightly low in one study site. The study demonstrated that due to the on-street parking footpath crisis is higher in Hathazari road and moderate in Notun Bridge road and lower effects in the Kalurghat road.

Besides, noise pollution effects were also found in deviation among the sites. More noise was created due to on-street parking at Kalurghat road and less noise was in Hathazari road because of available open spaces and trees near the roadsides. Other effects (accidents, huge people gathering) have a slight variation among the three study sites. In addition to analysis of variance (ANOVA) was conducted among the three major types of respondents (drivers, passengers, and neighborhood residents) to determine the on-street parking effects in Chittagong City. It should be mentioned here that respondents were requested to tell three major effects of on-street parking. Based on the respondents' opinion, the ANOVA results were given in Table 2. The ANOVA of the three study sites demonstrated that the effects of on-street parking are equally influenced (traffic congestion, roads become narrower; footpath crisis) in the city areas. Almost all three types of respondents similarly mentioned the effects of on-street parking and the ANOVA also showed the same result. Although some types of effecting factors (noise pollution, shops get blocked, loss of time, accident, and huge people gathering) deviate in the context of second and third effects.

3.5 Effects of on-street parking on passengers and neighborhood residents

Many kinds of research confirmed that on-street parking reasons threats and raises the threat of road manipulators and neighborhood residents as well. As the earlier section of the study mentioned that on-street parking effects are in several ways especially creating traffic congestion which ultimately stops or slows down the speed of the vehicles. Bearing in mind the on-street parking effects, furthermost of the conveyance designers still deliberate the exclusion of on-street parking as the easiest to augment the capability (Biswas, et al., 2017) and the security of an urban road. This study found that due to on-street parking creating huge traffic congestion, public bus scarcity increases (38%), and passengers are bound to avail of the overcrowded public transport. Women most of the cases cannot avail of public transport due to overcrowding vehicles (12%) and they try to avoid these types of congested transport afraid off to be the victim of physical harassment. It should be mentioned that there is no separate public transport for women and usually economically disadvantaged women cannot get the benefit of public transport.

Table 2. Analysis of variance (ANOVA) on the effects of on-street parking (Source: Authors' calculation, 2020)

Effects of on-street parking		Drivers					Passengers					Neighborhood residents				
		Sum of Squares	df	Mean Square	F	Sig.	Sum of Squares	df	Mean Square	F	Sig.	Sum of Squares	df	Mean Square	F	Sig.
Effects 1	Between Groups	.000	2	.000	.	.	.000	2	.000	.	.	.000	2	.000	.001	.999
	Within Groups	.000	47	.000			.000	47	.000			2.820	47	.060		
	Total	.000	49				.000	49				2.820	49			
Effects 2	Between Groups	.012	2	.006	.005	.995	.030	2	.015	.024	.977	.115	2	.058	.144	.866
	Within Groups	54.408	47	1.158			29.750	47	.633			18.765	47	.399		
	Total	54.420	49				29.780	49				18.880	49			
Effects 3	Between Groups	.298	2	.149	.174	.841	.120	2	.060	.043	.958	6.623	2	3.311	.656	.524
	Within Groups	40.202	47	.855			65.000	47	1.383			237.397	47	5.051		
	Total	40.500	49				65.120	49				244.020	49			

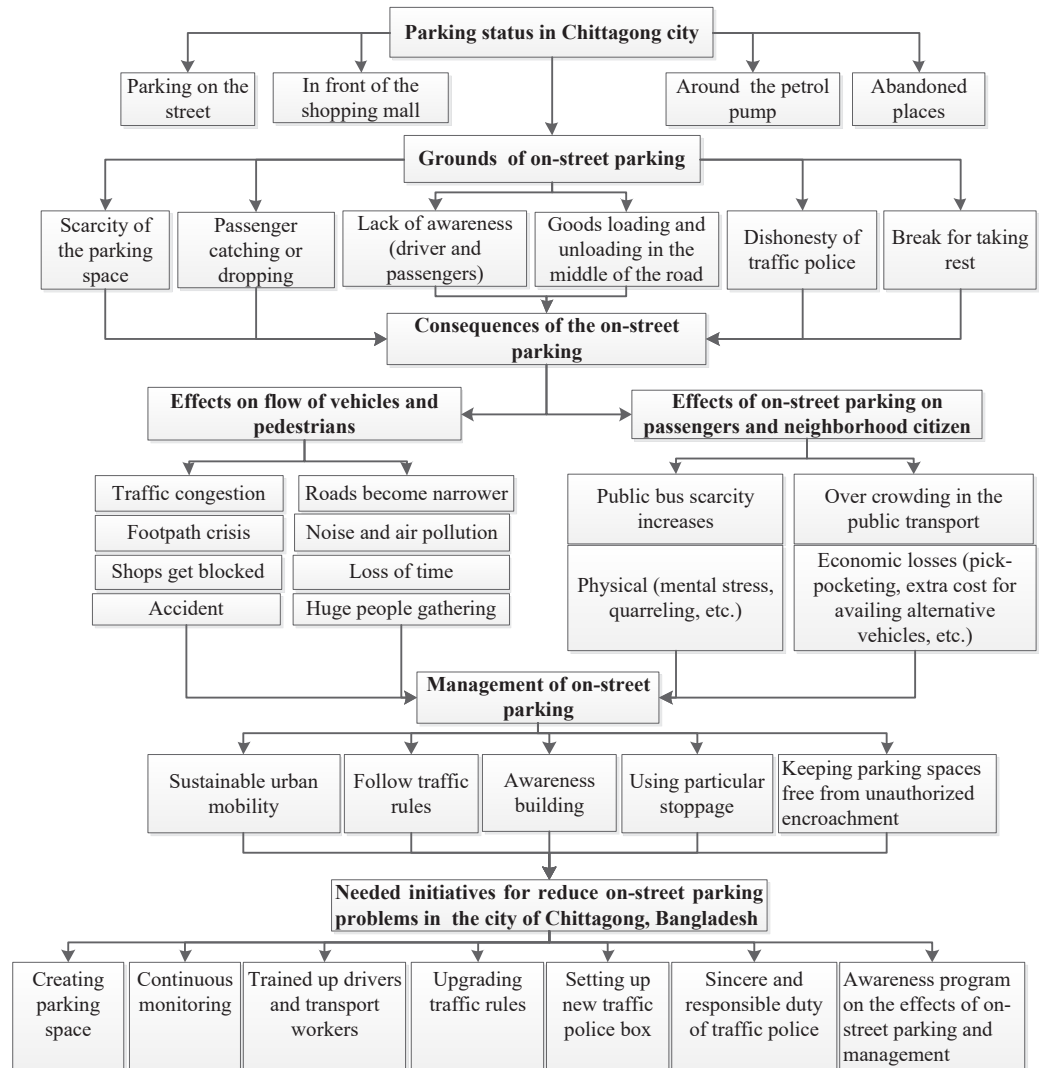


Figure 7. Parking status in Chittagong city

Hence, availing of public transport has consequences physical (mental stress, quarreling, etc.) and economic losses (pick-pocketing, extra cost for availing alternative vehicles, etc.). Besides, the effects of on-street parking in the neighborhood residents also have multi-dimension. They are the victim of noise pollution, air pollution, accident, and blocked off their business as well as overcrowded of people.

3.6 Management of on-street parking

On-street parking management supports the broader off-street parking structure and inspires more ecological urban movement. Good on-street parking administration is necessary for every demanding zone of each municipality. On-street parking management affects the method, position, technique, and interval of parking laterally roads to safeguard that such parking is used competently and is reliable with broader goals for the street, for the area, and the transport system.

The study revealed that there are very few parking spaces in Chittagong City; the management of vehicle parking for the drivers is very challenging. There are usually three-dimensional issues of on-street parking management: drivers following traffic rules, passengers' awareness to catching the vehicle or dropping in the specific location, and above all, monitoring and implementation of traffic rules by the law enforcement personnel. The study suggests that in assuring sustainable urban mobility, it is needed to follow traffic rules (44.67%), awareness building regarding the effects of on-street parking (18.67%), using particular stoppage for rest and passenger catching or dropping (15.33%), and keeping parking spaces free from unauthorized encroachment (2.67%) respectively. Furthermore, it is urgent needs to create parking space (100.00%), continuous monitoring by the legal authorities (61.90%), trained up drivers (38.10%), and upgrading traffic rules, and setting new traffic police box to monitor on-street parking rules violation (54.76%), and sincere and responsible duty of traffic police (90.48%), etc. respectively. See Figure 7 the flowchart was shown the parking status in the Chittagong city.

4. Conclusion and Recommendations

Rapid urbanization and motor vehicle growth are creating various problems in modern urban life, especially in developing countries' cities. On-street parking also is making several complications in the mobility of city dwellers and hampering the quality of urban life. The reasons for on-street parking in Chittagong City were no available parking space, passenger catching in the middle of the road, lack of awareness (passengers and drivers), goods loading and unloading in blocking the roads, dishonesty of traffic police (intentionally harassing drivers for illegal money as well as negligence of law enforcing), break for taking rest, etc. On-street parking is one of the major problems in Bangladesh as well as in Chittagong City which is the root of many serious problems such as traffic congestion, narrowing footpaths, accidents, pollution (noise and air), etc. Besides, due to huge traffic congestion public bus scarcity increases, and passengers are bound to avail of overcrowded public transport. Women in most of the cases cannot avail of public transport because of overcrowding vehicles and they try to avoid these types of overcrowded transport afraid off to be the victim of physical harassment. It should be mentioned that there is no separate public transport for women and usually economically disadvantaged women avail of public transport. Hence, the availing of public transport

has consequences physical (mental stress, quarreling, etc.) and economic losses (pick-pocketing, extra cost for availing alternative vehicles, etc.). Besides, the effects of on-street parking in the neighborhood residents also have multi-dimension. They are the victim of noise pollution, air pollution, accident, and blocked off their business as well as overcrowded of people. It is urgent needs to create parking space, continuous monitoring by the legal authorities, trained up drivers, and upgrading traffic rules and setting up new traffic police box to monitor on-street parking rules violation, and sincere and responsible duty of traffic police, etc. as well as generating awareness regarding the effects of on-street parking, using particular stoppage for rest and passenger catching or dropping, and keeping parking spaces free from unauthorized encroachment respectively. Finally, further investigation and a structural policy and planning are needed to formulate by the city authorities to overcome this situation.

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