STAMFORD UNIVERSITYBANGLADESH
DEPARTMENT OF CIVIL ENGINEERING

A COMPARATIVE STUDY ON MASS TRANSIT SYSTEM (BUS) IN DHAKA CITY

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A project and thesis by

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In partial fulfillment of the requirements for the degree c
Bachelor of Science (B.Sc.) in Civil Engineering

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DECLARATION

We, Mohasin Kamal, Saidur Rahman, Raijul Hasan and Alamgir Hossain the student of B.Sc. in Civil Engineering hereby solemnly declare that, the works presented in this thesis & project has been carried out by me and has not previously been submitted to any other University / College / Organization for any academic qualification / certificate / diploma / degree.

We warrant that the present work does not breach any copyright.

We, further undertake to indemnify the University against any loss or damage arising from breach of the foregoing obligations.

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DEDICATION

We dedicate this thesis to our parents and to all of our honorable faculties of Department of Civil Engineering, Stamford University Bangladesh.

ACKNOWLEDGEMENT

The research ‘A Comparative Study on a Mass Transit System (bus) in Dhaka City’ has been conducted in partial fulfillment of the requirements for the degree of Bachelor of Science (B.Sc.) in Civil Engineering. This critical work came to life due to the unconditional help and co-operation in different ways by many people. We express our gratefulness and thank them for their assistance in preparation of this project and thesis.

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ABSTRACT

The specific objectives are to investigate the facilities & service qualities provided by some selected bus service. We conducted questions answer survey by passengers, drivers and helpers at various point of our selected routes and selected bus service. The study was mainly aimed at identifying the transport facilities in Dhaka city. Through there are fixed stoppages for every particular bus this is hardly maintained due to pick people from any paths resulting in increasing delay time during one trip. In peak hour maximum buses provide local services. As a result it fails to meet the mobility .The seat capacity of private buses is better than public buses. According to people opinion private transports provide more facilities although fare rate is higher. From survey it is observed that, private car reduction, ticketing system, improving traffic system and management, increasing Bypass road, and modification of the transport planning system can be helpful to increase the use of buses. Weak public mass transport, ineffective traffic control, the mix of motorized and non –motorized vehicles, poor road condition, illegal parking and the presence of hawkers contribute to excess traffic congestion and ineffective use of buses. The passengers also had given some suggestions about improvement of bus service. These are Improve maintenance system, Increase seat capacity of buses, Arrange sitting service and ticketing system.

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LIST OF ACRONYMS & ABBREVIATIONS

BRTC = Bangladesh Road Transport Corporation

BRTA = Bangladesh Road Transport Authority

BRT = Bus Rapid Transit

DRT = Demand Responsive Transport

ICD = Inland Container Depot

LED = Light Emitting Diode

TOD = Transit Oriented Development

MT = Mass Transit

CHAPTER ONE

INTRODUCTION

CHAPTER I

INTRODUCTION

1.1 General

Dhaka is the capital city of Bangladesh which covers 1528 sq. Km area of the country. It represents huge population is about 20 million with high growth rate at 3.62% yearly. This large population is creating additional pressure on services including mass transit system (Bangladesh Bureau of Statistics). Dhaka is one of the organically developed cities in the world and urban planning did not receive any good response from public policy level. In Dhaka, both motorized and non-motorized transports ply on the same road, no well organised mass rapid transport, very weak traffic management system, no parking policy, lack of co-ordination and co-operation among the different government and non government departments for ensuring an efficient mass transport system. Traffic congestion has dominant characteristics and well known scenario in Dhaka. Eighty seven percent (87%) mass transits including buses and minibuses ply on the roads in Dhaka violating traffic rules, according to survey of a passenger platform. There are almost 5500 public buses plying in Dhaka city, taking its millions of commuters across one end of the capital to the other every day and night. Comprehensive and efficient transportation systems with good inter and intra city linkages are essential to ensure Dhaka's position as a modern city and to serve the administrative, financial and commercial capital of the country. The city must be able o provide an efficient and equitable transport infrastructure which will allow all members of the community equal access so that everyone can enjoy the minimum benefits of city life. The current chapter of the structure plan report analysis the current transport problems of the city and makes policy proposals for a fully integrated multimodal transportation system integrating the entire metropolitan region. There is also huge freight transport movement from and to Dhaka due to location of railway and river Inland Container Depot (ICD) within the city, and a major whole sale market. Much of the freight transport movement within the main city can be reduced with relocation of industries outside Dhaka and decentralization of wholesale trade activities. There are only four access links to Dhaka City, and because of absence of access controlled arterial road/bypass, entry and exit to Dhaka becomes a nightmare. Dhaka is perhaps the only city of its size that almost totally lacks bus transport with reasonable capacity, let alone other form of mass transport system. According to the two Dhaka city corporations, there are 79,554 licensed rickshaws in the capital. However, the actual number is estimated to be around 1.1 million rickshaw create serious problems. These vehicles fight for street space and negotiate constantly with cars, buses and pedestrians. It is likely that the problem will grow even worse considering the still low levels of motor vehicles per thousand inhabitants. If bus transit is going to become a more effective part of Dhaka's transportation system, these challenges need to be addressed.

1.2 Objectives of the Study

The objective of the study is to develop a concise about the mass transit facilities in Dhaka city. For this purpose the number of buses was collected at selected route. The buses are (Turag, BRTC A/C, Anabil, Raida) in the selected route.

1. To investigate existing mass transport facilities at the study area.
2. To gather information about the existing road traffic condition and physical condition of the study area.
3. To suggest some measure to improve the existing condition.

1.3 Limitations

We had faced some problems for collection data. These are given below:

1. Weather condition.
2. For questioning survey the passengers, driver and helper they were not too much cooperative.
3. Bus owners association were not interested to give us the information.
4. Data for some day was collected due to time contains however it is necessary to collect data for whole year for exact data result.

1.4 Organization of Thesis Works

Chapter ONE: The first chapter is introduction which discusses the general information, objectives, limitation and approaches of the survey work.

Chapter TWO: It is the literature review, which discusses the basic concept of mass transport.

Chapter THREE: It discusses about site selection and work procedure.

Chapter FOUR: The Four chapter is data analysis which we are Survey of mass transit of Dhaka city.

Chapter FIVE: It presents the conclusions and recommendation.

CHAPTER TWO

LITERATURE REVIEW

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

This article reviews the literature on current "best practice" principles for planning Mass transit networks within the context of planners seeking to transition their cities toward sustainable mobility. An overview is provided of the history of ideas about network development. The emerging frontiers for multimodal, demand-responsive mass transit and the potential implications of new transport technology on traditional mass transit are discussed. The future role of transit-oriented development within mass transit network structures is considered. The "moderators" to network design that may impede future best practice brings the article to conclusion.

2.2 Historical Evolution of Mass Transit Systems and Their Governance

There is a significant diversity in the establishment and characteristics of urban mass transit networks around the world, dictated by their urban growth periods and investment plans relative to the prevailing mass transit technology of the time. In the rapidly industrializing cities of the nineteenth century and early twentieth century tram or streetcar systems, in larger cities supplemented by heavy rail, became the mainstay of urban mobility and exercised a critical influence on the growth patterns of cities (Newman andKenworthy2015). After World War I, buses and trolley buses became more common and, particularly after1945, replaced tram systems in most of North America, the United Kingdom (UK), France, Australia and New Zealand. In other continental European countries and the (former) Soviet Union, many tram networks survived and now form the backbone of mixed light rail and bus networks. Since the 1970s, numerous Western cities where mass transit had become bus-dominated reintroduced light and/or heavy rail systems, most notably in France, Spain, the United States, and Canada. In recent decades, mass transit has featured as a cornerstone of inner-city renaissances and redevelopment projects internationally. The globally diverse histories of urban transit in cities have resulted in a considerable variety of system ownership and Management structures. The fragmentation or consolidation of organizational control and the regulatory and operational arrangements that arise from them is a key differentiating factor of mass transit systems globally. Often, this contrast is most obvious where services are either publicly controlled, or regulated through a single agency, or provided by individual organizations competing within a competitive market In the nineteenth century, it was common for mass transit operators to be private entities and to engage in integrated economies of infrastructure construction, transit operation, and land development During World War I and the economic crises that followed it, many such private operators struggled and, in continental Europe Canada, and Australia, commonly moved into public ownership so their essential service to the community could be maintained independently of commercial considerations and fares controlled for social equity. In the United States and the UK, nationalization generally did not occur until after 1945, when cities started adapting to the automobile and mass transit lost significant market share to private vehicles. Since the 1970s, and partially in response to competition from cars, it has become common for mass transit operators of different jurisdictions or government tiers to coordinate or integrate their fares, services, and planning in regional transit associations in order to achieve greater efficiencies and present a more user-friendly interface to the public . Since the 1980s, a renewed trend toward privatization of the mass transit industry has seen the re-emergence of private operators particularly in Europe and Australasia (White 1995, 1997). Outside the UK, however, these private players generally continue to operate under the coordination of regional transit agencies and have a role in service delivery rather than in configuring the network.

Today's resulting systems can be assessed on a spectrum, based upon their degree of formalized central control. In many cases, the degree of such control also extends to the realm of land use planning. At either end of this spectrums it's the archetypal model of network governance type—the "free market" and the "centrally planned". The free market model is characterized by the presence of informal, multi provider systems; where a large number of providers compete in a deregulated market, operating individual vehicles, lines, or on-demand transportation services. Services may range from owner-operated "par transit" jitneys to entire bus or subway systems (Del Maestro and Behrens 2015). Lines are likely planned to cater for the most profitable demand, with no necessary consideration for broader network context, though providers do have some incentive to connect to other transport infrastructure. Individual providers may swiftly meet new or changing demand patterns, leading to an organic state of service provision. However, unregulated service patterns caused by the confluence of several competing providers within a limited roadway can induce congestion, such as the bus bunching that can be observed in Hong Kong's or Edinburgh's urban core . Electronic ticketing technology enables providers to offer inter operator transfer compatibility, but this requires a coordinating effort on behalf of a superior planning agency which is not necessarily in place or has the resources or authority to take such efforts. Very large operators with significant capital power, such as Tokyo's many privatized railway providers, have strong economic incentives to conduct their own development around transportation infrastructure investments. Otherwise and particularly in the case of bus systems, the interaction of these services with the urban fabric may be limited, as lines and stops often lack physical permanence. Unless specifically legislated, operators may not enact disability access or universal user legibility standards. Operators and individual drivers may also operate recklessly, driven by profit motives. The centrally planned model is characterized by permanent, fixed, legible systems, managed by a single organization or government entity, providing integrated fare systems and system programming. Depending on governance, this model may enable highly integrated long-term land use planning, where effective interagency governance structures exist-though in reality, this is far from universal, as transport and land use planning continue to follow processes with limited coordination in many cities. While private enterprise is likely to respond to changing demand patterns, government planning may include consultation and public participation processes and allow contemplation of issues and strategies at the network scale. Planning with reference to the other lines in the network can reduce overlaps, preserving operational resources. However, network changes may become politicized and public investment in new routes or services may falter, particularly in neoliberal political climates. Politically driven piecemeal route deviation decisions may increase route circuitry, resulting in poorer network speed. Strategic regulation of providers can enable mitigation of common service problems, such as bus bunching, by reducing conflicting decisions and by implementing central control technologies. Ticketing is much more likely to be integrated, allowing for fare incentives such as free transfers or system wide time discounting. Services provided by governments are likely to have mandatory disability standards, and legibility standards can be consistent across services, particularly to cater for marginalized users or tourists. Examples in the literature describe the formalization and consolidation of fragmented systems, particularly those in developing cities, into more cohesive, planned networks. Collaboration of small independent providers into cooperatives is an alternative reform strategy, though competitive forces can limit reform out comes. In some cases, formalization of previously fragmented demand-oriented systems into "modern" formalized networks may reduce mobility for some users, as the system becomes inherently less flexible and less able to rapidly meet changing demand patterns. There is an inherent loss in flexibility and rapid adaptability of direct services, sacrificed in the trade-off for legibility and permanence. Some scholars argue, therefore, that providers must balance both network efficiency and social equity goals. This is not to say either, that two diametric system typologies cannot complement each other; Ferro, Munoz, and Behrens (2015) suggest that informal par transit providers and small transport companies may compliment large formal networks by acting as feeder services. Indeed, Alpkokin et al. (2016) find that new light rail lines installed in medium Turkish cities were more successful when existing private bus system operators reoriented their services to feeder networks.

The prevailing view in the literature is that centrally managed systems are most desirable, as they allow for the strategic allocation of resources, and can be integrated in the land use planning process, thus stimulating land development investment. In a broad review of mass transit across thirty-three European cities, Florio, Florio, and Perucca (2013) found that single-provider systems are associated with higher levels of user satisfaction than free-market systems with multiple providers. Operational problems (such as roadway bottlenecks) can be better addressed, and route design can be focused on providing legible and consistently accessible services, even to those unfamiliar with the network.

Ideally, a single public sector agency should retain control of network design, ticketing, and branding as those elements are central to high-quality outcomes. Governments may then still "privatize" operations by contracting the operation of services at the direction of that authority. In these cases, or in public–private partnership projects, wise contract dictation, careful design of incentives, and effective ongoing contract management are pivotal to mitigating risk, optimizing operations, and ensuring good outcomes for users . The importance of system simplicity cannot be understated as passenger turnover can be generally very high (Nielsen et al. 2005, 29). Mass transit systems competing for mode share with the private car need to reduce barriers to access in order to maintain competitiveness. Ease of use maximizes the scope of potential user groups and mass transit's ability to serve tourists, for whom making inner-urban trips depends on a degree of user legibility Ease of use of transit systems is closely correlated with satisfaction among tourists and incidental user groups (Thompson and Schofield 2007, 142). Good experience during incidental use is likely to encourage later use and potentially longer-term mode choice habits (Hung Wei and Yuan Kao 2010). Information technology may assist users to navigate an unfamiliar system, though evidence suggests that preterit public transportation way finding systems may not themselves encourage mass transit use (Farag and Lyons 2012, 91). Hence, an easy-to-understand network is a pivotal foundation upon which a broader urban accessibility system is best built.

2.3 Network Design and Multimodality

While different ownership and governance approaches have seen diversity of mass transit delivery over time, it is possible to identify common mass transit network morphologies. These are described in this section together with a consideration of the purpose of mass transit lines and a discussion of the current best practice network type including a discussion of new mass transit modes.

2.3.1 Network-oriented Planning

The radial, central city emphasis of traditional hub-and-spoke mass transit networks, oriented to service central city commuters, has been the subject of much criticism within the literature over a considerable period.

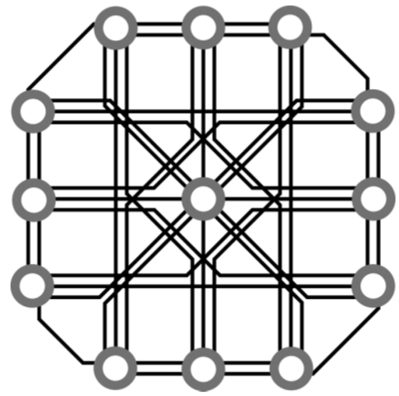


Figure 2.1: Ubiquitous network. Adapted from Thompson (1977, 160).

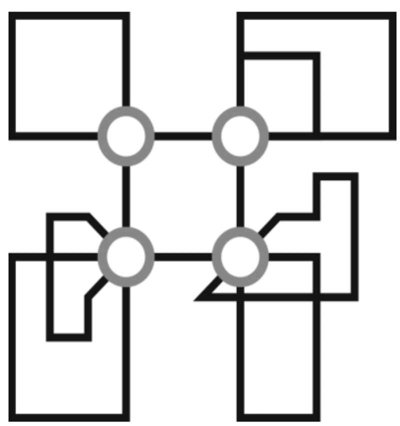


Figure 2.2: Timed-transfer network.

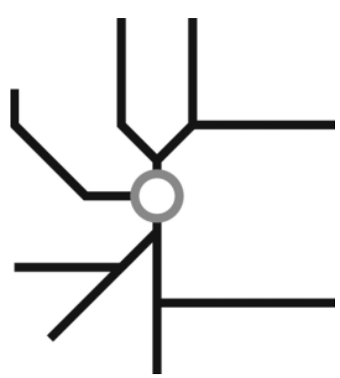


Figure 2.3: Radial network. Adapted from Thompson (1977, 160).

Radial systems with lines that terminate in the city center instead of continuing through to an opposite line are particularly poor at delivering mobility, because no cross town travel can be made without a centralized transfer (Mees 2000, 237; Nielsen et al. 2005, 120). Radial networks also centralize most transfers, even for orbital trips between suburban destinations. The decentralization and spatial diffusion of a large subset of employment and activity away from central cities during the second half of the twentieth century (Watkins 2014) to locations beyond mass transit access (based on the expectation that these places would be served instead by private car in the era of the "modern city") have left many traditional radial mass transit networks poorly equipped to service prevailing trip demand patterns. Network analysis with accessibility tools highlights the pressure placed on inner-urban links of radial networks, which make the network highly vulnerable to any disruption or sudden increase in patronage (Curtis and Scheurer 2016).

The prevailing commuter-oriented system design philosophy of the modernist era was informed and influenced, at least in part, by the well-documented reluctance commuters have toward transfers (Lawrie and Stone 2015). Three models exemplify such designs: Ubiquitous/distributed. This is characteristic of Mees' (2000, 104) "Bangkok" model, where a service is likely to exist (or may be requested), albeit at very low frequency, or on a highly meandering route, indirectly servicing a litany of destinations. This model seeks to eliminate transfers (Figure 1). Timed transfer hub. Where coordinated "pulse" time tabling is mused to allow passengers to switch between services at specific interchanges (Lawrie and Stone 2015, 2; Scheurer, Curtis, and Bell 2014; Thompson 1977). This model seeks to concentrate and limit interchanges (Figure 2) Radial. Where all trips are to or through the urban core, at moderate frequencies servicing central city commuter trips directly. This model reduces transfers for central business district commuters and centralizes all others at inner-city stations (Figure 3). Network design planning embraces effective transfers seeking to improve rather than eliminate them thereby introducing a fourth model (Figure 4). Rather than emphasizing their impedance, Chowdhury and Cedar (2016) describe the function of transfers in increasing accessibility by expanding destination choices and reducing the duplication of parallel routes headed to different destinations, thereby saving operational resources.

In this sense, perpendicular transfers are particularly advantageous— creating maximal accessibility benefits—while parallel transfers represent inefficient duplication of routes along a shared segment grid/network. Where high frequency direct services are available in a mesh like structure enabling rapid interchange at almost any intersection point. This model disperses transfers, using frequency and service directness to compensate for in convenience. The grid network morphology was initially conceived within a hypothetical grid-shaped urban structure (Thompson 1977), illustrated most pertinently in Mees' (2000, 139) famous "Squaresville" thought experiment. Squaresville illustrates that a grid of services can deliver access between any two points with no more than a single transfer. In advocating for the grid/network typology, Mees (2000, 138) hypothesizes the "network effect," whereby such a large, multidestinational grid-like system, operating at adequate line frequencies, drastically increases mode share of mass transit by offering relatively direct access to a multitude of distributed location.

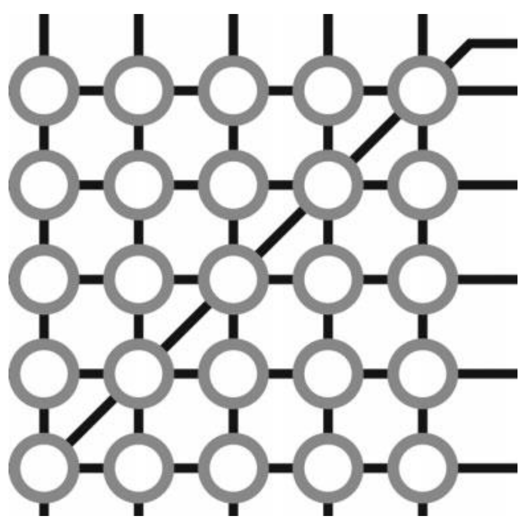


Figure 2.4: Grid network. Adapted from Thompson (1977, 161)

High frequencies ensure relatively quick transfers and can reduce the need for passengers to contemplate timetabling. Increased operating costs are offset by the overall increase of passenger fare-box revenue, through increased patronage (Imran and Matthews 2015, 64). Later refinements propose the layering of hierarchical route structures to further optimize the network model (Currie and Tivendale 2010; Dodson et al. 2011, 12). Central to the network model is the elimination of duplicate or competing routes, redistributing resources into either increased frequency along a consolidated single line or elsewhere in the system. Within the constraints of available resources, network route planning has to balance competing goals. Walker (2008) characterizes the two main goals: patronage outcomes and coverage outcomes. Patronage goals tend to emphasize financial return, efficiency, or overall mode shift, whereas coverage goals place emphasis on providing geographic equity or meeting the needs of disadvantaged or reduced mobility groups. Mass transit provision choices should be made with a clear appreciation for which goals should be given preference (Walker 2008; Nielsenetal. 2005, 19). Systems which have evolved across a long term period of fragmented decision-making may lack any cohesive direction toward any particular strategic goal (Dodsonet al. 2011, 16) and may exhibit duplication and waste which can be reallocated to improve overall service for no additional cost (Pucher et al. 2005, 46). Individual routes designed in an incremental, incoherent fashion are likely to be circuitous, lack directness, and fail to play a significant role within the network (Huang and Levinson 2015; Mees 2000, 239; Walker 2008). Put simply, the fundamental principle of network-oriented mass transit is that every route should effectively, efficiently, and directly service a specific flow of passengers, interlinked within the system to provide maximum transfer accessibility Evidence continues to mount in support of the network typology. El-Hifnawi (2002) found that introduction of cross town orbital routes over an existing radial system in Monterrey, Mexico, could result in significant mode shift and, therefore, ameliorate traffic congestion, reduce travel costs, and curtail externalities. While square-shaped topologies are typically used to illustrate grid networks, more recent research suggests that fractal triangular network structures may be an improvement, depending on local geography (Bell 2015). Networked systems are optimistically considered a means by which car dominance and petroleum price vulnerability might be ameliorated (Stone and Mees 2010). Increasing mass transit mode share has various well-documented (Hickman, Ashiru, and Banister 2010) social, economic, and environmental benefits, particularly as rail-based mass transit modes are broadly much cheaper to construct and operate than the same capacity in private motor cars (Glaze brook 2009). The network effect's tantalizing promise of competitive journey times between a wide range of destinations has seen it adopted as best practice, adopted in the influential HTrans guide to mass transit network design (Nielsen et al. 2005, 84; Dodson et al. 2011). Nielsen's guide has informed several network redesigns internationally (Imran and Matthews 2015; Mees et al. 2010).

2.3.2 Multimodality in Urban Transit Networks

Effective mass transit systems must employ several transit modes to perform different accessibility roles within the network (Krygsman, Dijst, and Arentze 2004; Vuchic 2007). Different modes have different accessibility attributes and are thus each suited to performing specific mobility roles of individual lines within a network. Strategic hierarchical and multimodal distribution of mass transit route investment is essential to achieving economically efficient operations (Currie and Tivendale 2010). In a review of thirty four mass transit projects in the United States, Zhang (2009) calculated the cost of light rail infrastructure as 2.64 times more than bus rapid transit (BRT), and metro rail around 12.82 times more expensive than BRT, per distance unit. Modeling supports the economic feasibility of successive upgrades to mode types along routes, as the catchments undergo urban succession and maturation. Xu and Lin (2016) find that successive upgrades to routes from BRT to light rail to metro is a cost-effective approach to urban development in dense Chinese cities. Recent literature further emphasizes the varied application of on-road mass transit modes depending on service context. Particularly in sprawling cities, bus routes should be designed to serve a specific mobility purpose within a broader hierarchical network (Devney 2014), rather than deploying buses in a heterogeneous mesh of local services.

The introduction of new or improved mass transit services can promote significant mode shift. Mode shift may generally be much higher in fringe areas, where existing service provision and network access is low (Ho and Mulley 2014). Evidence from Paris suggests that investments to improve the speed of bus links in the outer suburbs yield significantly higher network benefits than increasing the speed or capacity of metro lines near the center of the city (Bureau and Glachant 2011), further emphasizing the promise of non radial network effects. This also supports the notion that network-oriented systems require fewer expensive inner-city infrastructure investments than heavily radial systems. The degree to which a system attracts “low involvement” discretionary patrons (who make casual or poorly informed decisions of mode choice) determines the viability of the system (Hung Wei and Yuan Kao 2010); therefore, expanding high-frequency lines across a city is likely to initially capture some latent demand and gradually encourage residents to form habits centered on transit.

2.4 Embracing and Managing Transfers

Inherently, “grid” or “network” mass transit systems necessitate transfers at a dispersed range of intersecting nodes throughout the city. While transfers are recognized as inconvenient and undesirable, almost all mass transit trips will involve some form of change between modes. Short transfer times are universally critical to encouraging users to accept multimodal mass transit trips. Stated preference surveys conducted on Dutch train commuters by Schakenbos et al. (2016) found that eight minutes is an optimal acceptable transfer time, though preferences vary substantially between demographic groups, travel purpose types, and geography. Other survey data from Santander, northern Spain (a regional area of 250,000 inhabitants), strongly support mass transit waiting time as the most significant metric influencing user mode choice (dell’ Olio, Ibeas, and Cecin 2011). Lawrie and Stone(2015) suggest that, for car-centric, low-density, suburban oriented postwar cities (such as those commonly found in the United States and Australia), between four and ten minutes is an optimal transfer time period. They suggest that reluctance to transfer is influenced by previous experience of low-quality transfers. Thompson’s (1977, 162) grid model was based around frequencies of less than ten minutes. Research in New Zealand found that users were willing to make transfers provided that overall journey time was shortened, and preferably where transfer locations offered a high level of physical comfort. Recurrent in the literature is the need to contemplate trips door-to-door (Aarhaug and Elvebakk 2015), with appropriate interventions to the design of the public realm. It is well established that personal safety fears are an influential factor in discouraging mass transit use (Currie and Delbosc 2013; Delbosc and Currie 2012). Increasing the degree to which older people or limited-mobility persons believe they are capable of accessing transport networks is an important element in encouraging sustainable mobility usage (Ryan, Wretstrand, and Schmidt 2015). The quality and amenity of interchange facilities are significant to improving journeys for passengers, especially in larger, sprawling cities, where trips are more likely to necessitate transfers (Hernandez and Monzon 2016). However, urban design is no panacea or substitute for a high-quality network. Iseki and Taylor (2010) found that passengers would prefer a shorter wait for a better service in a low-quality environment, rather than a longer wait for a less regular service in a high amenity environment. They conclude: "In sum, we found that transit users tend to care more about personal safety and frequent reliable service than the physical conditions of transit stops and stations" (Iseki and Taylor 2010, 24). While time spent transferring is generally undesirable, time spent while riding mass transit services may have some utility for commuters (Ettema et al. 2012). Interviews of young commuters in the UK suggest that an emerging competitive attribute of mass transit is that passengers may derive some usefulness from their travel time particularly with the increasing iniquitousness of portable computing and social media (Line, Jain, and Lyons 2011).

2.5 New Technology and Complementary Nontraditional Mass Transit

Informal services and on-demand modes have a long history of complementing formal systems by acting as feeder services (Ferro, Mun˜oz, and Behrens 2015; Alpkokin et al. 2016). However, the potential impacts of new and innovative transportation services and modes on traditional mass transit networks remain unclear. New transportation technologies range from publicly owned (such as subsidized bike share systems), new private enterprise services (taxi-like ride sharing), new private products (electric and autonomous cars), and contemporary forms of co-ownership, like car sharing. These modes respond to demand in novel ways and have been characterized as post for distributed systems (Glover 2014). The potential effects of ride sharing on mass transit patronage are unclear. Some evidence suggests that on-demand ride services may replace a proportion of mass transit trips (Rayle et al. 2016), while there is also the potential for ride sharing to feed passengers onto traditional mass transit systems. Despite the anticipated promulgation of self-driving cars and a diversified market of on-demand transport services, rail transport may be likely to retain speed and price competitive advantages between key urban centers, owing to the modes inherent speed and efficiency (Glazebrook 2009). While traditional mass transit may have to compete with new modes, it may itself adapt through the application of improved management technology. Nelson and Phonphitakchai (2012) describe the application of "Demand Responsive Transport" (DRT), responsive and flexible rebooked bus services, in being especially effective in servicing very local trips for concessionary users. Forms of DRT, such as "dial-a-bus" services, have existed in various forms for several decades, though increasingly ubiquitous communication technologies are improving services by significantly optimizing operations. Liu and Ceder (2015) describe the popularization of "customized" bus services in thirty cities across China, illustrating the competitiveness of the mode against the private car, particular in dense, congested cities. Li and Quadrifoglio (2010), in contrast, point to the rapidly mounting operating costs of DRT services, in comparison to the greater economies of scale achievable with fixed-route transit, in conditions of higher passenger demand. Bike-sharing schemes may increase the catchment of traditional fixed mass transit lines, especially in low-density areas.

Table 3. Potential Future Public Transport Network Multimodality.

Core, High Capacity Network	Interchange Extension	
	Publicly Managed Investments	Private Investments
Grade-separated heavy rail	Demand-responsive transit routes	Taxis, on-demand chauffer services, ridesharing, car sharing
Light rail Bus rapid transit Strategic/ targeted local bus routes	Bike share Pedestrian realm improvements, cycle networks	Autonomous (self-driving), electric cars

Orat city fringes (Ja¨ppinen, Toivonen, and Salonen 2013; Martin and Shaheen 2014). Autonomous cars or ride-sharing servicescould also be considered a form of demand-responsive transportation (Milakis, Van Arem, and Van Wee 2015). Applicationof DRT for specific user groups or mobility purposes is therefore a possible mechanism for militating against the reduced spatial coverage of consolidated patronage-oriented network systems that Walker (2008) describes. In this sense, DRT could form an additional layer to formal mass transit systems absorbing much of the sporadic demand that previously meandering low-frequency buses inefficiently served. The provision of such modes integrated with traditional mass transit systems is a tantalizing prospect for the future of sustainable mobility. One potential extended urban passenger mass transit network is detailed in (Table 3).

2.6 Integrating Mass Transit with Land Use Planning

Increasingly, multimodal passenger transport in cities is likely to see greater spatial proliferation of transfers. The likely nature of resulting transfer development matches the postmodern spatial planning structures that have been increasingly popularized and applied to improve transport sustainability across metropolitan regions since the 1990s (Curtis and Olaru 2010, 53). Planning at the neighborhood level, encouraging self containment (i.e. people working close to home rather than undertaking long commute journeys), and transit-oriented development (TOD) are foundational concepts that fit within a framework of designing places within a polycentric network of neighborhood transfer points. The distribution of new local transfer points poses immense opportunity for new urban center developments at new route intersections, while multimodal networked mass transit systems also pose new opportunities to increase the effectiveness of existing stations and TODs. The implementation of networked systems may trigger a new phase of polycentric, networked cities, with a patchwork of mixed-use, increasingly self-contained precincts (Curtis 2006). The role of TOD is multifaceted, and the functions of an effective TOD are inextricably interlinked. Effective TOD can have multiple benefits. It will introduce mixed land uses and improved “place” qualities through station infrastructure and public realm investments (Bertolini’s [1999] place in his node– place concept). It can also act as an exemplar and catalyst for denser development locally and concentrate residential catchments around interchange points (Mees 2014; Vale 2015). A review of twenty-seven BRT projects in various international cities by Cervero and Dai (2014) identified that cost minimization in infrastructure provision results in suboptimal urban development outcomes around stations, illustrating the relationship between service provision and reciprocal private land investment.

TOD can improve the multimodal transfer potential of the existing network, often triggering a reconfiguration of nearby transit services (Martinoivich 2008; Mees 2014, 462; Scheurer, Curtis, and Bell 2014, 7). TOD can drive private land investment creating the potential for value capture, where uplifts in property prices attributable new transit infrastructures are harvested through taxation instruments or public or private development initiatives that contribute to the cost of infrastructure investment (McIntosh et al. 2017). On the other hand, others have found that value uplift and consequent redevelopment created by improved transit services may threaten affordable housing and the social equity associated with it (Jones and Ley 2016, 19; Moore 2015). Rezoning initiatives triggered by the infrastructure installation may further exacerbate the process of gentrification. Rayle (2015), however, highlights that there is little empirical evidence of displacement of lower-income residents at TODs, contending that the effects may be subtle, highly complex, or difficult to measure. Nonetheless, any housing affordability externalities caused by transport investments can be alleviated through affordability requirements for new buildings (Dawkins and Moeckel 2016). Clearly, planners must grapple with the challenge of ensuring any land value benefits that arise from improved mass transit infrastructure are distributed equitably. TOD further enables residential self-selection, whereby people most likely to utilize mass transit decide to reside proximate to stations (Mokhtarian and Cao 2008). It can improve the polycentricism and multidestinationality of the city's mass transit system (Cats, Wang, and Zhao 2015) and "lock-in" long-term transit level of service by both fixing infrastructure investment and creating a population reliant user who will oppose service cuts (Newman). The original and simple concept of TOD has been subject to considerable advances in planning literature since Calthorpe's (1993) and Bernick and Cervero's (1997) early influential works. Bertolini's (1999) node–place model provides an excellent nexus for the evaluation and balancing of the mobility and land use functions of a station precinct. However, subsequent research has emphasized the need to evaluate a broader diversity of TOD typologies (Cats, Wang, and Zhao 2015; Kamruzzaman et al. 2014). Vale (2015) expands on the node–place model by incorporating pedestrian network analysis to further differentiate between pedestrian-oriented residential "dormitory" TODs and more transfer-oriented multimodal TODs. Even simple analytics such as drawing walk able catchments around interchanges have been widely used to evaluate the success urban development planning around stations (Allan 2014; Curtis

2005).Australian evidence shows that introduction of TODs tends to increase the modal diversity of local commuters (illustrate that patronage gains can be maximize regardless of station type by improving walking and cycling adjacent to the interchange. The potential for individual TODs as a "silver bullet "approach to retrofitting low-density car-centric regions is relatively limited in comparison to the potential for multimodal feeder systems to expand the reach of the system more broadly(Curtis 2012b; Martinoivich 2008; Mees 2014; Meesand Dodson 2011, 17). Even in high-patronage heavy rail TOD precincts in already dense cities, the percentage of train passengers who walk directly to railway services is relatively low, compared to those who arrive by feeder bus services (Mees2014, 467). In contrast, both and find that the majority of passengers embarking on to Melbourne's radial commuter rail network are walking to stations from nearby residential properties and suggest that patronage gains could be attained through improved multimodality in a more networked, transfer-oriented structure. Following Bertolini's node–place model, Mees (2014) describes historical examples of TODs as either:

-prioritizing local urban design amenity (for TOD sdesigned for maximum residential concentration), often neglecting multimodal transfer potential—Bertolini's "unbalanced place" or prioritizing multimodal transfer potential (such as railor bus interchanges or the classic "Park and Ride" station type)—Bertolini's "unbalanced node."

Advocates of rail's competitive advantage over highways have supported the development of park and ride stations, particularly in car-oriented cities (Martinoivich 2008). Park and ride railway stations, often separated from the surrounding unban fabric are dichotomous opposite of urban TODs, comprising few nearby residences and little urban amenity (Mees 2014, 465). Examples of railway stations in low-density suburbia in Perth, Australia, attract up to two thirds of railway passengers from feeder bus services, with most of the remainder arriving by private car (Mees and Dodson 2011, 17). However, TODs realize their full potential to discourage car travel when they function as a both destination and an exchange point, rather than a dormitory or surface car park along a single line. Cats, Wang, and Zhao (2015) compared Stockholm's station precincts by commuter flow data, finding that only a small subset of station precincts attract inward mass transit passengers through active land uses they attribute this failure to transition to a more multimodal network as stalling the realization of mixed-use polycentrism. Chorus and Bertolini (2016), in contrast, investigate rail movement and land use development patterns in the larger and (concerning mixed-use polycentrism) more successful agglomeration of Tokyo. They highlight the importance of dedicated strategies and synergistic collaboration of public and private actors to diversify and intensify land use in a string of sub centers along a rail corridor in order to optimize the performance of the rail service and the land use system alike. Hence, TODs should exhibit a degree of interconnectivity to at least two mass transit axes, enabling transfers, and destination land uses. This notion reflects the rationale behind the earlier Dutch national spatial policy, which aimed to develop settlement intensification and transport networks in a mutually supportive process, thus understanding both the urban–regional geography and its transport infrastructures as components of an integrated network (Bertolini and Le Clerq 2003; Bertolini 2005; Van der Bijl and Hendriks 2010). Commercial centers at and adjacent to mixed-use TODs will attract trips from adjacent areas beyond the core railway corridor. In instances where little networked connectivity and interchange potential exists, those trips are likely to be made by car, increasing the need for parking, resulting in a suburban-style urban environment, and diminishing the effectiveness of TOD (Mees 2014, 463; Vale 2015). Thus, there is a risk that poorly designed TODs will merely replicate car-oriented suburban centers or act as car dependent highway interchange proxies. The influence of new mass transit system investment on land use is mixed and not well understood (particularly where regulatory control is weak). Further, it is useful to acknowledge these tensions in the challenge of measuring system performance.

Mass transit system planning and design outcomes may be measured only in terms of the direct outcome of transit ridership, or they may also be evaluated with reference to the more indirect benefits of land use change, and the complex interactions between transit, communities, economic activity, and the environment. Historical analysis in New York suggested that the subway acted as a long-term agent of economic decentralization (King 2011). More effective land use planning adjacent to stations along new rail projects in Europe amplifies their regenerative effects (Mejia-Dorantes and Lucas 2014, 251). However, Chatman and Noland (2011) note that there remains limited evidence to support the hypothesis that mass transit improvements induce economic agglomerations, suggesting that city form and local factors are likely to be overwhelmingly influential. This is congruent with Curtis and Mellor (2011), who found that for firms located close to a new commuter railway, their location decisions do not appear to be influenced by opportunities created by the railway. Some authors have also stressed the importance of developing communities of regular users along mass transit routes not only to ensure continued ridership but to create a political bloc to withstand budget cuts or negative service changes (Newman n.d.). The increased value of properties resulting from the transit infrastructure (McIntosh et al.2017) should also be a force to further consolidate local support for the line (Rodrı´guez and Mojica 2009). We contend, therefore, that the lasting permanence of urban development approaches, in conjunction with high-frequency rail or high quality fixed BRT systems, will build immunity to reductions in the level of service, particularly compared to low-quality meandering bus routes of radial or ubiquitous network types, further contributing to user certainty, legibility, and the realization of network effects Activity corridors have also been promoted as a form of linear TOD model, suitable for implementation in the "Greenfields" along existing arterial roads (Curtis and Tiwari 2008; Jones, Marshall, and Boujenko 2008). Activity corridors are likely to become increasingly common, owing to the comparative affordability of on-road modes (Zhang 2009). They may also be an effective tool in transitioning car-reliant park and ride stations to multimodal TODs, by creating substantial linear catchment corridors, feeding the station with transit passengers. Activity corridors also mirror emerging international trends for strategic roadway planning, such as the removal of grade-separated urban highways and the conversion of arterial roadways to more multimodal boulevards in Stockholm and Helsinki (City Planning Department of Helsinki 2013). The importance of direct, rapid, and networked mass transit lines should also be a relevant subject for consideration in street network design and structure planning processes, particularly where surface modes are likely to pass through. The land use density required to feasibly support relatively high-frequency mass transit services without excessive subsidies hasbeen the subject of considerable conjecture (Curtis 2012a; Mees 2000, 146). Such debates, though often highly context dependent, are likely to partially discount the less quantifiable benefits of transit, and Mees (2000) hypothesized network effect. In any event, these different examples serve to remind us that designing future mass transit systems must account for the complexity of relationships with land use and planning and with multimodal transport systems. The future is shaping up to being creasing multimodal, with a broader diversity of modes and transfer types. To remain effective and efficient, we assert that mass transit systems must not be planned in “silos” where land use planning may be “blinkered” but instead must be planned as part of increasingly sophisticated urban systems.

2.7 Implementation

The most ambitious goal of any mass transit system is to compete with the private car (Nielsen et al. 2005, 24), and thus, cities must decide the degree to which mass transit will competitively address passenger mobility demand. Many cities implicitly make this decision through the allocation of institutional power and associated infrastructure prioritization, albeit tempered by the effect of path dependencies (Curtis and Low 2012; Vigar 2002). From the above, it is evident that mass transit has limited scope to attract discretionary users if it cannot offer frequent services, convenient transfers, and access to a broad range of destinations comparable or close to the car. These immense tasks are much less feasible without adequate investment. Comprehensive network redesign, coupled with increased investment, poses the greatest potential for improving sustainable urban mobility options. Small local improvements, such as individual bus lanes, are unlikely to yield substantial ridership benefits to the broader network in isolation (Bureau and Glachant 2011; Pucher et al. 2005, 47). However, improving line speeds by signal priority, rationalizing stops, providing segregated rights-of-way, and reducing delays caused by ticketing and boarding reduce operational costs by reducing the number of vehicles required to deliver the desired line frequency (Martinoivich 2008, 17; Hensher 2007, 101). These dividends can then be reinvested to further gain network effects, by extending lines further into fringe areas, where there may be greater latent patronage to be absorbed (Ho and Mulley 2014). Additionally, if speed and reliability can be managed, increasing the length of lines (while maintaining directness) further improves accessibility because the scope of destinations that can be reached on that line without a transfer increases (Nielsen et al. 2005, 120). Other innovative operational optimizations, such as the strategic placement of standby bus fleets, can be employed to improve individual network performance characteristics, such as resistance to stoppages or debilitating events (Pender et al. 2014). Considerable research has been undertaken to maximize the operating efficiency of public transportation (Vuchic 2007). Many researchers have suggested the optimization of networks through the application of highly sophisticated mathematical network models (Guihaire and Hao 2008). Big data created through the emergence of electronic ticketing can be used to inform evidence-based network design (Tao et al. 2014). Data mining techniques can also provide insights into transportation networks in near real time (Gal-Tzur et al. 2014). While these sophisticated mathematical models and computational optimization tools are useful, qualitative, experiential, and consultative methods are also critical to designing both transit systems and the urban fabric around them (Napper, Coxon, and Allen 2007; Walker 2008). High-level strategic transportation issues cannot be solved through only engineering approaches, since the sophisticated multidimensionality of urban transport cannot be compartmentalized into individual solvable parts (Cascetta et al. 2015). Qualitative research is also important in assessing transport access equity, since factors which inhibit travel (such as perceived safety, timetable legibility, or obstacles in the pedestrian realm) may not be evident in census data or GIS analysis (Blair, Hine, and Bukhari 2013, 194). For example, service delays caused by passengers with luggage may be entirely imperceptible in computational optimization modeling, remaining overlooked without observational or communicative investigations (Napper, Coxon, and Allen 2007, 5).

2.8 Inherent Weaknesses of Mass Transit System in Dhaka City

2.8.1 Inherent Weaknesses and Challenges

Proper land use and transport planning, adequate well oriented functional road network and optimum operational capacity is the key elements of the sustainable, safe, efficient transport system of a city. Ensuring of this system is now become a great challenge in the Dhaka Metropolitan City for the immense land use and transport planning, road network and functional and operational inherent deficiencies and weaknesses. Some of these weakness as well as challenges for sustainable development to cater with the forthcoming demand are listed below:

2.8.2 Land use and Transport Planning Population Growth

Dhaka City has been witness a tremendous growth in population and physical expansion. Urbanization in Dhaka is essentially a process of migration from rural and smaller towns. After the liberation of Bangladesh in 1971, the development processes of Dhaka City rapidly increased and the population has grown very fast and the forefather of the city or city authority could not predict the population of the city will jump in such dramatic way. The great example of that is the master plan of 1959 which was developed assuming 1.75 percent of annual growth rate of population but actual growth rate of the city is almost three and half times higher than the assuming rate (8 percent per year). The accommodation and shelter facilities did not grow with the growth of population results haphazard and unplanned colossal identified development of the different areas of the city to survive in the limited areas.

2.8.3 Development and Impact

Urban land use planning and policy, integrated and co-ordinate transport network development, protection of environmentally sensitive areas are the issues discussed only in seminars and research papers but unfortunately very little practical measures have been under taken to provide integrated and efficient transportation facilities, safeguard ecologically vulnerable areas and to control development of the mega cities. As a consequence, city is expanding in an unplanned and uncontrolled way with haphazard land development, destroying natural flood plains, depression areas for storm water drainage canals, even the encroachment of river is taking place. Outcome of such reckless conversion of urban land results unrecoverable default land use, non-integrated transport transportation network, huge traffic operational and management disturbance, in frequent and devastating flood, water logging, reduction of ground water recharge area, destruction of recreational and scenic areas and lose of biodiversity with intolerable traffic jam. Whenever there is no comprehensively planned development of a city and all the development is controlled by speculative motives. It is obvious that the present lopsidedness of land use reflects the inequality of the existing socio economic structures.

2.8.4 Regulate and Control

Though several planning documents have been prepared to regulate and control development but in reality the application and execution of the proposed policies in not worth mentioning. Failure of government intervention to guide and control land development process is primarily responsible for uncontrolled conversion of wetland to urban use. The other problem is that if a city does not grow according to a guideline, than the whole system gradually collapses.

2.9 Conclusions

Effective mass transit networks are legible, coordinated and frequent, and utilize transfers to service a diverse range of trips across urban areas. Formal mass transit networks should be multidestinational, providing access across cities along rapid, direct lines, especially for orbital trips. Lines which travel to the city center should continue through, and, where possible, most lines should extend to the city periphery, particularly where line speed can be maintained. Demand-responsive modes of transportation (such as bike sharing, ride sharing, autonomous cars, and demand-responsive buses) can broaden the catchment of formal mass transit systems, and service sporadic travel demand patterns which cannot be efficiently met with traditional bus or train services. This potential for demand-responsive modes to make up the “first mile” or “last mile” of trips, and to service sporadic late-night trip demand, may enable formal transit providers to reorient their service resources to providing very efficient, frequent networks. Interestingly, the concurrent recent expansion of informal transportation options in highly developed cities, and the coordination of some previously fragmented lines into more formalized networks in developing cities, may be indicative of the emergence of a common passenger transport system typology in cities globally. We infer that almost all cities might be tending toward a typical archetype, where formal rail and BRT do the heavy lifting of moving large flows of people, in a high frequency, multidestinational network, while the informal and on-demand sector compliments the system, expanding catchments in low-density areas, and servicing obscure trips at obscure times which mass transit cannot efficiently serve. We conclude that transfers and the interplay of multiple modes must play an increasing role in informing land use and urban design policy, especially proximate to new transfer nodes. Implementation of such transformative mass transit futures requires a regionally oriented approach, interagency collaboration, and should exploit the symbiotic benefits of mass transit and urban development to achieve the best possible outcomes. In all, the findings of this systematic review support the paradigm of mass transit oriented urban mobility and provide an optimistic insight into the future of sustainable travel in city.

CHAPTER THREE

METHODOLOGY

CHAPTER III
METHODOLOGY

3.1 General

To accomplish the research on Mass Transport Facilities at selected road in Dhaka City some particular survey works are needed. In this regard we surveyed and collected data at selected road to permit a suitable termination. It was quite impossible to cover the whole city due to time and resource constraints. While selecting the bus route it was considered that its considered the whole city. The major bus service providers operating the selected route were considered for this study. While selecting the bus providers at selected route local service was considered.

3.2 Methodology of Study

Methodology of study refers to a systemic process; it is a systemic process of performing the study. For proper analysis of study, systematic procedure of performing the study plays an extremely importance rule. The method of performing the study is as follows:

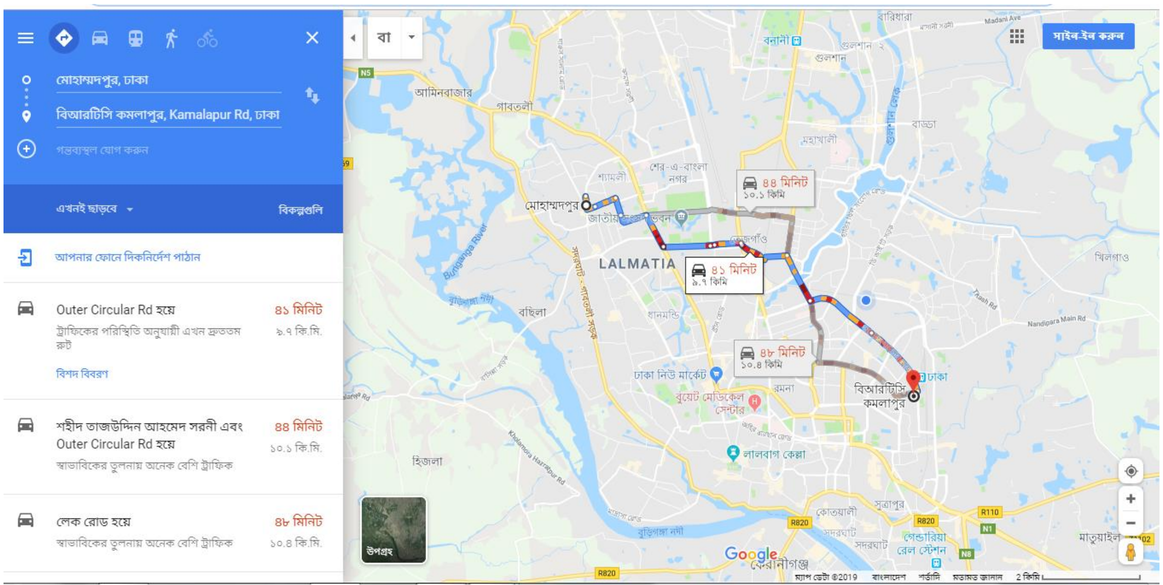
- First step is identifying the objective and selection of the study area.
- Then, survey is performed. Primarily reconnaissance survey is done.
- After that, field survey is performed.
- In addition to that, data is collected from relevant sources.
- First survey includes on bus terminal survey and questionnaire survey.
- Finally, from data analysis and survey, Result & Discussion, conclusion and recommendation is given.

3.3 Site Selection

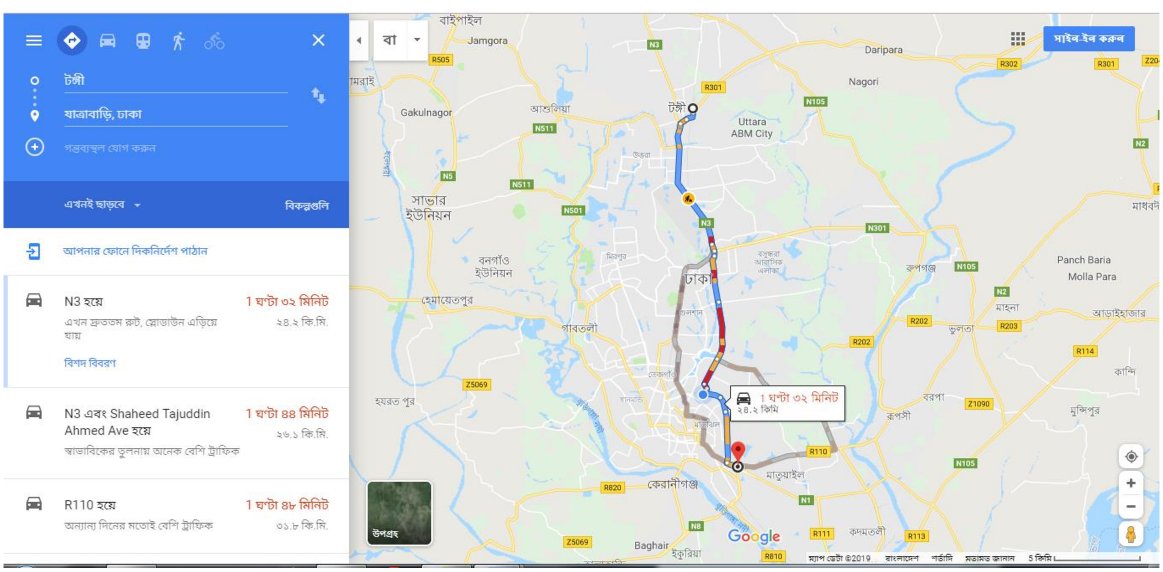
We have selected the area. The area is Mohammadpur to Kamlapur and Tongi to Jatrabari.

Map:

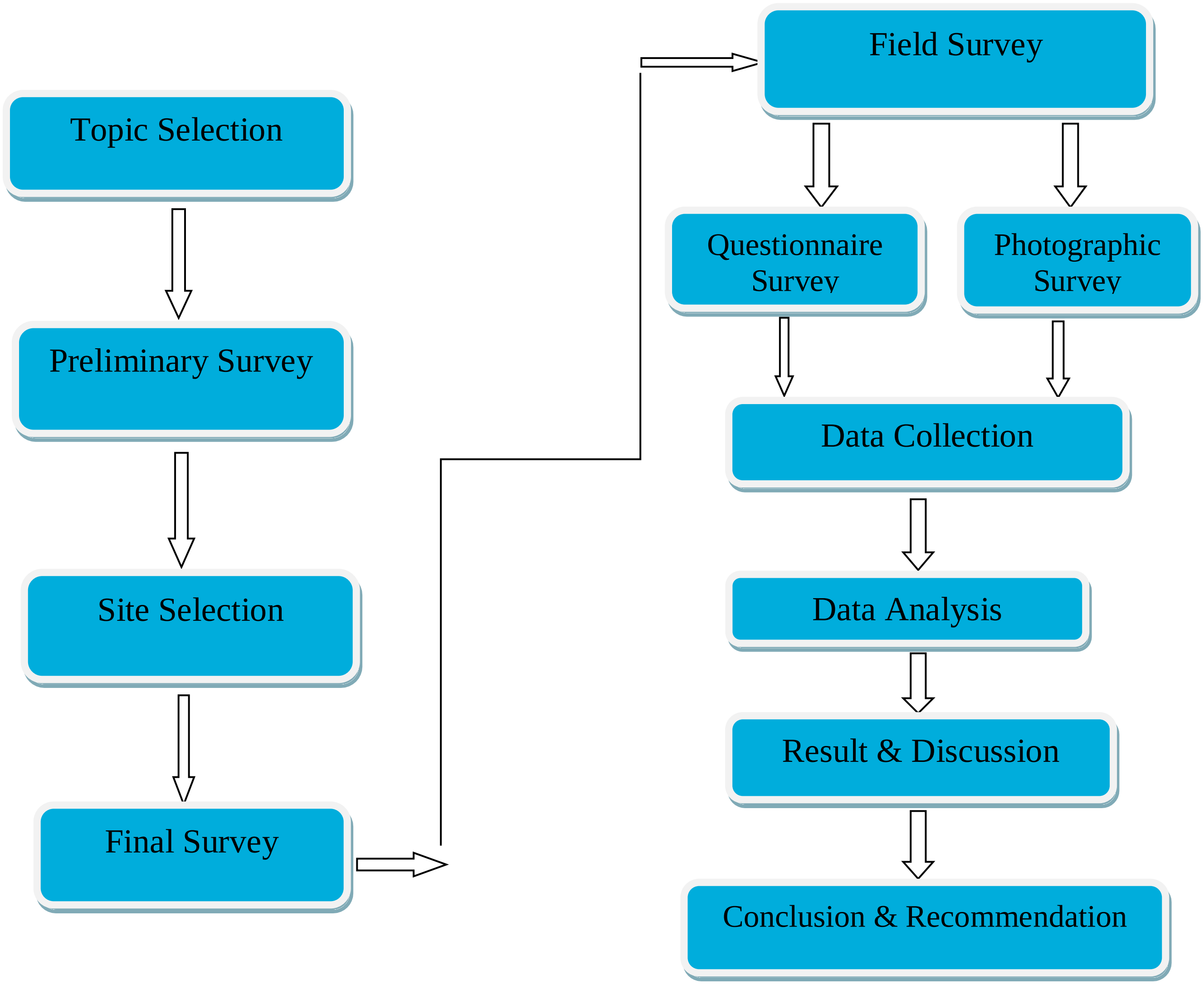
Mohammadpur to Kamlapur:



Tongi to Jatrabari:



3.4 Flow Chart of the Study:



CHAPTER FOUR

DATA COLLECTION AND ANALYSIS

CHAPTER IV

DATA COLLECTION AND ANALYSIS

4.1 Introduction

Data has collected by manual method. All data were collected by conducting field survey. Surveys have been conducted at different bus stoppages as well as at other locations along the survey route on frequency of bus services and travel time. The photographs have been taken at various locations. The field surveys also included driver, helper and passenger's opinion surveys about travel time and delay other facilities. On the other hand questionnaires survey has conducted among all passengers to find out the mass transport facilities.

4.2 Survey Area

The whole study was conducted at selected routes in Dhaka City.

1. Tongi to Jatrabari route
2. Mohammadpur to Kamlapur route
3. Dhanmandi to Azimpur route

4.3 Data Collection

Data has collected by manual method. All data were collected by conducting field survey. Our data collections were divided into two parts.

1. Questionnaire Survey
2. Photographic Survey

4.4 Questionnaire Survey

Questionnaire survey were divided into two category

Total Drivers = 90

Total Helpers = 82

Total Passengers = 148

1. Local bus service:
    - i. Drivers = 82
    - ii. Helpers = 82
    - iii. Passengers = 112
2. BRTC bus service:
    - i. Drivers = 08
    - ii. Passengers = 36

4.4.1 Questionnaire Survey for Driver in Local Bus Service

Question-1: The age of Drivers

i. Age range 20 to 30 = 33
ii. Age range 30 to 40 = 28
iii. Age range 40 to 50 = 18
iv. Age range 50 to 60 = 3

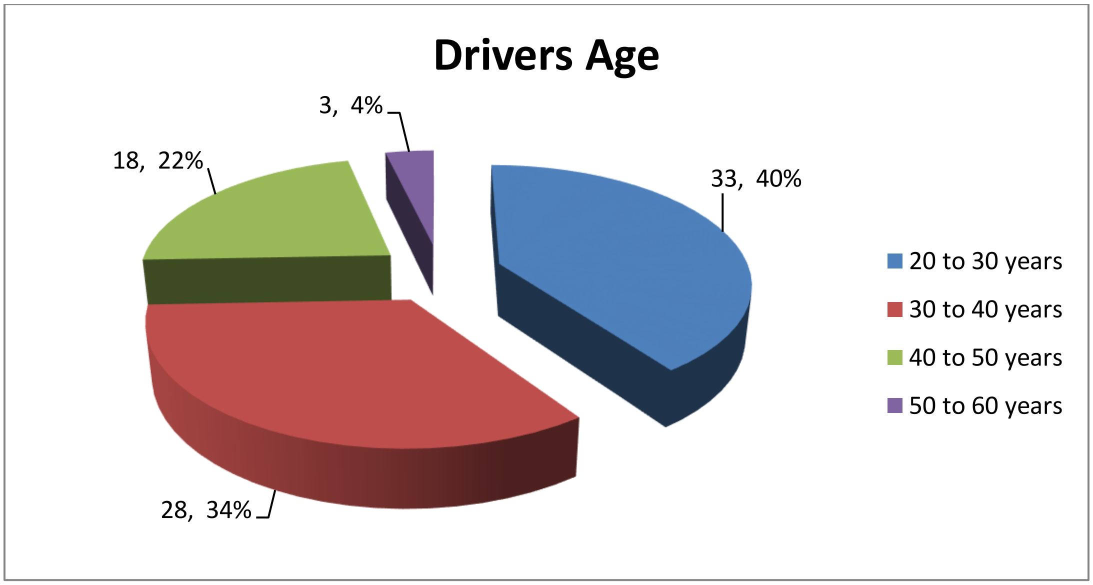


Figure 4.1: Driver Age

Figure 4.1, we saw that percentage of driver age. The maximum number of age percentage is 40% which belongs to 20 to 30 years old.

Question-2: Education qualifications of drivers

i. Class 1 to 5 = 23
ii. Class 6 to 8 = 34
iii. Class 9 to SSC = 19
iv. Class HSC to Honors = 6

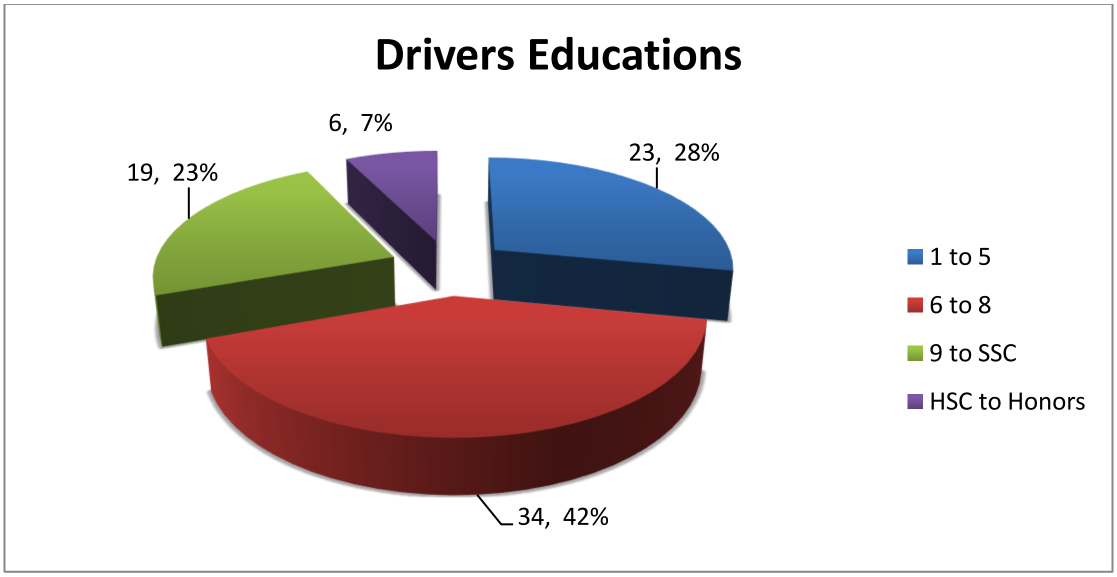


Figure 4.2: Drivers Educations

Figure 4.2, shows the educational qualifications of drivers. Most of the drivers are not well educated.

- The maximum number of percentage is 42% (Class 6 to 8)
- About 28% drivers belong to class 1 to 5.
- 19% are class 9 to SSC.

Question-3: How many years of yours driving?

i. 1 to 5 years = 31
ii. 5 to 10 years = 29
iii. Above 10 years = 22

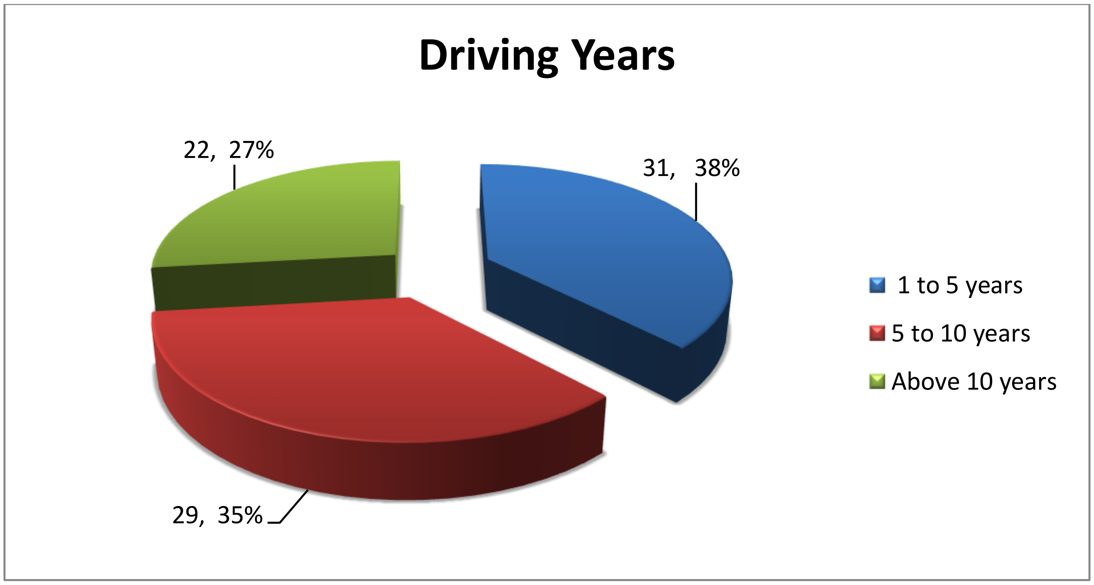


Figure 4.3: Driving Years

Figure 4.3, we saw that the percentage of driving years. Most of the drivers are belongs to driving in 5 years and its percentage is 39%, 10 years 35% and above 10 years is 27%.

Question-4: Do you drive regularly?

i. Regular = 74
ii. Irregular = 8

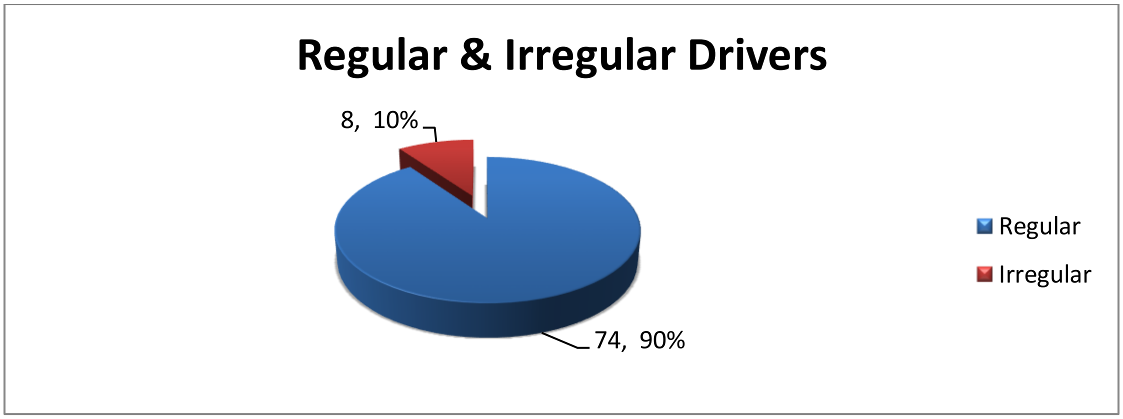


Figure 4.4: Regular & Irregular Drivers

Figure 4.4, we find out the percentage of regular and irregular drivers. About 90% drivers are regular and 10% are irregular drivers, that they are drive occasionally.

Question-5: Do you have license?

i. Yes = 79
ii. No = 03

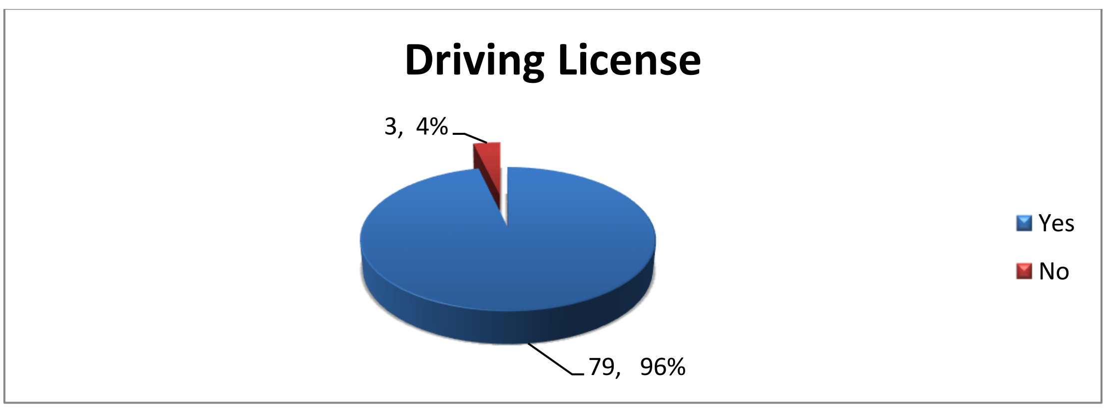


Figure 4.5: Driving License

Figure 4.5, we find out the percentage of driving license of drivers. About 96% drivers have their driving license and 4% drivers have no license.

Question-6: What are the characteristics of public transport user?

i. Good = 17
ii. Bad = 24
iii. Mixed = 36
iv. Friendly = 05

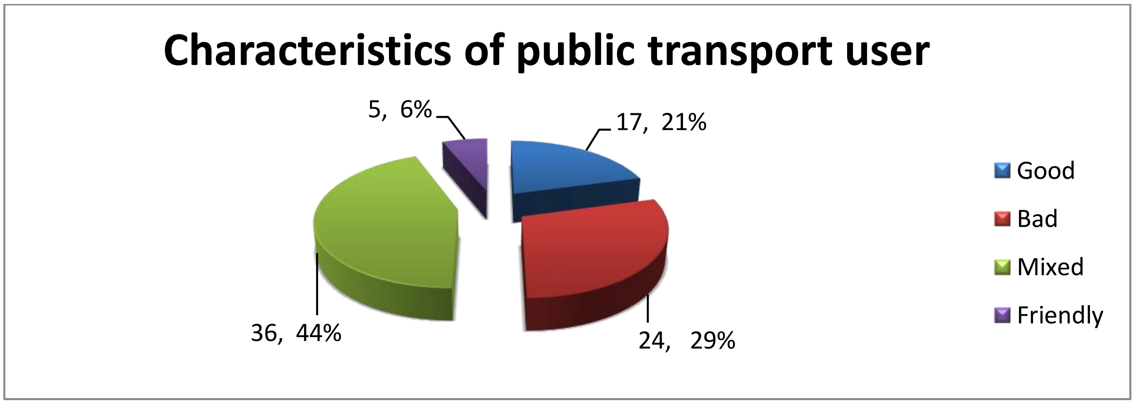


Figure 4.6: Characteristics of public transport user

Figure 4.6, we saw that the percentage of characteristics of passengers. About 21% passengers were good. 29% were bad and 44% passengers were mixed characteristics.

Question-7: What about your driving experience?

i. Good =68
ii. Bad =12
iii. Thrilling = 02

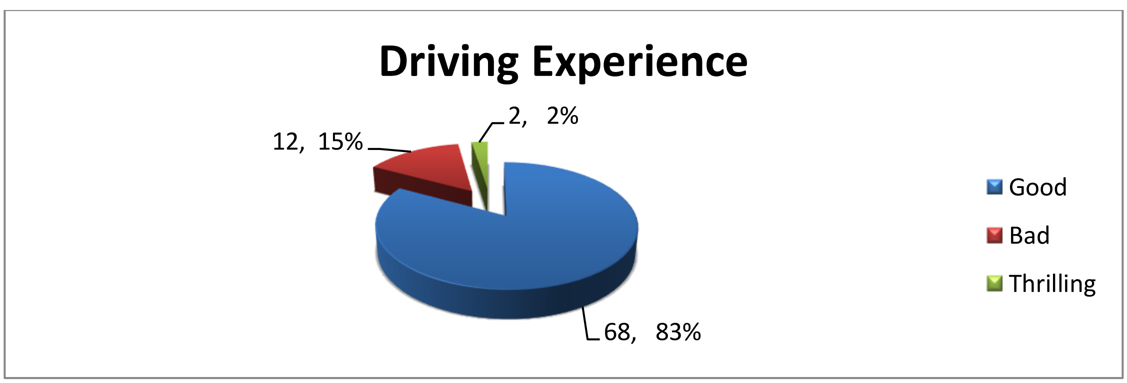


Figure 4.7: Driving Experience

Figure 4.7, we saw that the experience percentage of drivers. Most of the drivers are well experienced 83%.

Question-8: Do you have any bad experience in driving?

i. Yes = 58
ii. No = 24

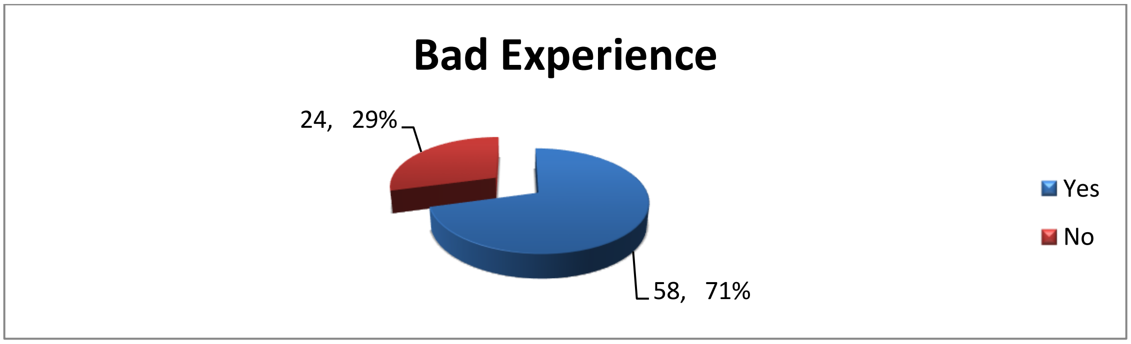


Figure 4.8: Bad Experience

Figure 4.8, we saw that the bad experience percentage of drivers.

- Yes percentage is 71% that means drivers are already faced bad situation.
- About 29% said no.

Question-9: About your driving hours?

i. 3 to 5 hours = 14
ii. 5 to 8 hours = 26
iii. 8 to 12 hours = 42

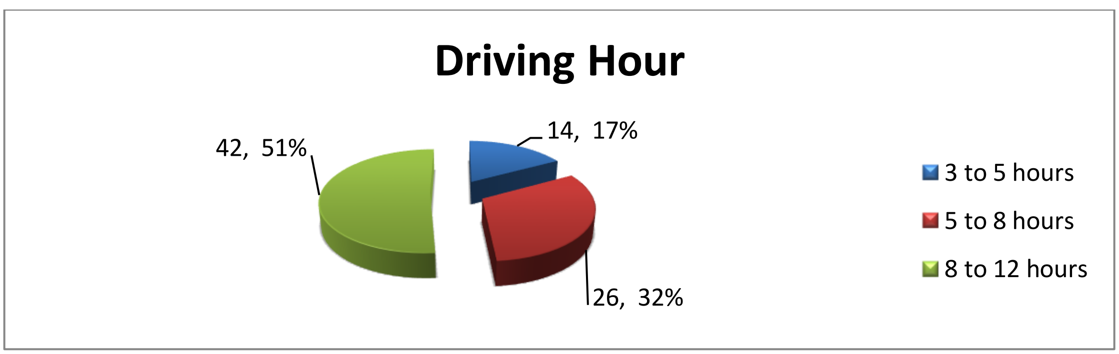


Figure 4.9: Driving Hour

Figure 4.9, we saw that the percentage of driving hour.

- 51% drivers drive the bus 8 to 12 hours.
- 32% drivers drive the bus 5 to 8 hours.
- 17% drivers drive the bus 3 to 5 hours.

Question-10: Are there any enough space for parking facilities?

i. Yes = 6
ii. No = 76

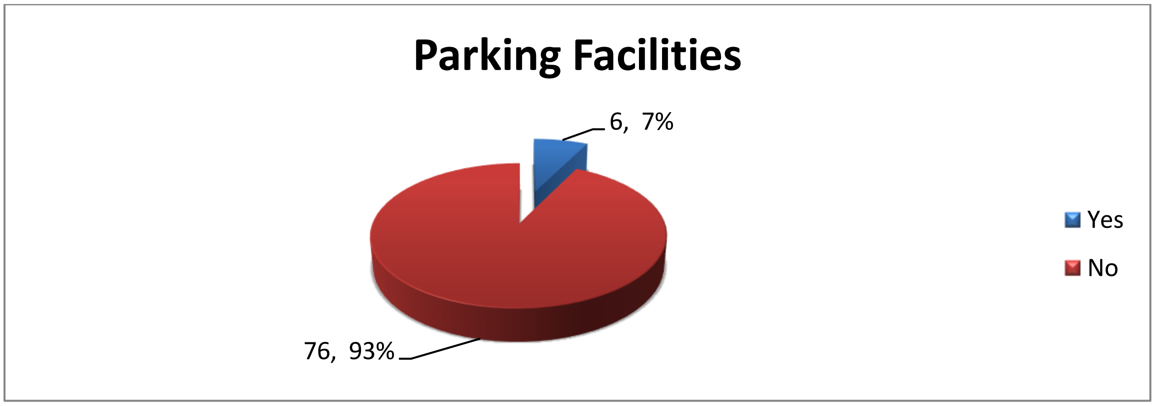


Figure 4.10: Parking Facilities

Figure 4.10, we saw that the percentage of space for parking facilities. There are not enough parking facilities and its percentage is 93%.

Question-11: Do the buses maintain scheduled?

i. Yes = 62
ii. No = 20

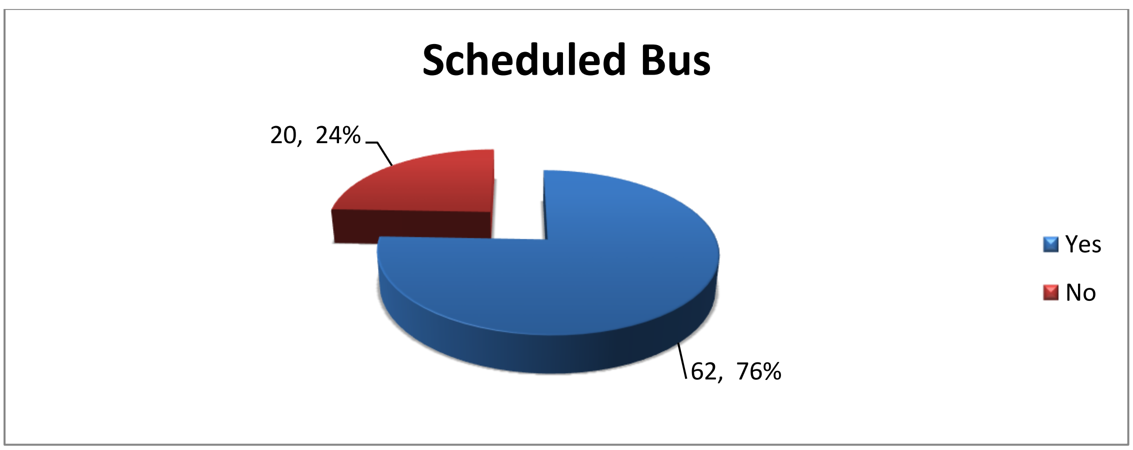


Figure 4.11: Scheduled Bus

Figure 4.11, we saw that the percentage of available in schedule bus. The maximum number of percentage 76%. That means there are a lot of available in scheduled bus.

Question-12: Are the buses overcrowded in peak hours?

i. Yes = 80
ii. No = 02

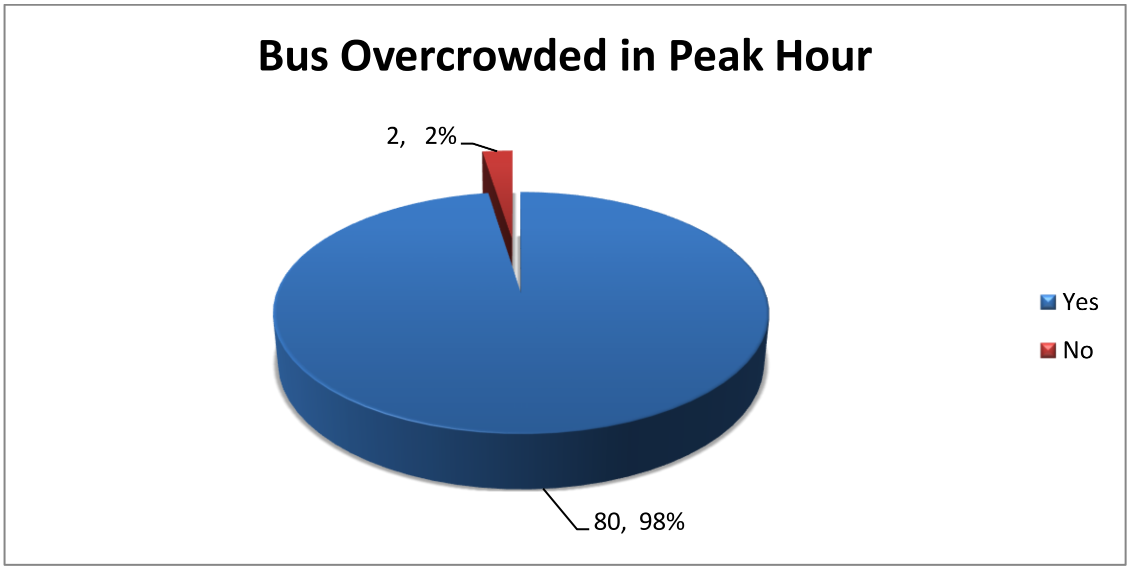


Figure 4.12: Bus Overcrowded Peak Hour

Figure 4.12, we saw that the percentages of overcrowded buses in peak hour. The 98% of overcrowded buses in peak hour.

Question-13: What are the main reasons for accident?

i. Overtaking tendency = 27
ii. Competition = 32
iii. Contract driving = 19
iv. Road condition = 04

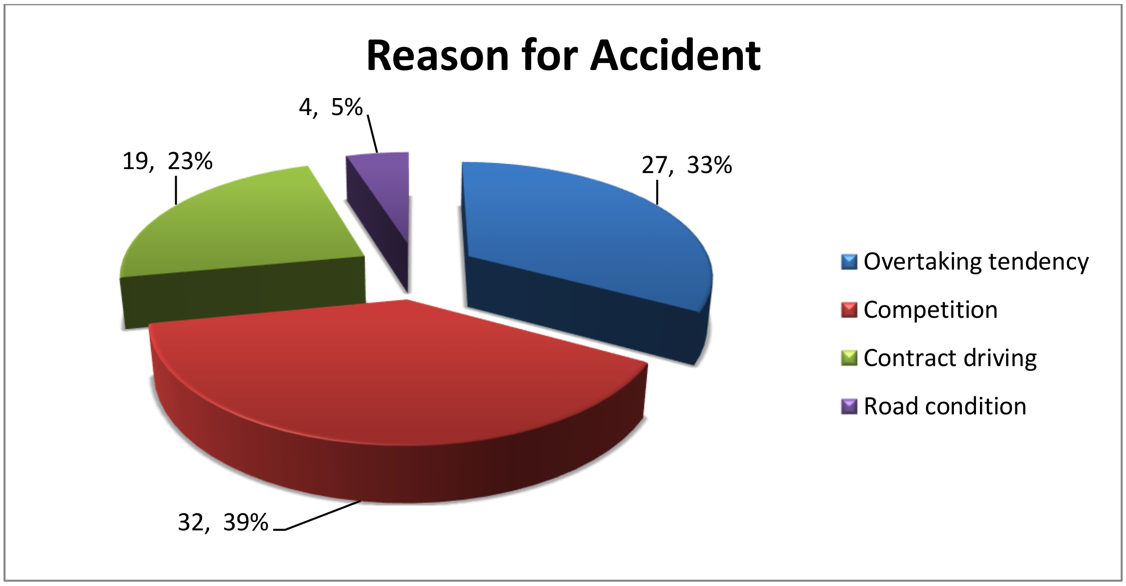


Figure 4.13: Reason for Accident

Figure 4.13, we saw that the percentage of accident reason.

- 39% drivers said that main reason of accident for competition
- 33% said for overtaking tendency
- 23% said for contract driving
- 5% said for road condition

Question-14: Do you have any suggestion for this sector?

i. Reduce local buses & reduce rickshaw
ii. Reduce private car
iii. Improve traffic rules
iv. Improve road condition

4.4.2 Questionnaire Survey for Helpers in Local Bus Service

Question-1: The age of Helpers

i. Age range 20 to 25 = 17
ii. Age range 25 to 30 = 29
iii. Age range 30 to 35 = 23
iv. Age range 35 to 40 = 13

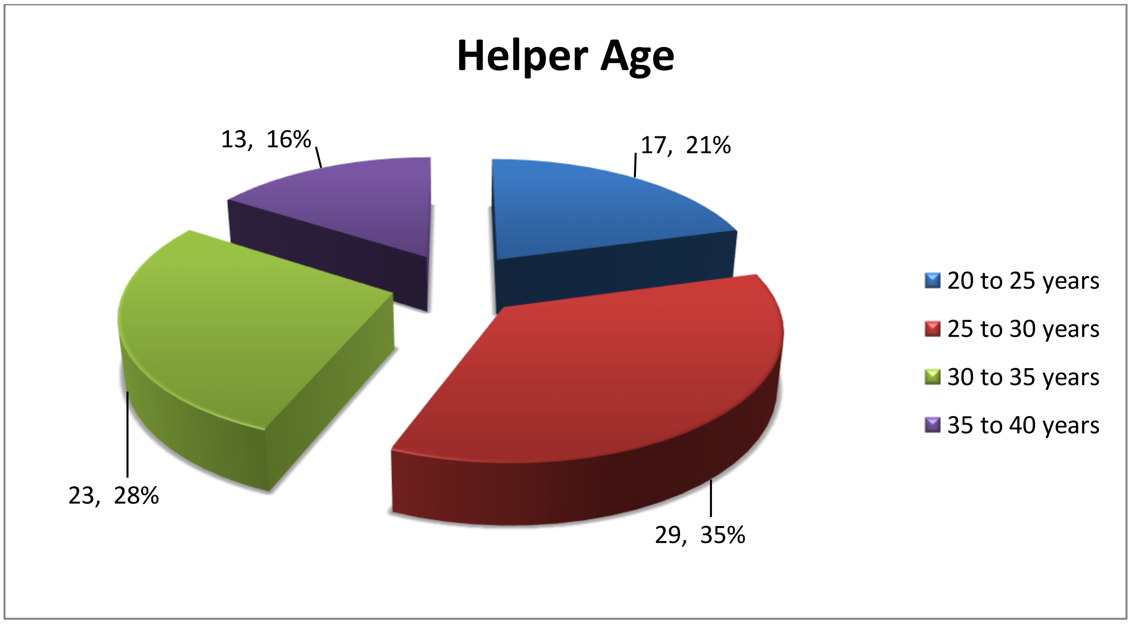


Figure 4.14: Helper Age

Figure 4.14, we saw that percentage of helper ages. The maximum number of age percentage is 35% which belongs to 25 to 30 years old.

Question-2: Education qualifications of Helpers

i. Class 1 to 5 = 38
ii. Class 6 to 8 = 27
iii. Class 9 to SSC = 07
iv. None = 10

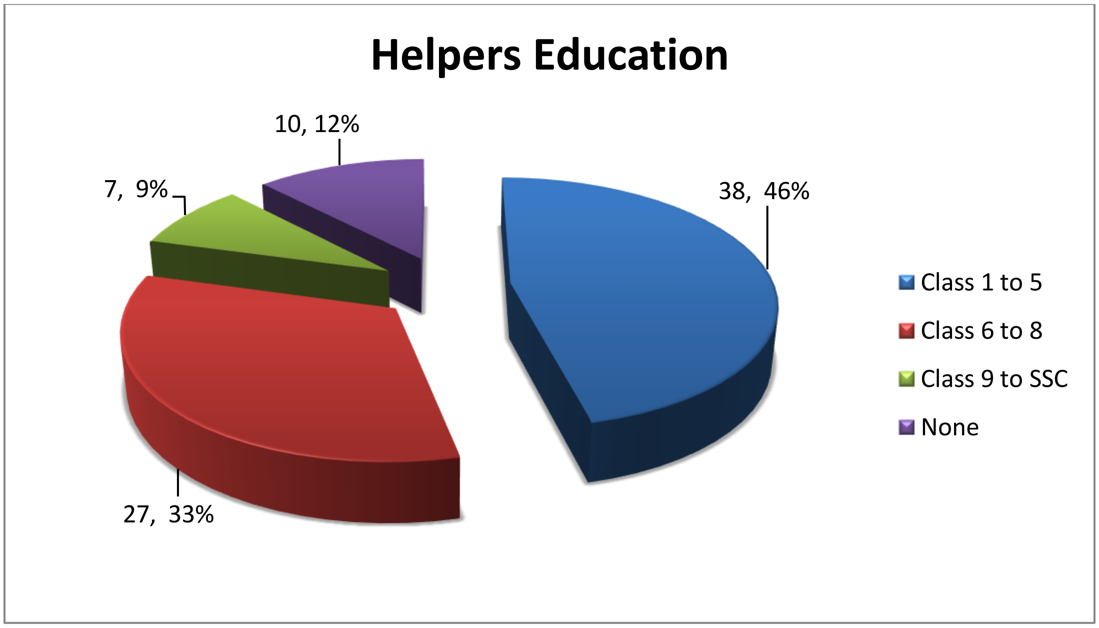


Figure 4.15: Helpers Education

Figure 4.15, we saw that the educational qualification of helper.

- Maximum helpers are belongs to class 1 to 5 (46%).
- 27% are in class 6 to 8.
- About 12% helpers are uneducated.
- Only 9% are class 9 to SSC.

Question-3: How many years of your experience in this position?

i. 1 to 5 years = 31
ii. 5 to 10 years = 37
iii. 10 to 15 years = 14

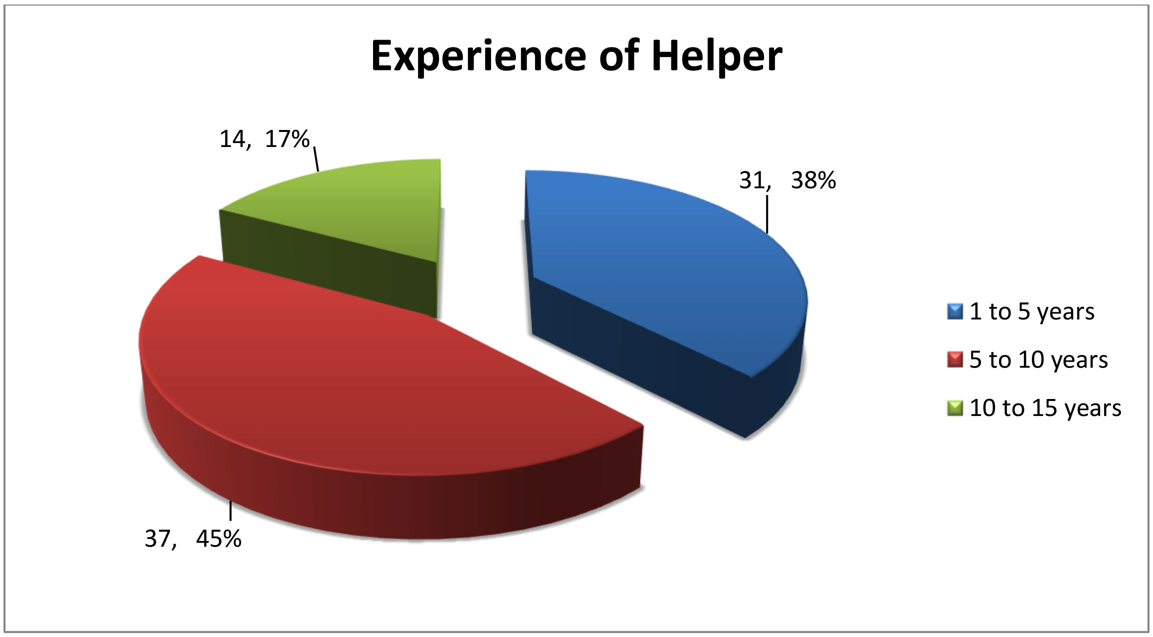


Figure 4.16: Experience of Helper

Figure 4.16, we saw that the experience of helper.

- About 45% helpers are belongs to 5 to 10 years in this position
- 38% are 1 to 5 years in this position
- 17 % are 10 to 15 years in this position

Question-4: Have you any good experience?

i. Yes = 22
ii. No = 60

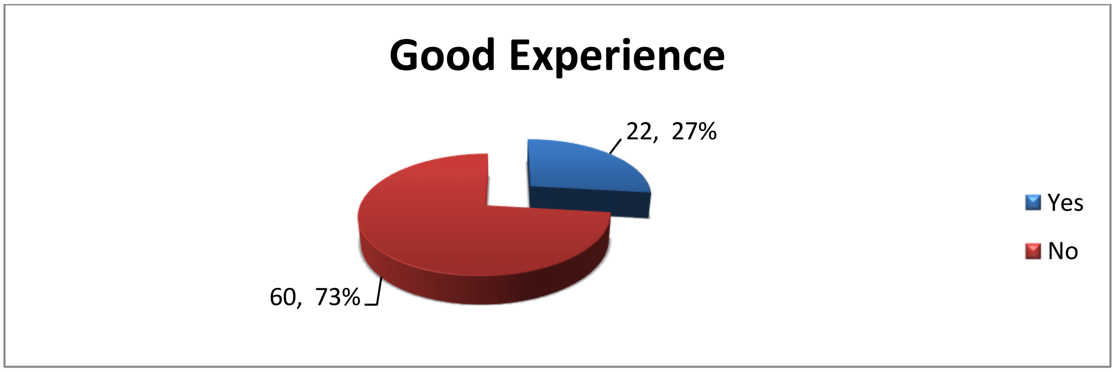


Figure 4.17: Good Experience

Figure 4.17, we find out the percentage of good experience of helper.

- About 73% said NO. They have no good experience in this position.
- 27% said YES.

Question-5: Have you any bad experience?

i. Yes = 68
ii. No = 14

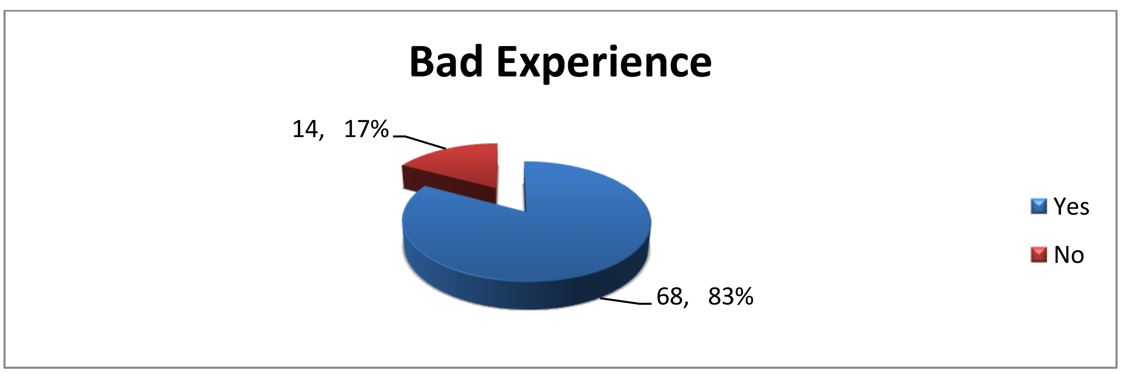


Figure 4.18: Bad Experience

Figure 4.18, we find out the percentage of helper

- About 83% said Yes. They have a lot of bad experience.
- 17% are said No.

Question-6: How is the relation with your driver?

i. Good = 57
ii. Bad = 05
iii. Average = 20

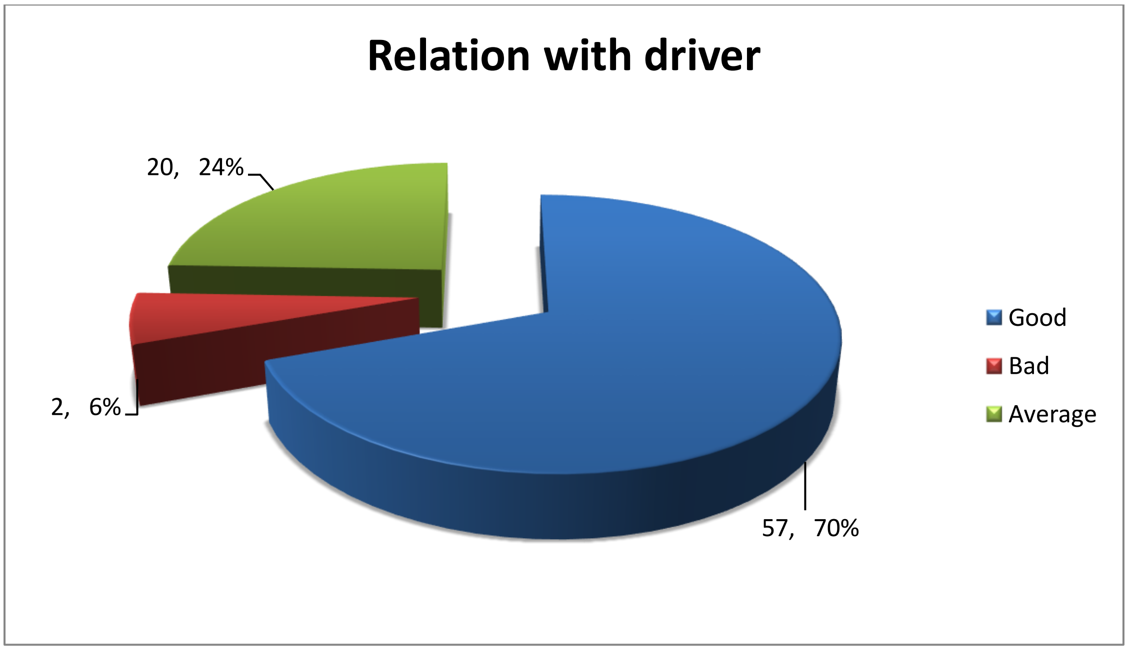


Figure 4.19: Relation with Driver

Figure 4.19, we saw that the percentage of helpers relation with driver.

- About 70% helpers said that Good relation with driver.
- 24% helpers said the average relation with driver.
- Only 6% helpers said bad relation with drivers.

Question-7: How Passengers behave properly with you?

i. Very Good = 05
ii. Good = 38
iii. Average = 34
iv. Poor = 07

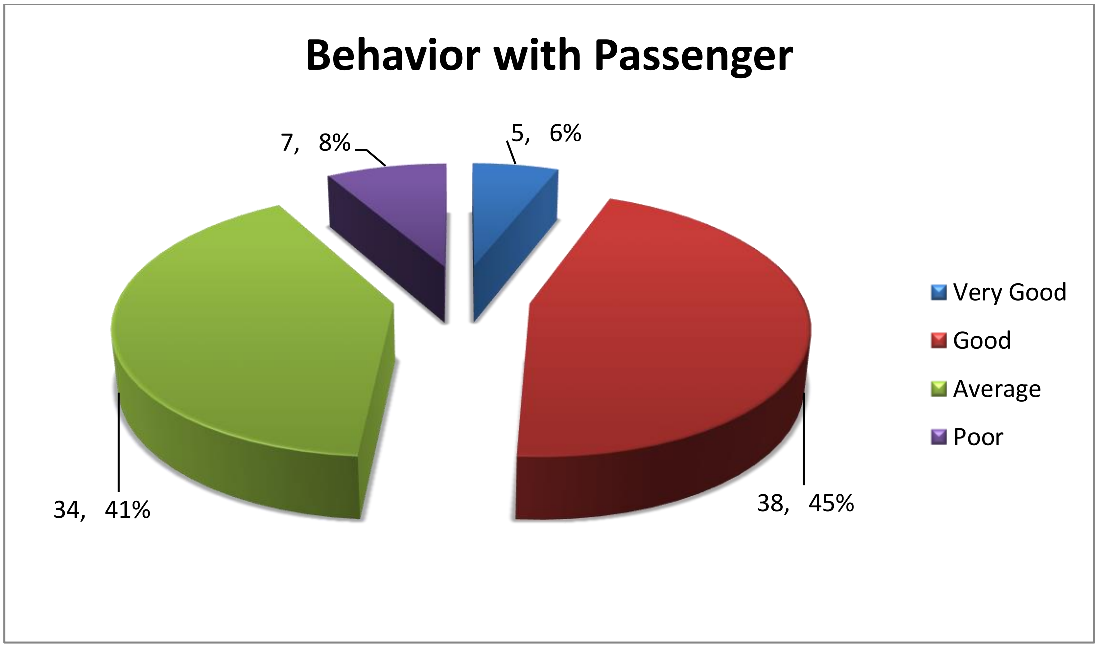


Figure 4.20: Behavior with Passenger

Figure 4.20, we find out the percentage of behavior with passenger.

- 6% helpers said that Very Good relation with passengers.
- 45% are said that Good relation with passengers.
- 41% are said that Average relation with passengers.
- Only 8% are said that Poor Relation with passengers.

Question-8: Loading/Unloading Time

i. Proper time = 27
ii. No proper time = 35
iii. No time limits = 20

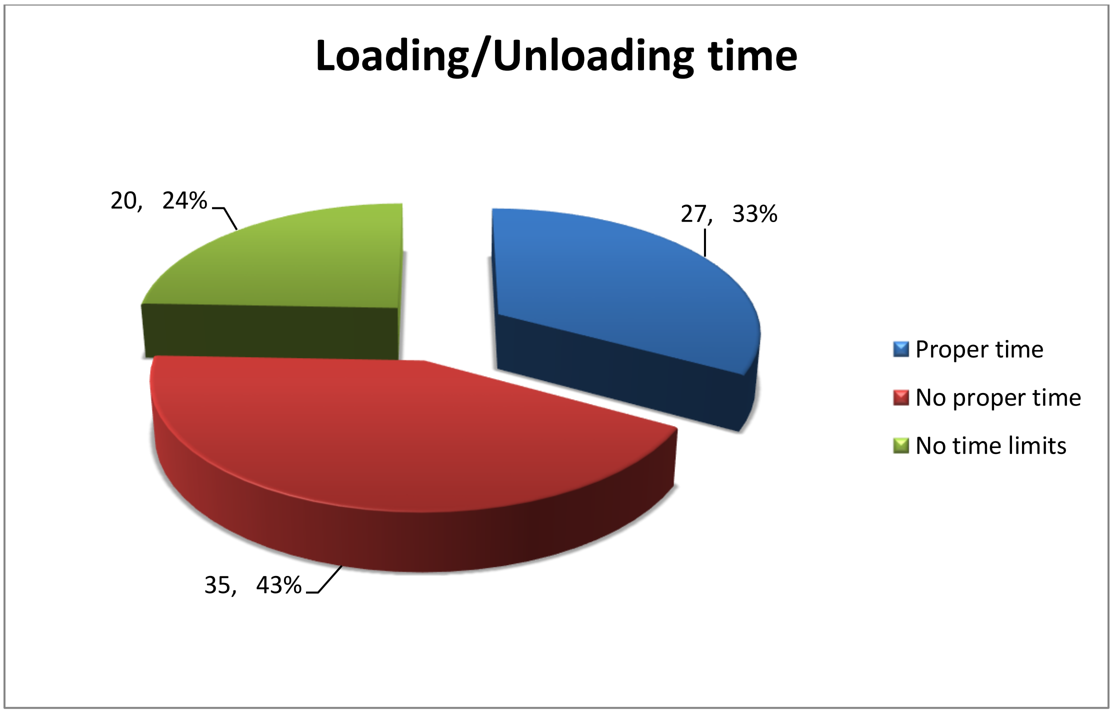


Figure 4.21: Loading/Unloading time

Figure 4.21, we identified that the loading/unloading time

- About 33% helpers said that loading/unloading time > proper time.
- 43% said that No proper time
- 24% said that there are no time limits for loading/unloading time.

Question-9: Loading/Unloading passengers in proper place.

i. Yes =75
ii. No = 07

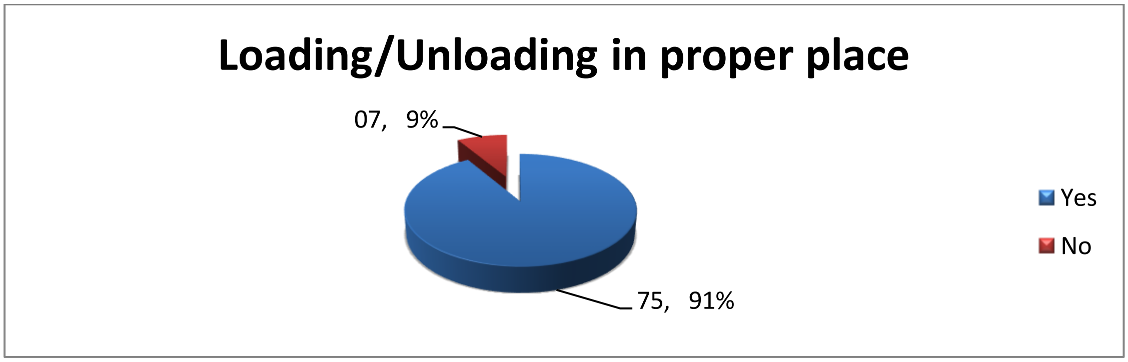


Figure 4.22: Loading/Unloading in proper place

Figure 4.22, we saw that the percentage of Loading/Unloading passengers in proper place

- Almost 91% helpers said that they Loading/Unloading passengers in proper place.

Question-10: Is there any Ticketing system?

i. Yes = 0
ii. No = 82

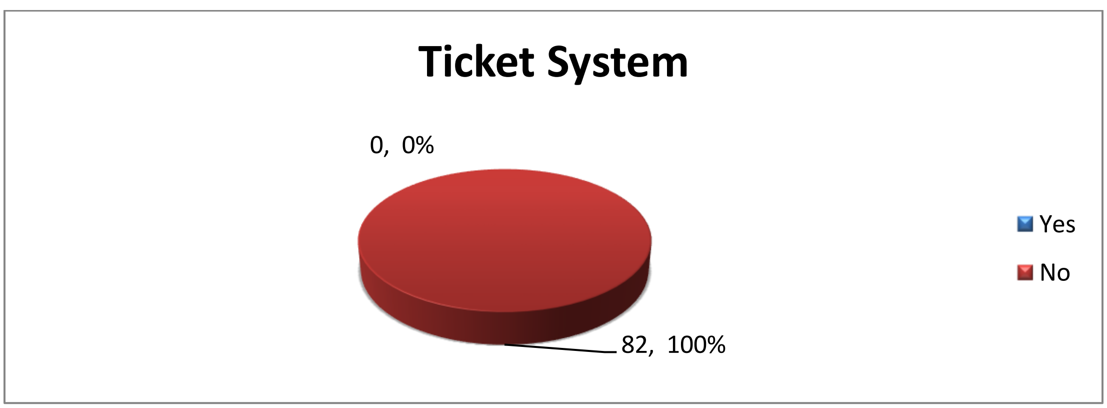


Figure 4.23: Ticket System

Figure 4.23, we saw that the percentage of ticketing system

- 100% helpers said NO

Question-11: Suggestion about bus service.

i. Sitting service = 21
ii. Ticketing system= 17
iii. Improve road condition = 11
iv. Reduced old buses, Rickshaw, Car = 33

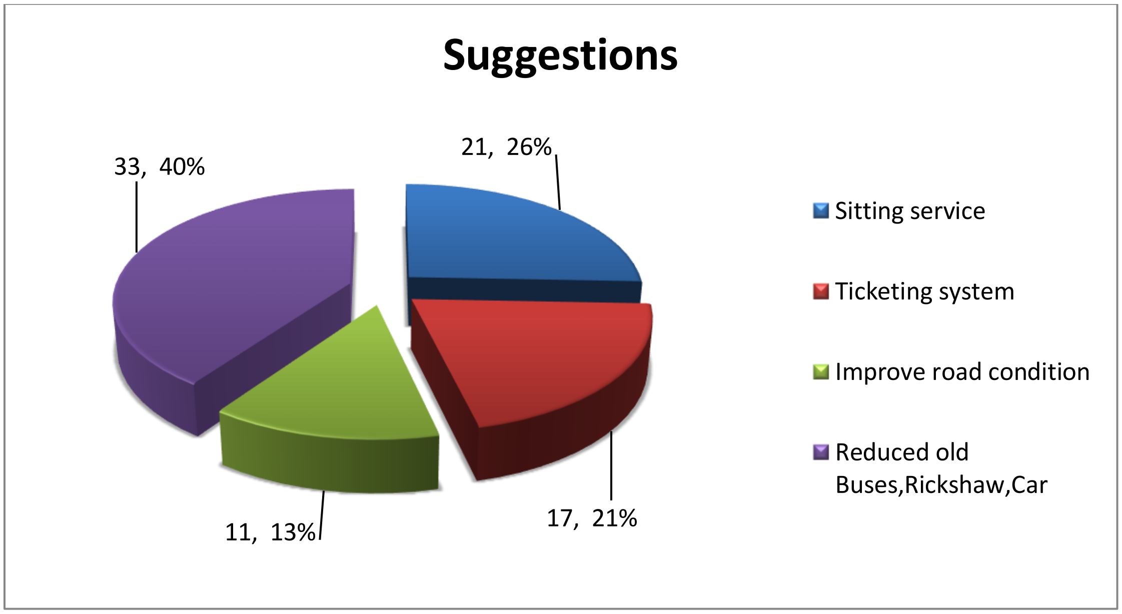


Figure 4.24: Suggestions

Figure 4.24, we saw that the percentage of bus service suggestion

- About 40% helper said reduce old bus, rickshaw and car
- 26% said need setting service
- 21% said need ticketing system
- 13% said improve road condition

4.4.3 Questionnaire Survey for Passengers in Local Bus Service

Question-1: Gender

i. Male = 85
ii. Female = 27

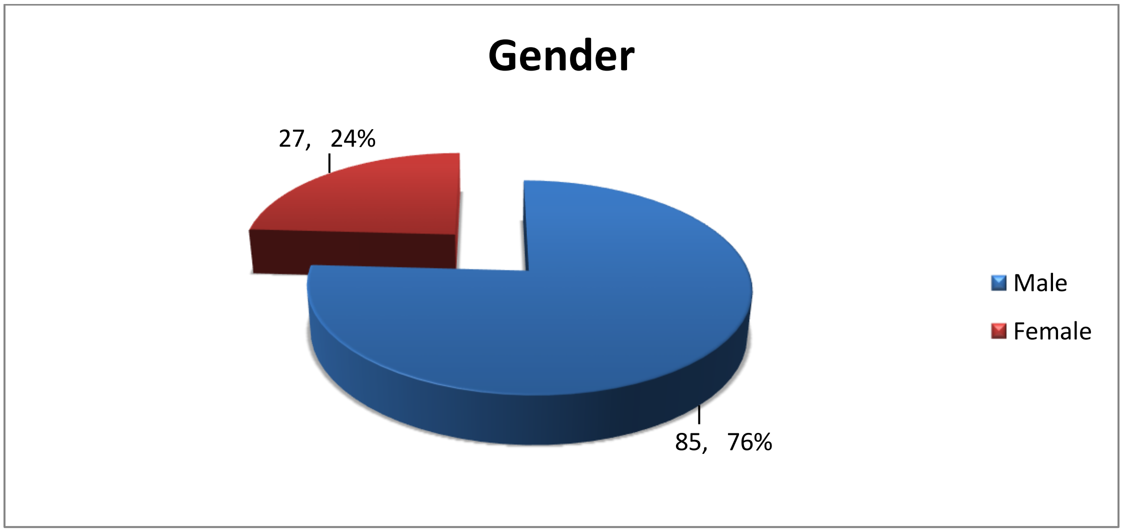


Figure 4.25: Gender

Figure 4.25, we find out the

- The percentage of male and female for our questionnaire survey.
- There were 76% Male
- 24% were Female

Question-2: Age of the passengers

i. 20 to 30 years = 32
ii. 30 to 40 years = 47
iii. 40 to 50 years = 17
iv. 50 to 60 years = 16

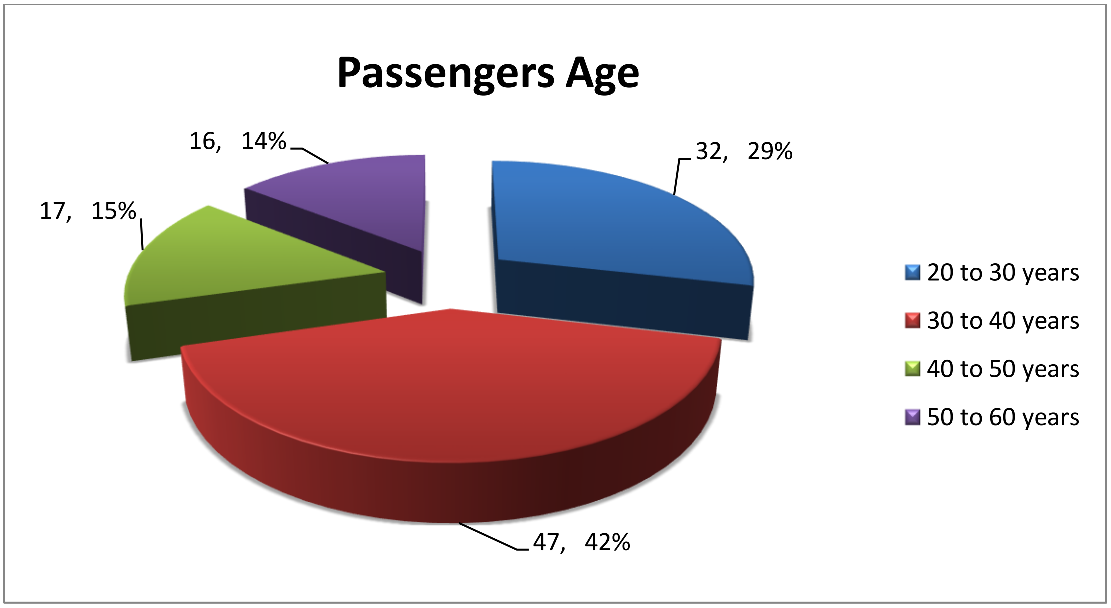


Figure 4.26: Passengers Age

Figure 4.26, we find out the age percentage of the passengers

- 29% passengers were 20 to 30 years old in our questionnaire survey
- 42% were 30 to 40 years
- 15% were 40 to 50 years
- Only 14% were 50 to 60 years old

Question-3: Educational Qualification

i. Under S.S.C = 27
ii. S.S.C/Equivalent = 34
iii. H.S.C/Equivalent = 21
iv. Honors/Equivalent = 23
v. Masters = 07

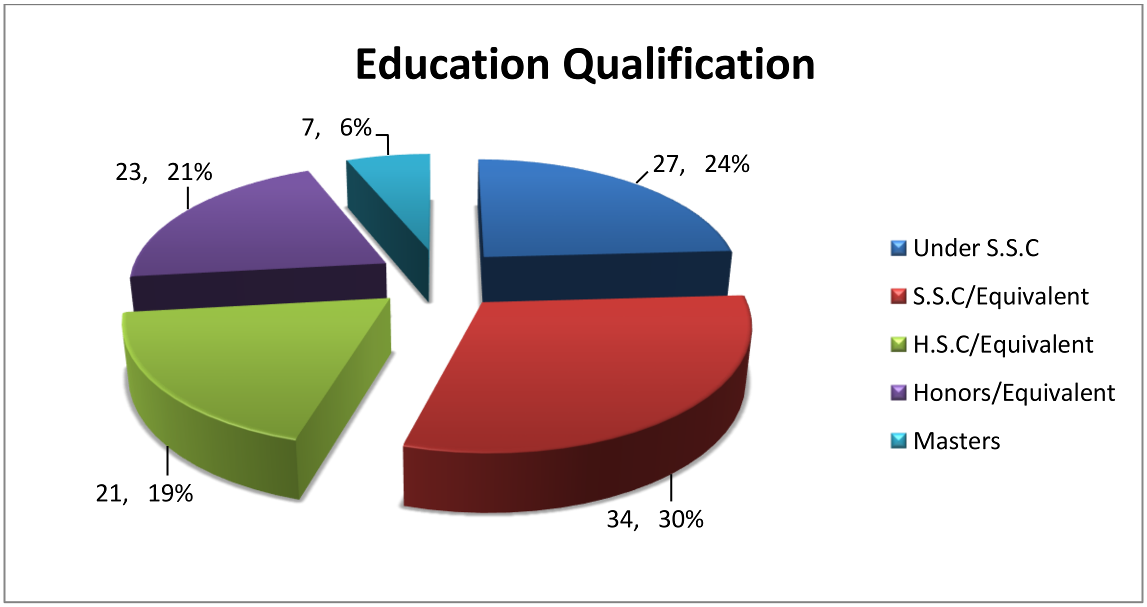


Figure 4.27: Education Qualification

Figure 4.27, we find out percentage of educational qualification of passengers

- About 19% passengers were H.S.C/Equivalent
- 30% were S.S.C/Equivalent
- 24% were under S.S.C
- 21% were Honors/Equivalent
- There were only 6% Masters pass

Question-4: Where are you coming from?

i. Home = 27
ii. Work place = 38
iii. Shopping = 10
iv. School/college = 37

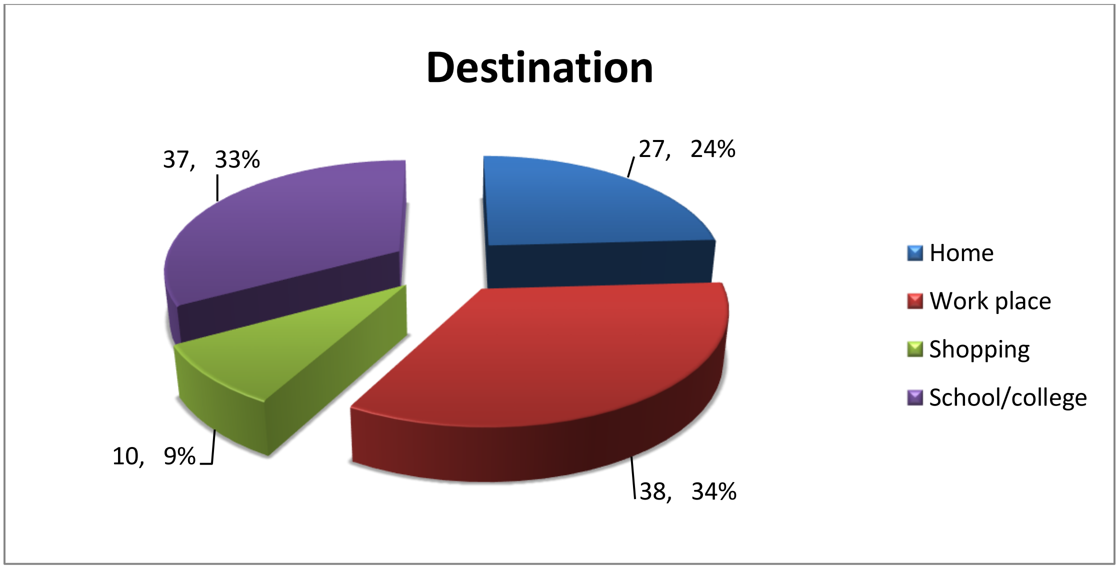


Figure 4.28: Destination

Figure 4.28, we saw that the percentage of passengers are coming from

- About 34% passengers were coming from their working place
- 33% were school/college
- 24% were home

Question-5: Did you ride this bus every day?

i. Yes = 77
ii. No = 35

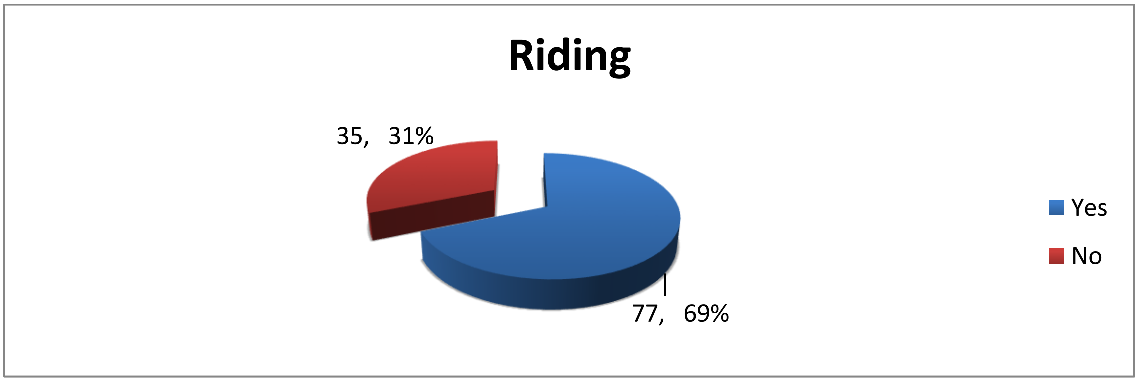


Figure 4.29: Riding

Figure 4.29, we saw that the percentage of passengers were ride this bus everyday

- About 69% passengers said Yes were ride this bus everyday
- 31% said No

Question-6: Do you have own cars?

i. Yes = 07
ii. No = 105

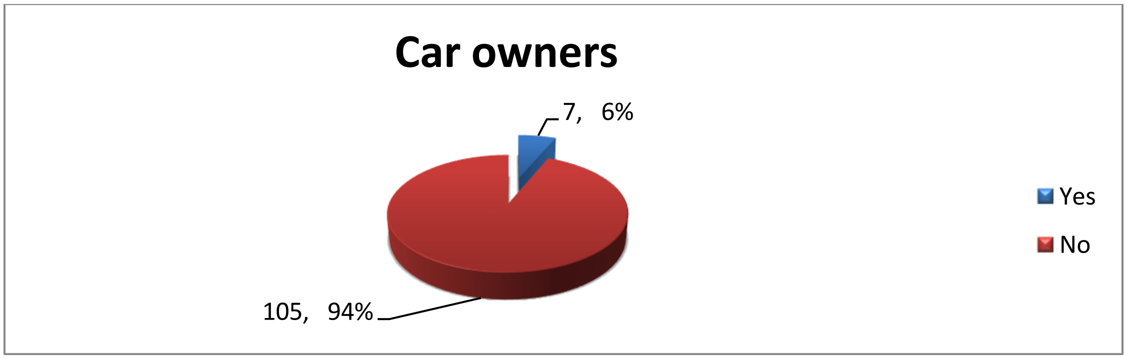


Figure 4.30: Car Owners

Figure 4.30, we saw that the passengers of car owners

- About 94% passengers said that they have No car
- 6% said Yes

Question-7: What is your opinion about physical condition of this bus?

i. Good = 10
ii. Average = 55
iii. Poor = 47

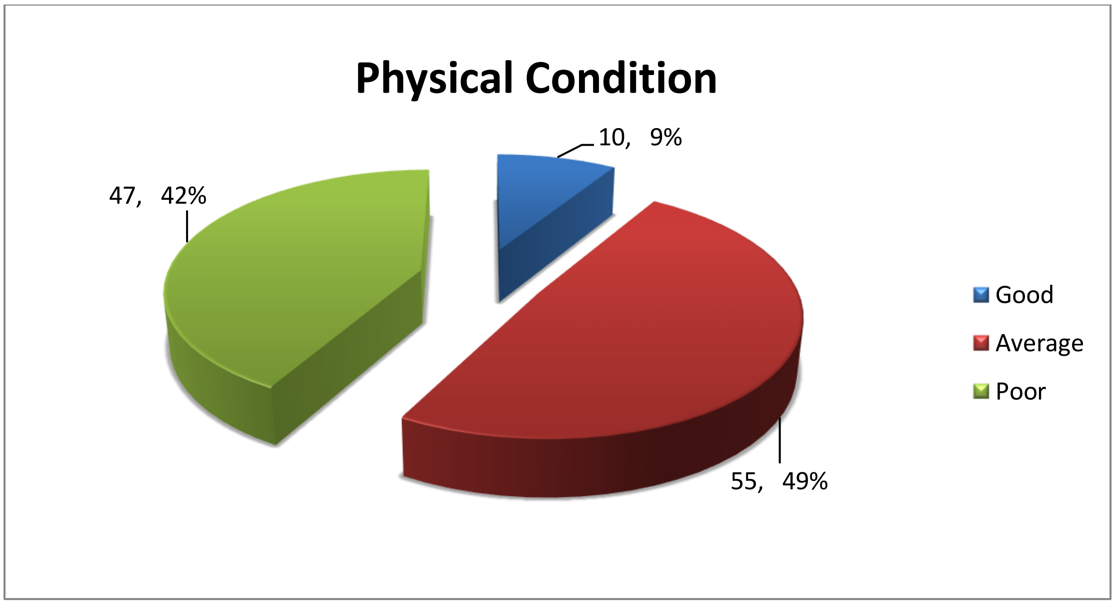


Figure 4.31: Physical Condition

Figure 4.31, we find out the condition of the bus stoppages

- 9% passengers said that Bus Stoppages condition is Good
- 49% passengers said that Bus Stoppages condition is Average
- 42% passengers said that Bus Stoppages condition is Poor

Question-8: Do you think there are enough waiting place for heavy passengers?

i. Yes = 09
ii. No = 103

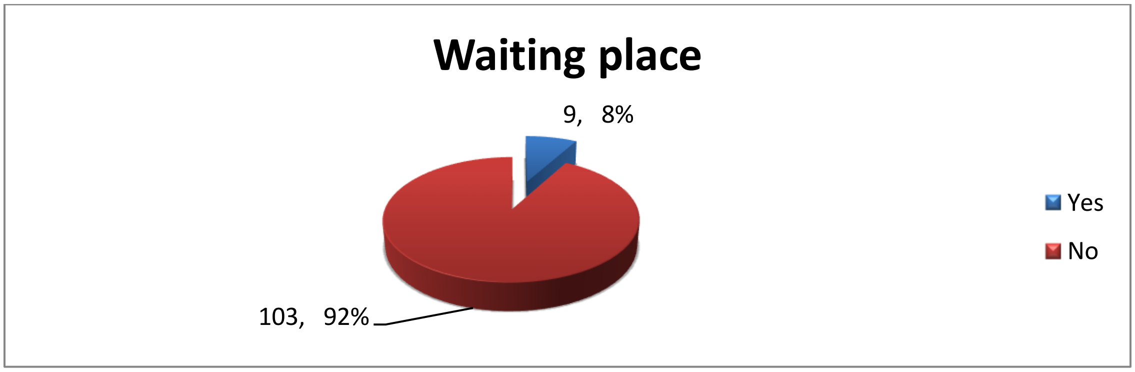


Figure 4.32: Waiting Place

Figure 4.32, we find out the percentage of enough waiting place for heavy passengers

- 92% passengers said that NO. There are no enough waiting place for heavy passengers
- Only 8% said Yes

Question-9: Do you feel comfortable in this bus?

i. Yes = 13
ii. No = 99

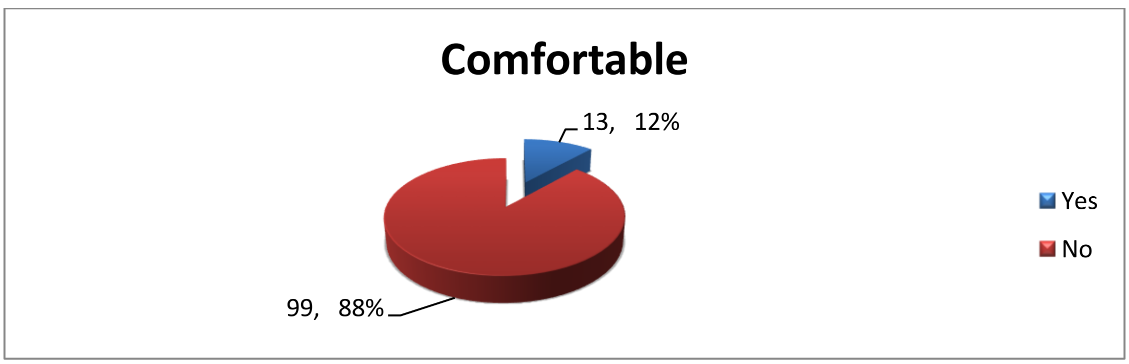


Figure 4.33: Comfortable

Figure 4.33, we saw that the percentage of passengers comfortable in this bus station.

- Almost 88% passengers said that they never feel comfortable in this bus station

Question-10: Are there any ticketing system?

i. Yes = 0
ii. No = 112

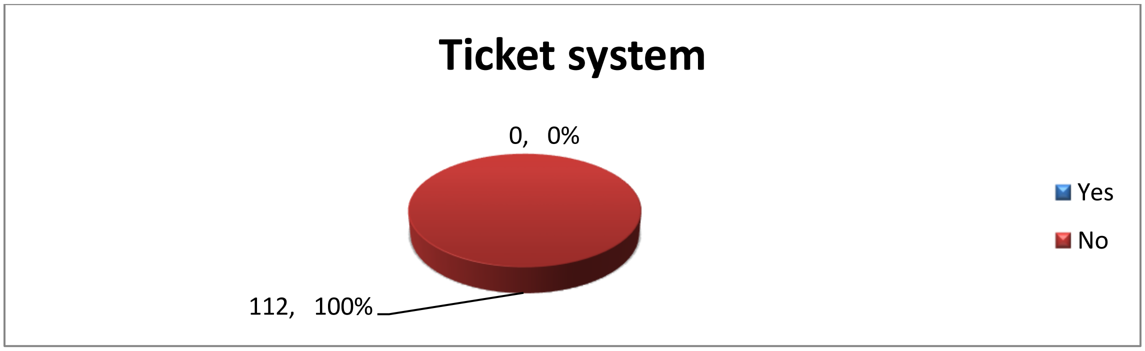


Figure 4.34: Ticket System

Figure 4.34, we saw that

- There are no Ticketing systems in selected bus service.

Question-11: Do you feel buses are overcrowded in peak hours?

i. Yes = 112
ii. No = 0

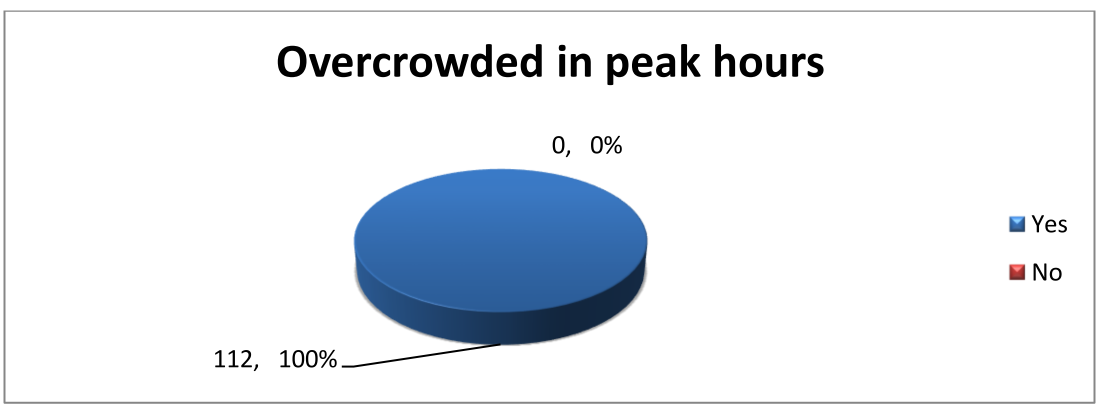


Figure 4.35: Overcrowded in peak hour

Figure 4.35, we saw that

- 100% passengers said that Busses are overcrowded in Peak hours.

Question-12: Have you ever faced any bad situation?

i. Yes = 78
ii. No = 36

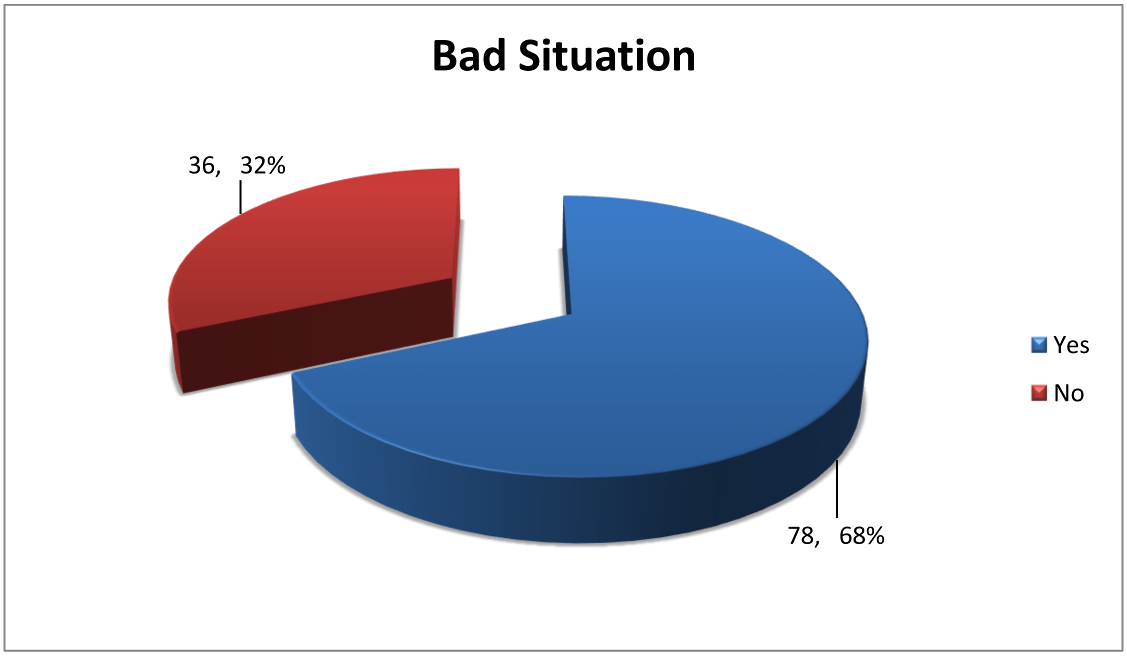


Figure 4.36: Bad Situation

Figure 4.36, we saw the percentage of passengers bad situation.

- 68% passengers said that they faced some unwanted situation.
- 32% said NO

Question-13: Information system

i. Boards = 1
ii. Telephone = 8
iii. Personal communication = 86
iv. Video monitor = 17

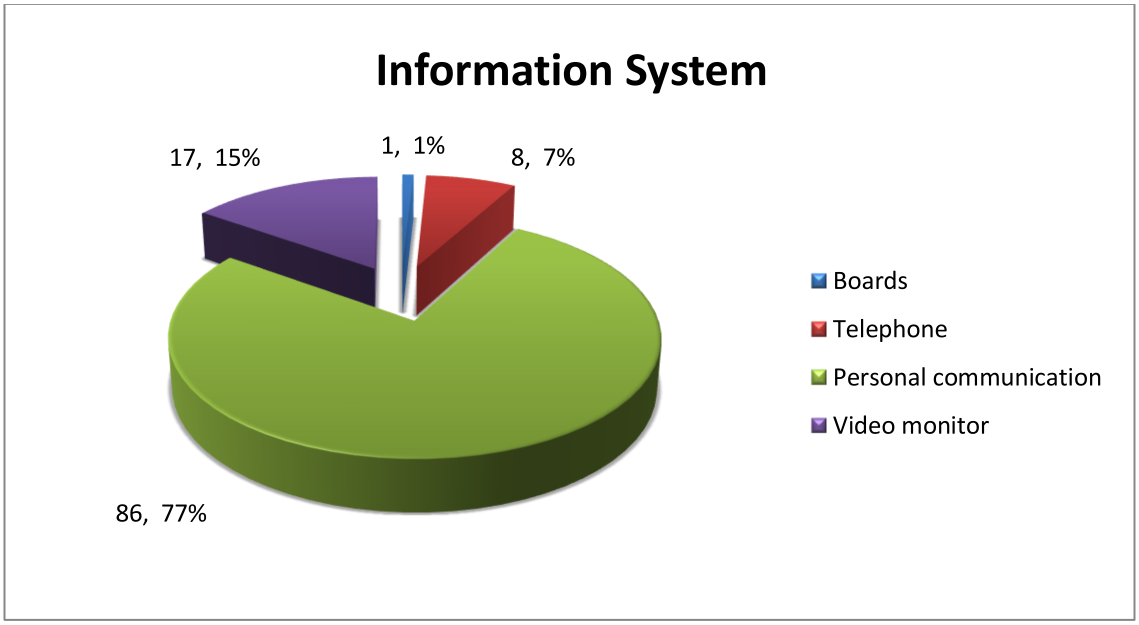


Figure 4.37: Information System

Figure 4.37, we find out the percentage of information system

- By Boards there its only 1%
- By Telephone its 7%
- By Personal communication 77%
- Video monitor 15%

Question-14: What do you think about the public transportation in Dhaka city?

i. Very bad = 37
ii. Poor = 10
iii. Good = 27
iv. Mixed = 38

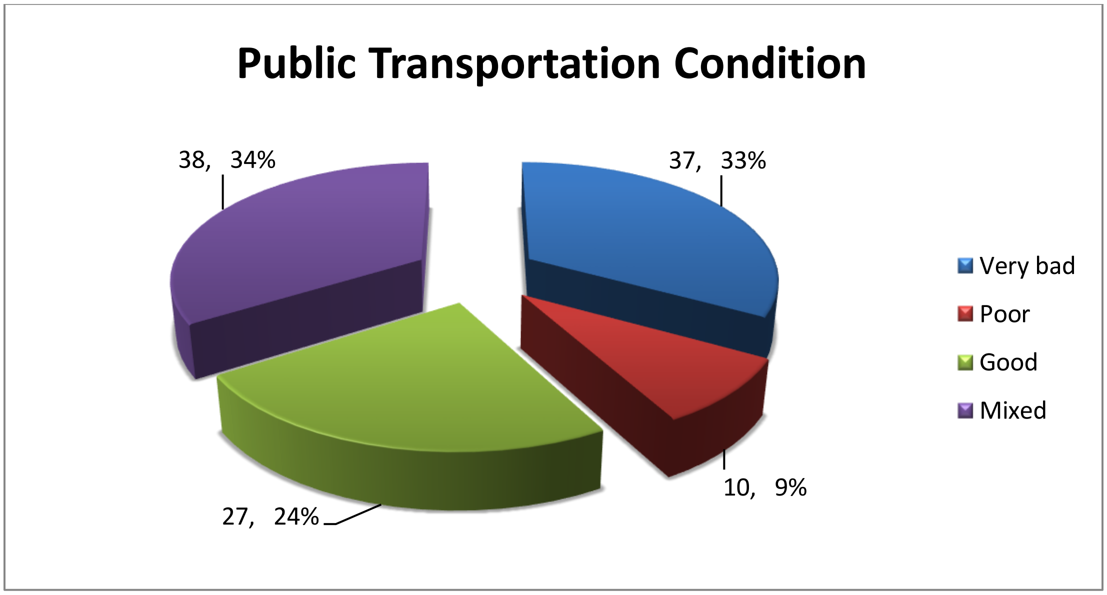


Figure 4.38: Public Transportation Condition

Figure 4.38, we find out the percentage of public transportation condition

- About 33% passengers said very bad condition
- 9% said poor condition
- 34% said mixed condition
- 24% said good condition

Question-15: If available would you like to use local services on holiday?

i. Yes = 27
ii. No = 85

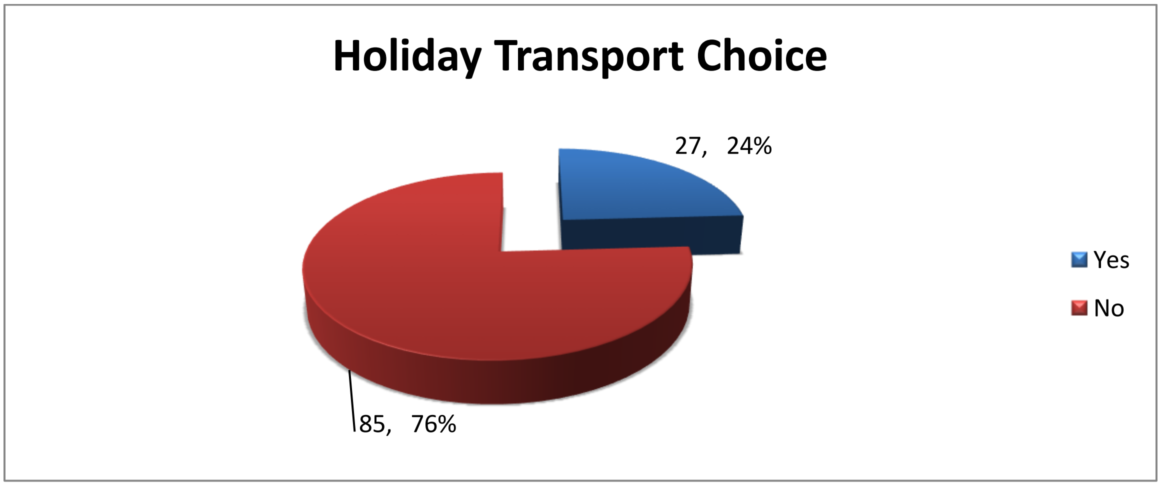


Figure 4.39: Holiday Transport Choice

Figure 4.39, we saw that the percentage of holyday transport choice

- About 76% passengers said that they like to use this service
- 24% said No

Question-16: Suggestions about mass transit system?

i. Improve maintenance system
ii. Increase seat capacity
iii. Sitting service
iv. Ticketing system
v. Increase Bypass road
vi. All buses need to combine under some companies
vii. Reduces private cars and Rickshaw
viii. Do not stop buses here and there
ix. Improve traffic rules
x. Proper monitoring by BRTA

4.4.4 Questionnaire Survey for Drivers in BRTC Bus Service

Question-1: The age of drivers

i. 20 to 30 years = 2
ii. 30 to 40 years = 3
iii. 40 to 50 years = 2
iv. 50 to 60 years = 1

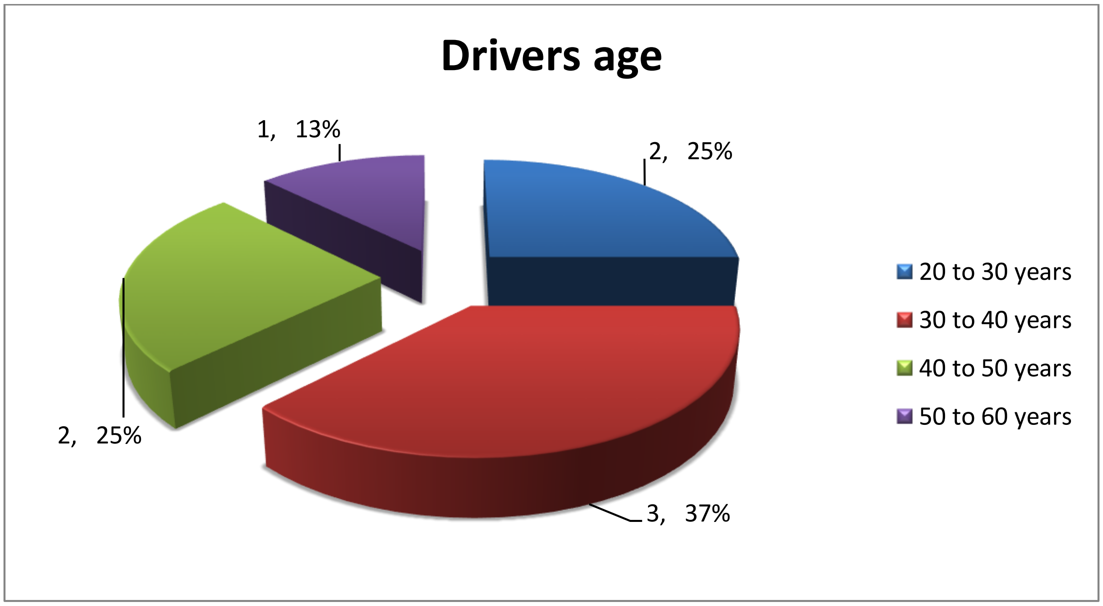


Figure 4.40: Drivers Age

Figure 4.40, we saw that the percentage of driver age. The maximum number of age percentage is 37% which belongs to 30 to 40 years old.

Question-2: Educational qualification of drivers

i. Class 1 to 5 = 1
ii. Class 6 to 8 = 4
iii. Class 9 to S.S.C = 2
iv. H.S.C to Honors = 1

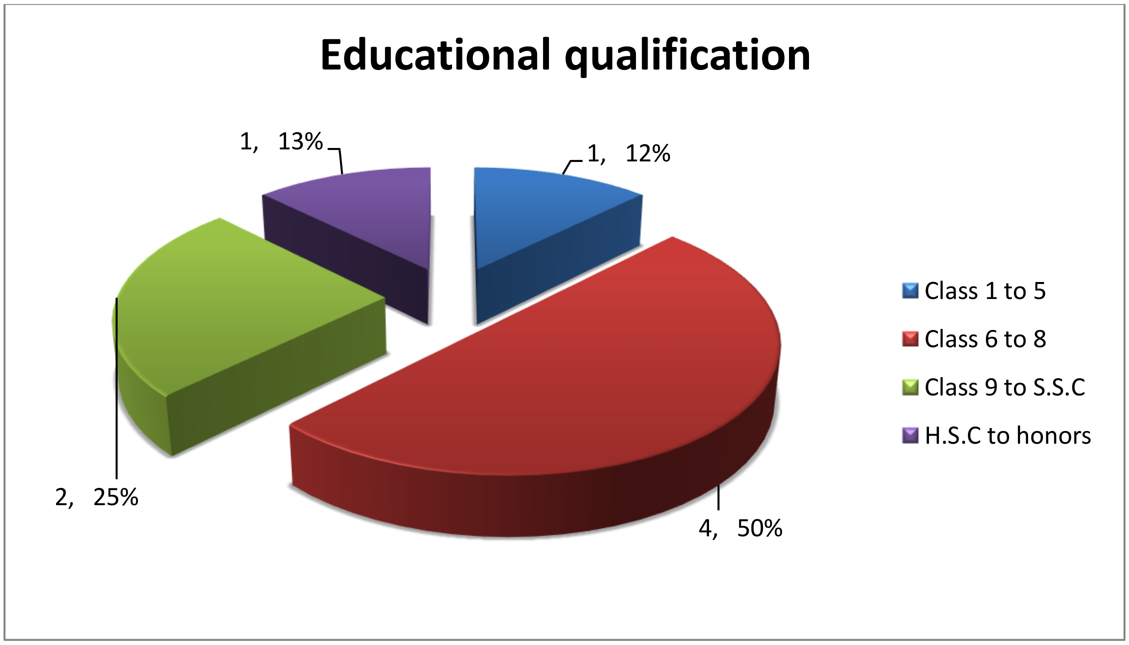


Figure 4.41: Educational Qualification

Figure 4.41, shows the educational qualification of drivers. Most of the drivers are not well educated.

- The maximum number of percentage is 50% (class 6 to 8)
- About 25% drivers belongs to class 9 to S.S.C
- 13% are class 1 to 5.

Question-3: How many years of yours driving?

i. 1 to 5 years = 1
ii. 5 to 10 years = 4
iii. Above 10 years = 3

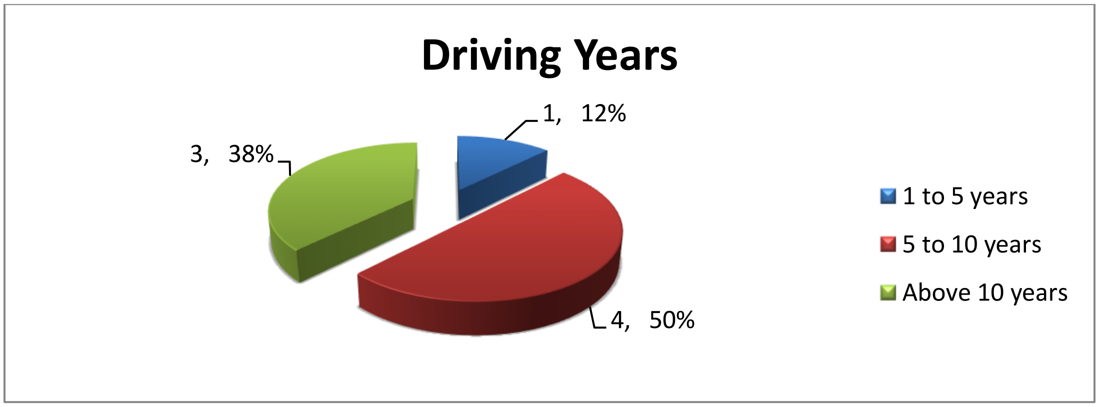


Figure 4.42: Driving Years

Figure 4.42, we saw that the percentage of driving years. Most of the drivers are belongs to 4 driving in 5 to 10 years and its percentage is 50%, 1 to 5 years is 12% and above 10 years is 38%.

Question-4: Do you drive regularly?

i. Regular = 7
ii. Irregular = 1

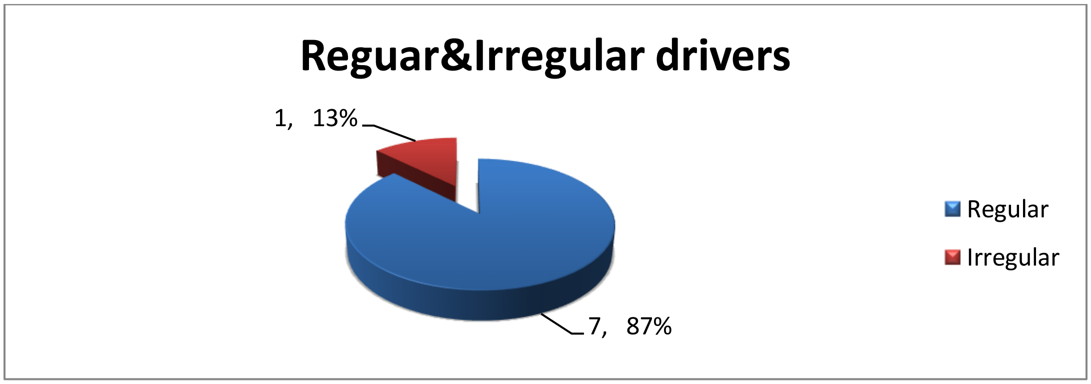


Figure 4.43: Regular & Irregular Drivers

Figure 4.43, we find out the percentage of Regular & Irregular Drivers. About 87% drivers are regular & 13% are irregular drivers that are they are drive occasionally.

Question-5: Do you have license?

i. Yes = 8
ii. No = 0

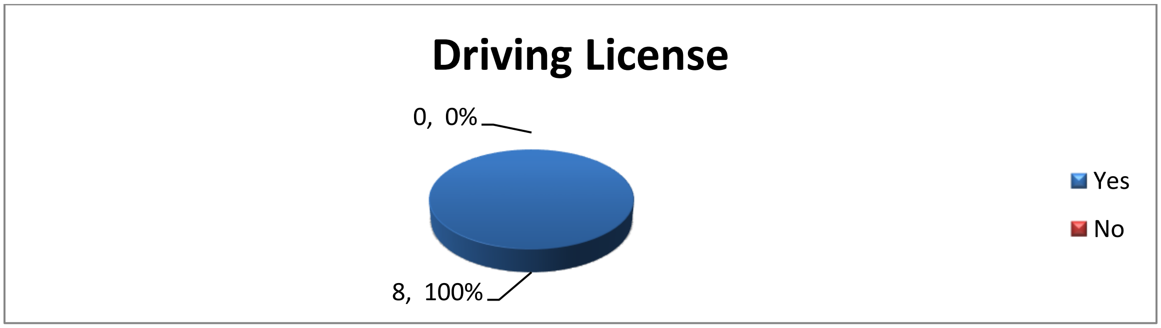


Figure 4.44: Driving License

Figure 4.44, we find out the percentage of driving license of drivers.

- About 100% drivers have their driving license.
- 0% drivers have no license.

Question-6: What are the characteristics of the passengers?

i. Good = 2
ii. Bad = 1
iii. Mixed = 3
iv. Friendly = 2

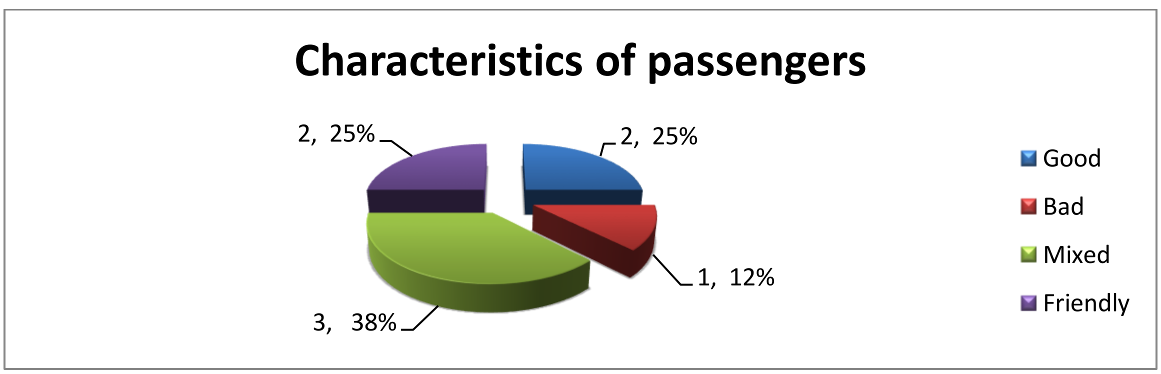


Figure 4.45: Characteristics of passengers

Figure 4.45, we saw that the percentage of characteristics of passengers. About 25% passengers were good and also 25% were friendly. 12% were bad and 38% passengers were mixed characteristics.

Question-7: What about your driving experience?

i. Good = 6
ii. Bad = 1
iii. Thrilling = 1

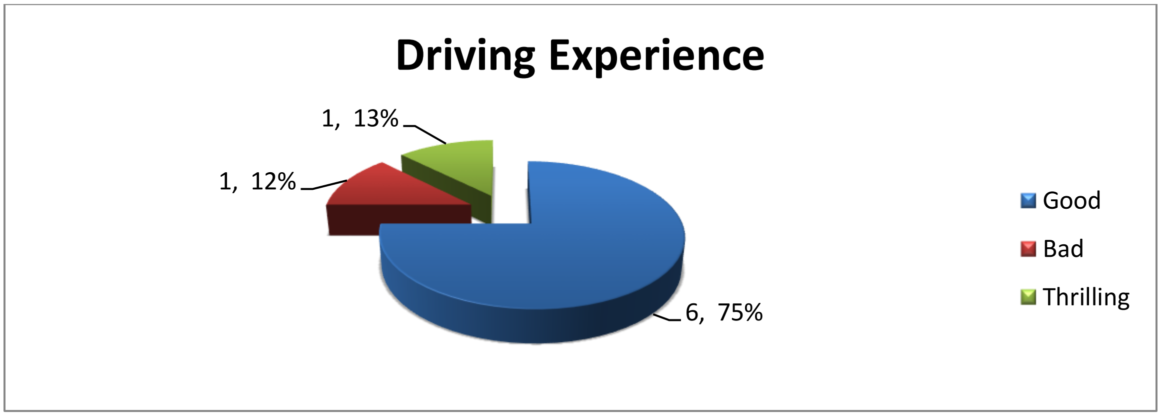


Figure 4.46: Driving Experience

Figure 4.46, we saw that the experience percentage of drivers. Most of the drivers are well experienced 75%.

Question-8: Do you have any bad experience?

i. Yes = 7
ii. No = 1

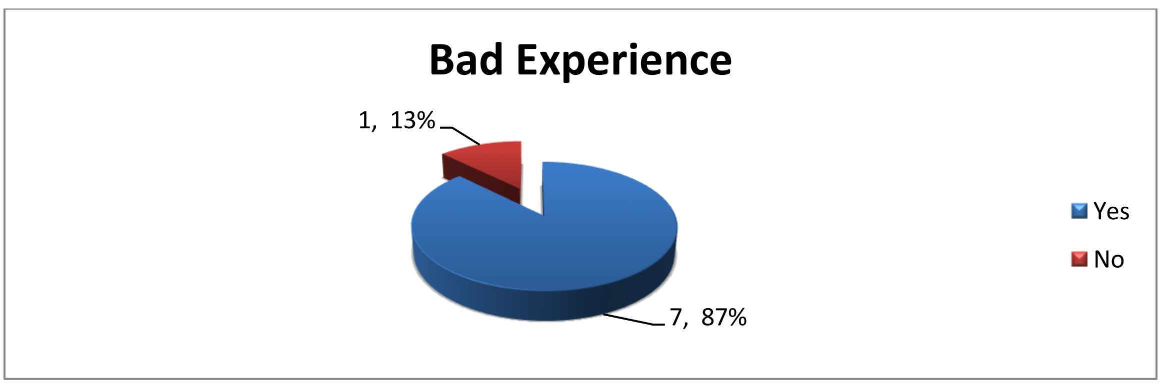


Figure 4.47: Bad Experience

Figure 4.47, we saw that the bad experience percentage of drivers.

- Yes percentage is 87% that means drivers are already faced bad situation
- About 13% said No

Question-9: About you're driving Hours?

i. 5 to 8 hours = 2
ii. 8 to 10 hours = 4
iii. 10 to 12 hours = 2

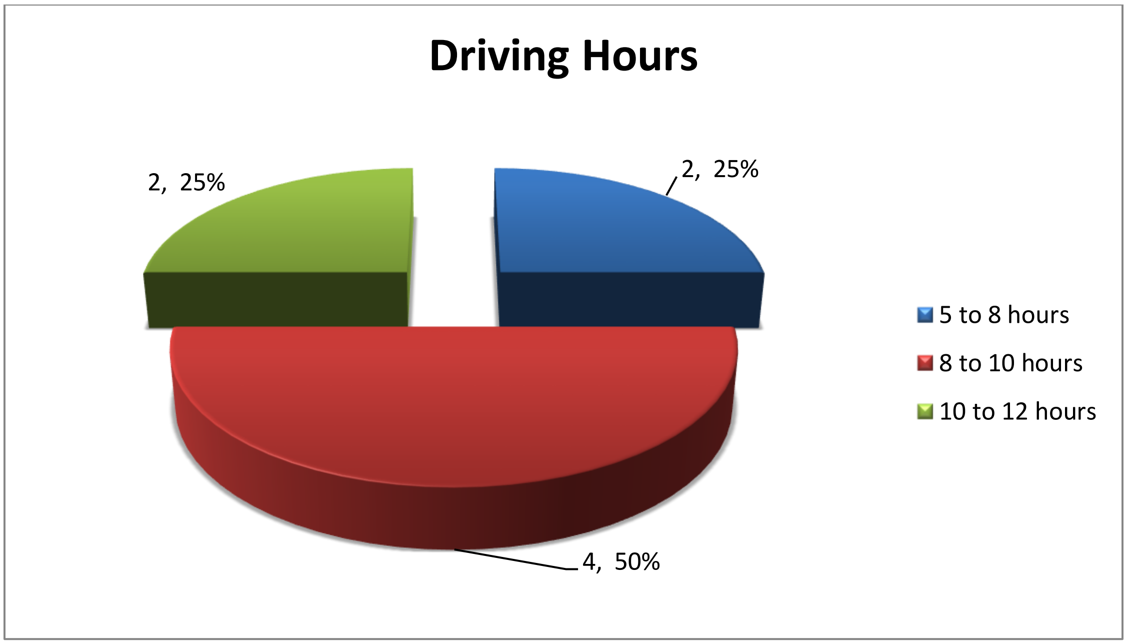


Figure 4.48: Driving Hours

Figure 4.48, we saw that the percentage of the driving hours.

- 50% Drivers drives the bus 8 to 10 hours
- 25% Drivers drives the bus 5 to 8 hours
- 25% Drivers drives the bus 10 to 12 hours

Question-10: Are there any enough space for parking facilities?

i. Yes = 1
ii. No = 7

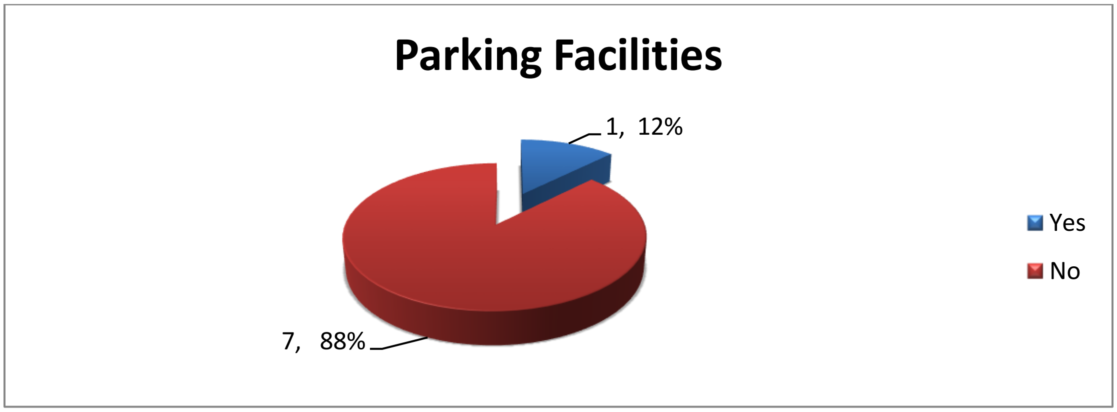


Figure 4.49: Parking Facilities

Figure 4.49, we saw that the percentage of the space for parking facilities. There are not enough parking facilities and its percentage is 88%.

Question-11: Do the buses maintain scheduled?

i. Yes = 8
ii. No = 0

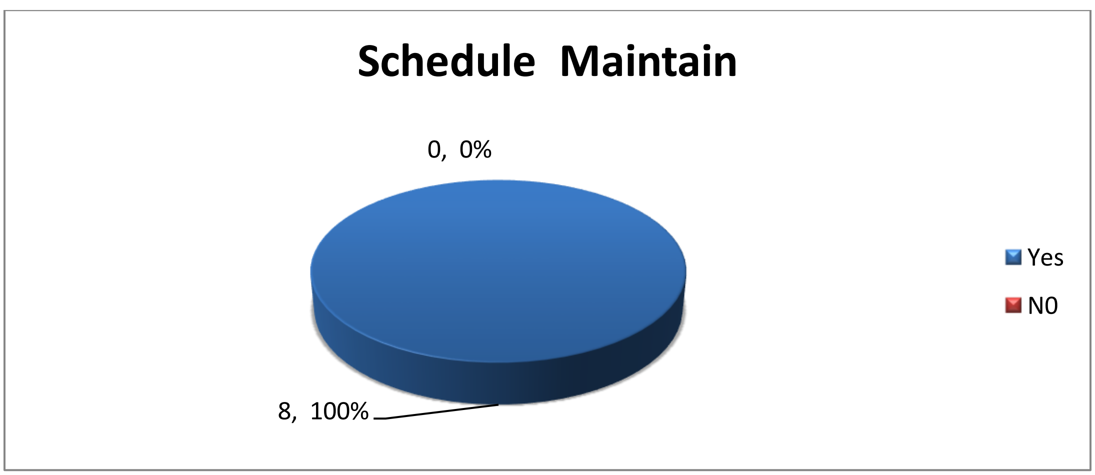


Figure 4.50: Schedule Maintain

Figure 4.50, we saw that the percentage of available in schedule bus. The maximum number of percentage 100%. That means there are a lot of available in scheduled bus.

Question-12: Is there any ticketing system?

i. Yes = 8
ii. No = 0

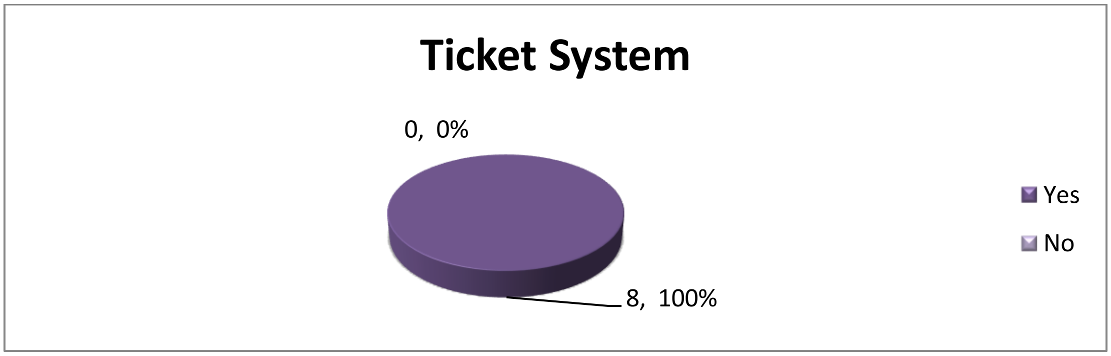


Figure 4.51: Ticket System

Figure 4.51, we saw that the percentage of ticketing system

- 100% Drivers said Yes

Question-13: What are the main reasons for accident?

i. Overtaking tendency = 2
ii. Competition = 2
iii. Contract driving = 4

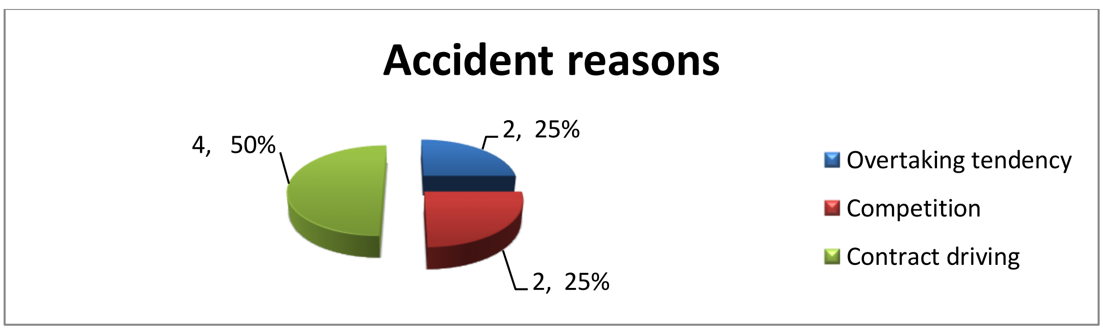


Figure 4.52: Accident Reasons

Figure 4.52 we saw that the percentage of accident reason.

- 50% drivers said that main reason of accident for contract driving.
- 25% said for competition
- Also 25% said for overtaking tendency

Question-14: Is these buses have insurance?

i. Yes = 8
ii. No = 0

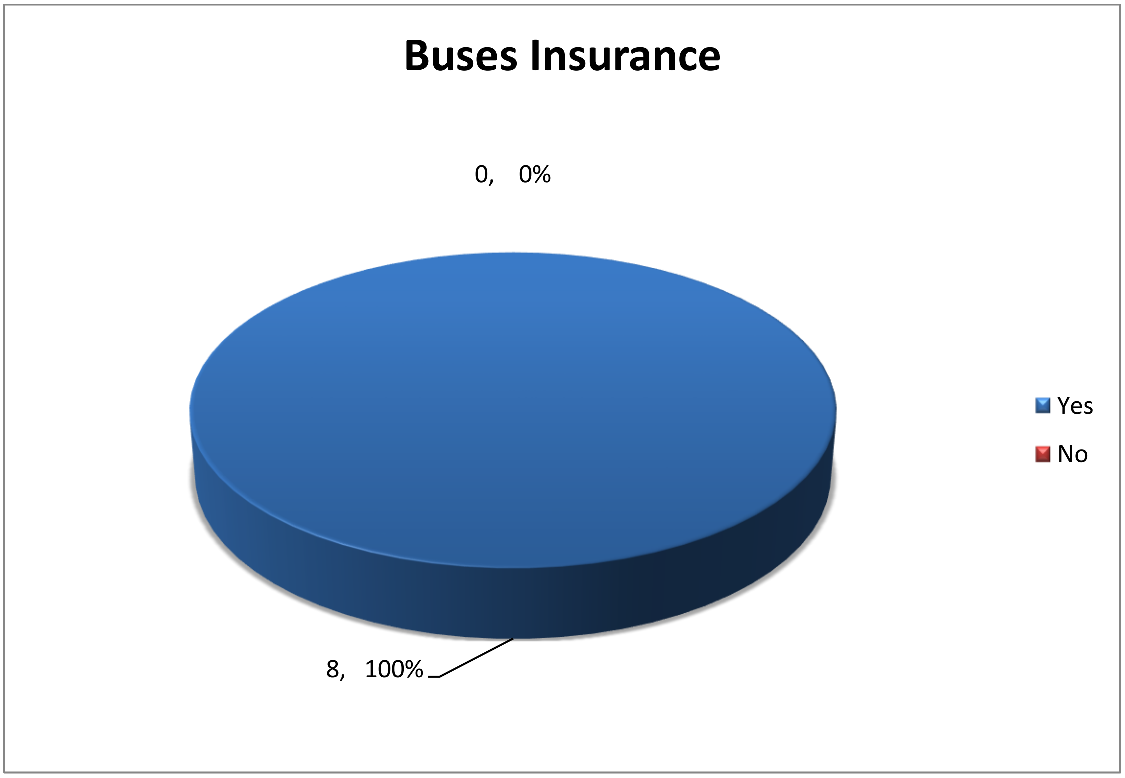


Figure 4.53: Buses Insurance

Figure 4.53, we saw that the percentage of bus insurance. All drivers said that the buses have insurance.

Question-15: How much time interval buses are left the terminal?

i. 5 to 10 minutes = 0
ii. 10 to 15 minutes = 1
iii. 15 to 20 minutes = 7

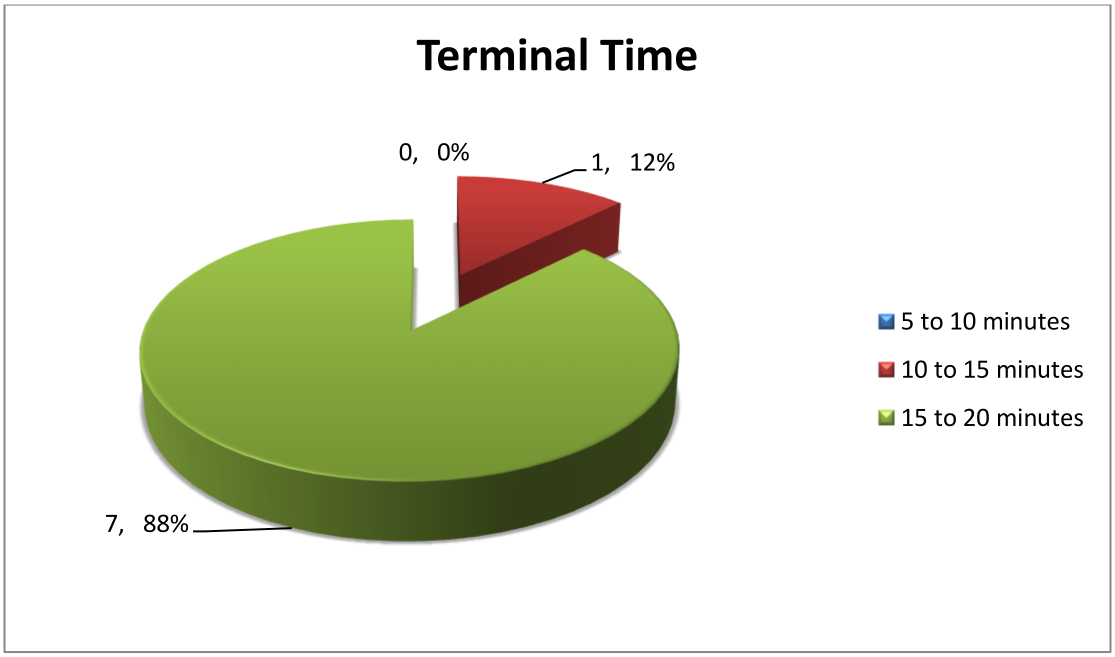


Figure 4.54: Terminal Time

Figure 4.54, we saw that the percentage of terminal time.

- About 88% drivers said that terminal time 15 to 20 minutes
- 12% said 10 to 15 minutes

Question-16: About your salary

i. Contract driving = 0
ii. Monthly salary = 8

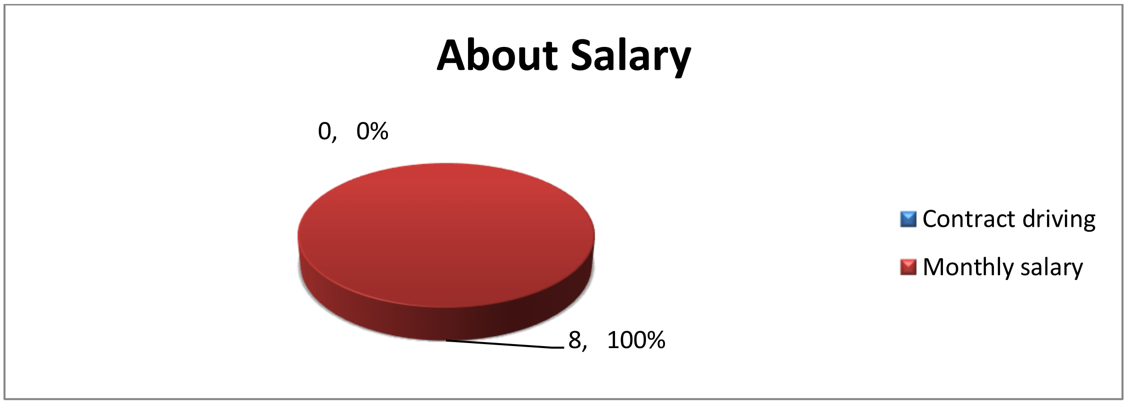


Figure 4.55: Salary

Figure 4.55, we saw that the percentage of drivers salary. 100% drivers drive the buses for monthly salary basis.

Question-17: Is this buses control by the government?

i. Yes = 7
ii. No = 1

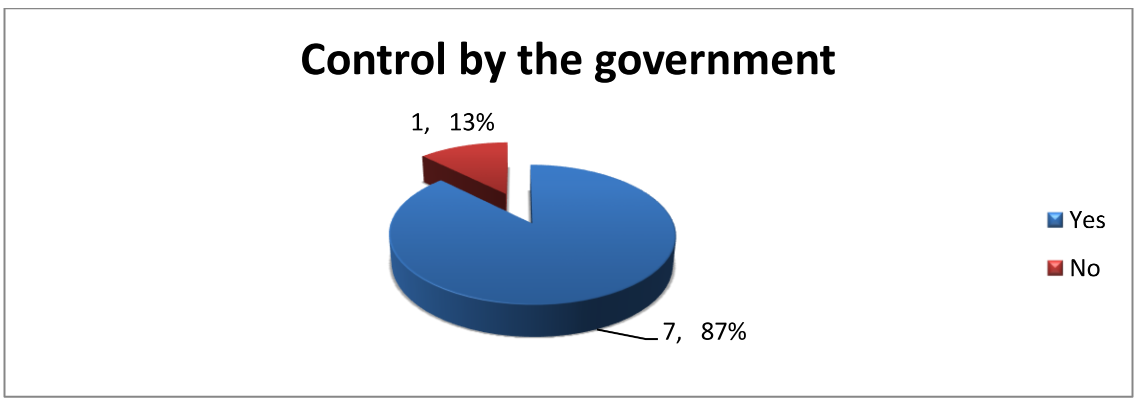


Figure 4.56: Control by the government

Figure 4.56, we saw that the percentage of bus control by the government were.

- 87% drivers said buses control by the government
- 13% said No

Question-18: How many Trip you done in a day?

i. 3 to 5 trip = 3
ii. 5 to 8 trip = 5
iii. 8 to 10 trip = 0

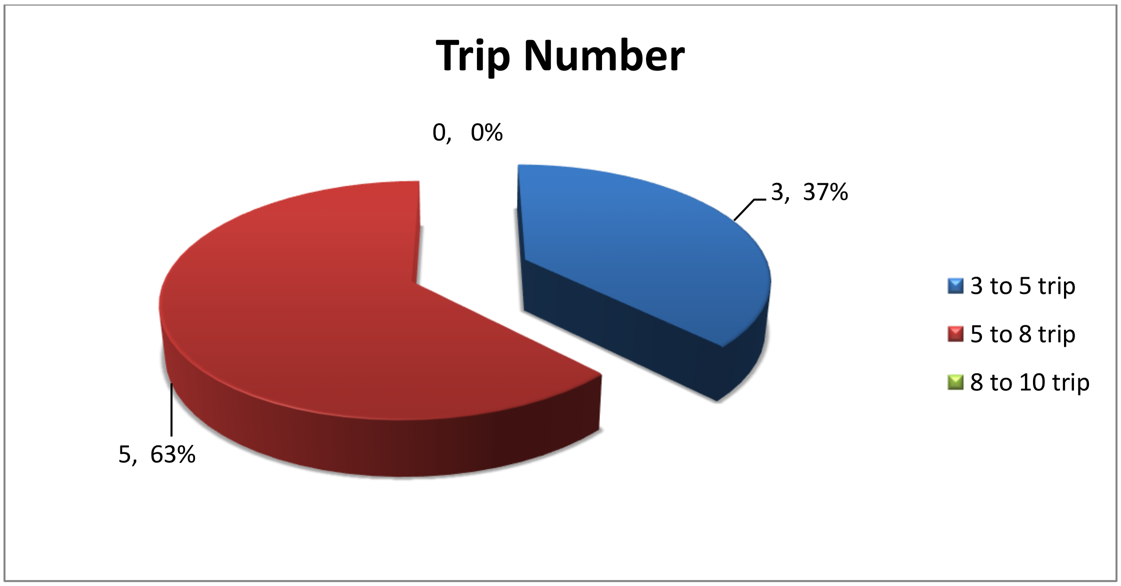


Figure 4.57: Trip Number

Figure 4.57, we saw that the percentage of trip number were.

- About 63% drivers said they done 5 to 8 trip in a day
- 37% drivers said 8 to 10 trip

Question-19: What are the most effective ways to solving traffic congestion?

i. Reduce old local buses = 3
ii. Reduce Rickshaw, Private cars = 2
iii. Do not stop buses here and there = 2
iv. Follow the traffic rules = 1

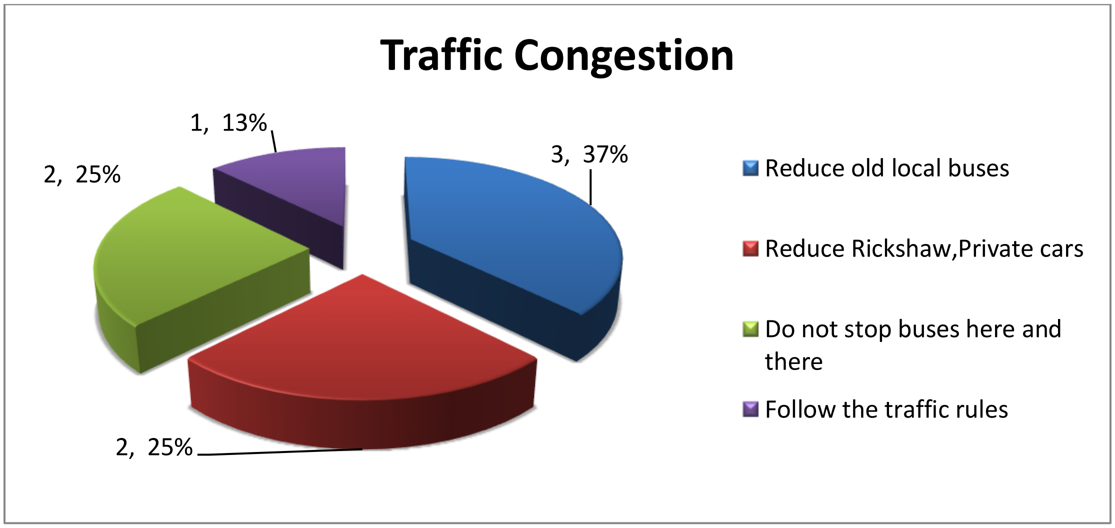


Figure 4.58: Traffic Congestion

Figure 4.58, we saw that the percentage of traffic congestion were.

- 37% drivers said Reduce old local buses
- 25% said Reduce Rickshaw, private cars
- 25% said Do not stop buses here and there
- 13% said Follow the traffic rules

Question-20: What are the specialists of these buses?

i. Camera
ii. Wireless
iii. Dustbin
iv. LED Screen
v. Only sitting
vi. Fire hydrant
vii. Emergency exit door

4.4.5 Questionnaire Survey for Passengers in BRTC Bus Service

Question-1: Gender

i. Male = 27
ii. Female = 09

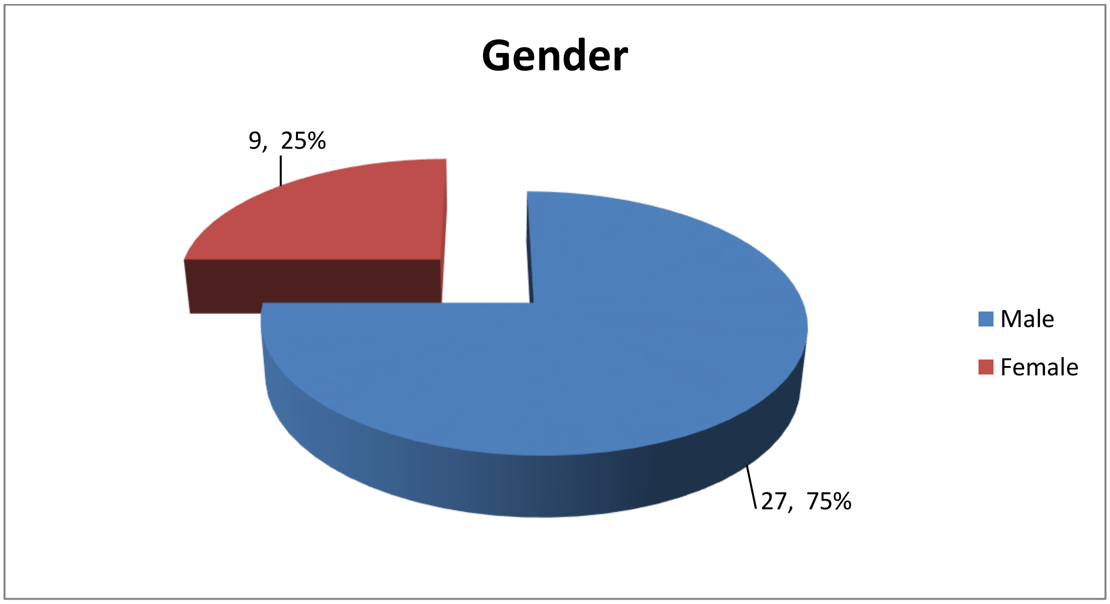


Figure 4.59: Gender

Figure 4.59, we find out the percentage of male and female for our questionnaire survey.

- There were 75% Male
- 25% were Female

Question-2: Age of the passengers

i. 20 to 30 years = 08
ii. 30 to 40 years = 12
iii. 40 to 50 years = 10
iv. 50 to 60 years = 06

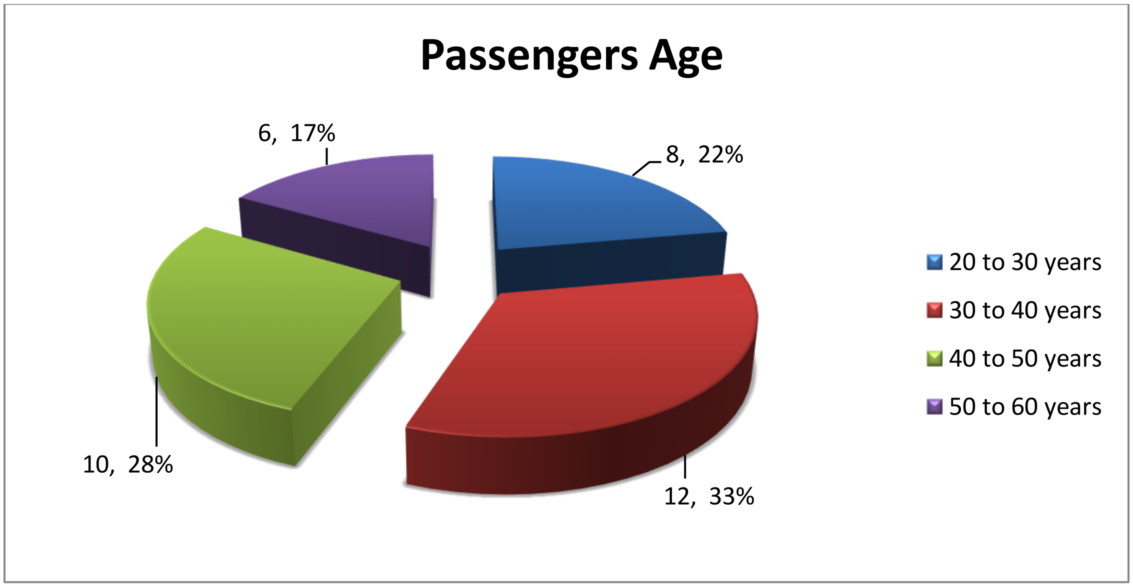


Figure 4.60: Passengers Age

Figure 4.60, we find out the age percentage of the passengers

- 33% passengers were 30 to 40 years old in our questionnaire survey
- 28% were 40 to 50 years
- 22% were 20 to 30 years
- Only 6% were 50 to 60 years old

Question-3: Educational Qualification

i. Under S.S.C = 07
ii. S.S.C/Equivalent = 09
iii. H.S.C/Equivalent = 11
iv. Honors/Equivalent = 06
v. Masters = 03

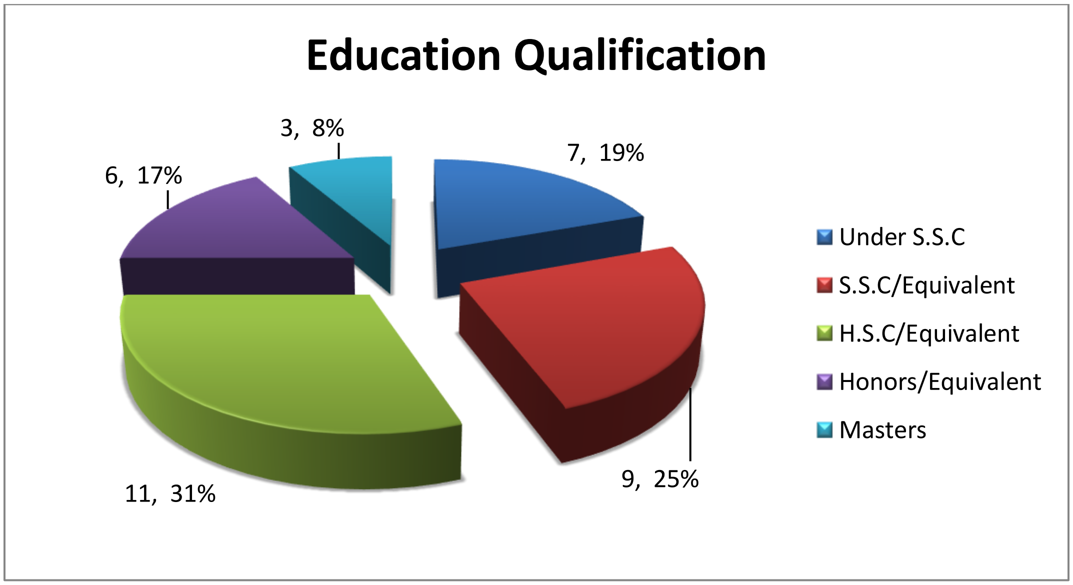


Figure 4.61: Education Qualification

Figure 4.61, we find out percentage of educational qualification of passengers

- About 31% passengers were H.S.C/Equivalent
- 25% were S.S.C/Equivalent
- 19% were under S.S.C
- 6% were Honors/Equivalent
- There were only 8% Masters pass

Question-4: Where are you coming from?

i. Home = 08
ii. Work place = 13
iii. Shopping = 05
iv. School/college = 10

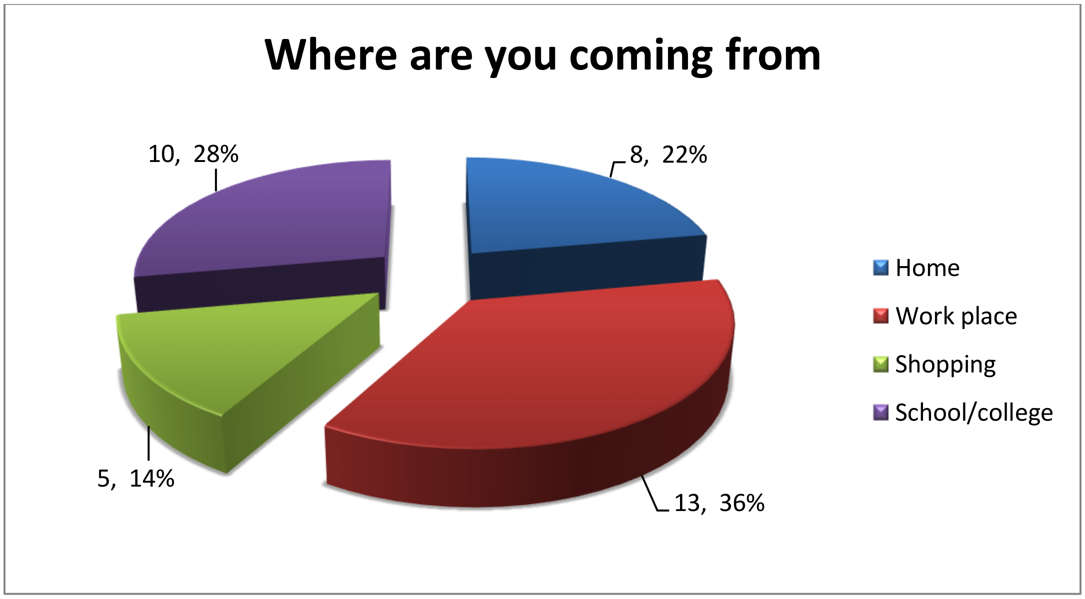


Figure 4.62: Where are you coming from

Figure 4.62, we saw that the percentage of passengers are coming from

- About 36% passengers were coming from their working place
- 28% were school/college
- 22% were home

Question-5: Did you ride this bus every day?

i. Yes = 21
ii. No = 15

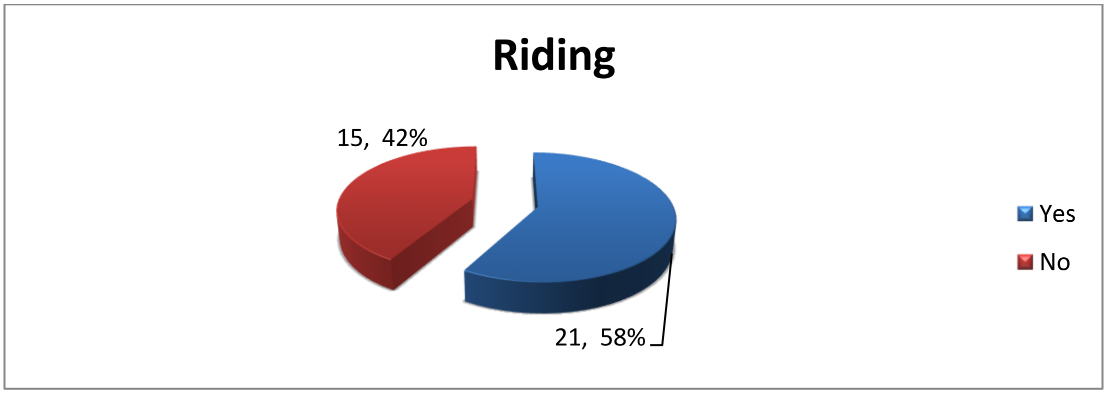


Figure 4.63: Riding

Figure 4.63, we saw that the percentage of passengers were ride this bus everyday

- About 58% passengers said Yes were ride this bus everyday
- 42% said No

Question-6: Do you have own cars?

i. Yes = 05
ii. No = 31

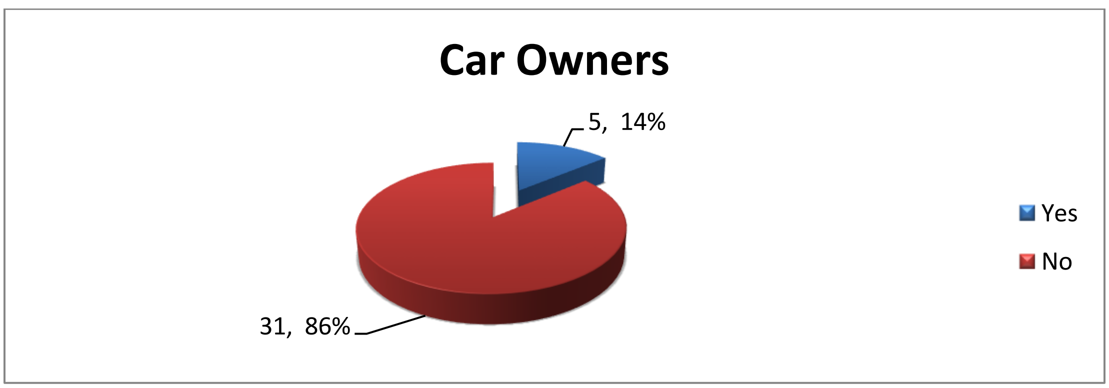


Figure 6.64: Car Owners

Figure 4.64, we saw that the passengers of car owners

- About 86% passengers said that they have No car
- 14% said Yes

Question-7: What is your opinion about physical condition of this bus?

i. Good = 30
ii. Average = 6
iii. Poor = 0

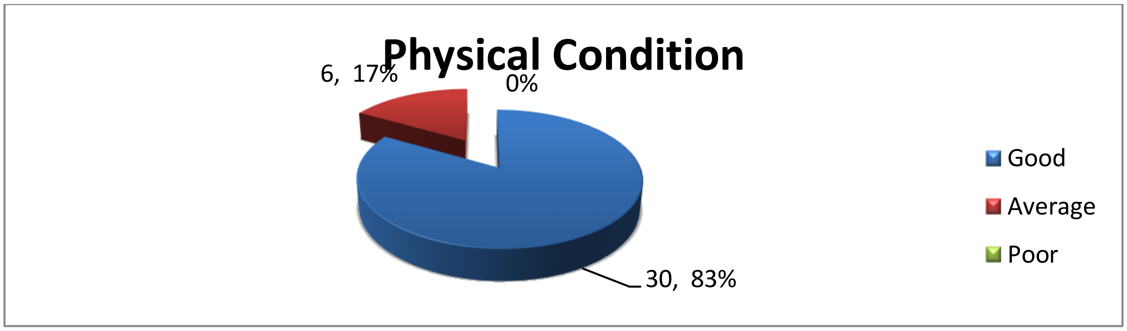


Figure 4.65: Physical Condition

Figure 4.65, we find out the condition of the physical condition

- 83% passengers said that physical condition is Good
- 17% passengers said that physical condition is Average

Question-8: Do you think there is enough waiting place for heavy passengers?

i. Yes = 12
ii. No = 24

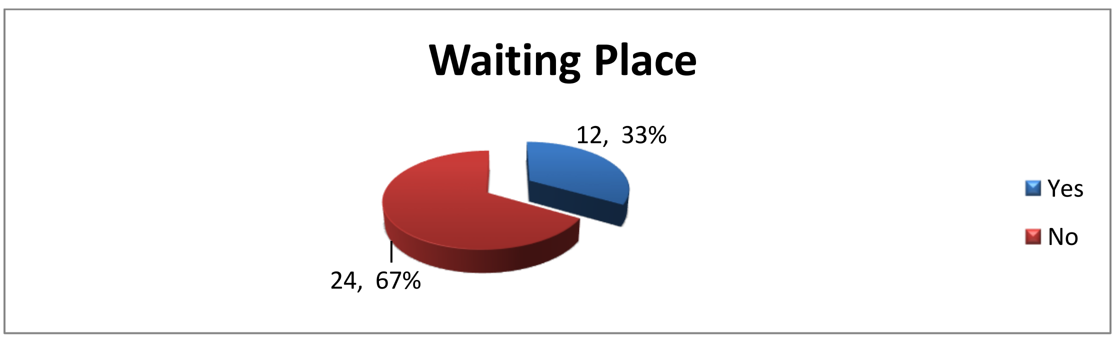


Figure 4.66: Waiting Place

Figure 4.66, we find out the percentage of enough waiting place for heavy passengers

- 67% passengers said that NO. There are no enough waiting place for heavy passengers
- Only 33% said Yes

Question-9: Do you feel comfortable in this bus?

i. Yes = 33
ii. No = 03

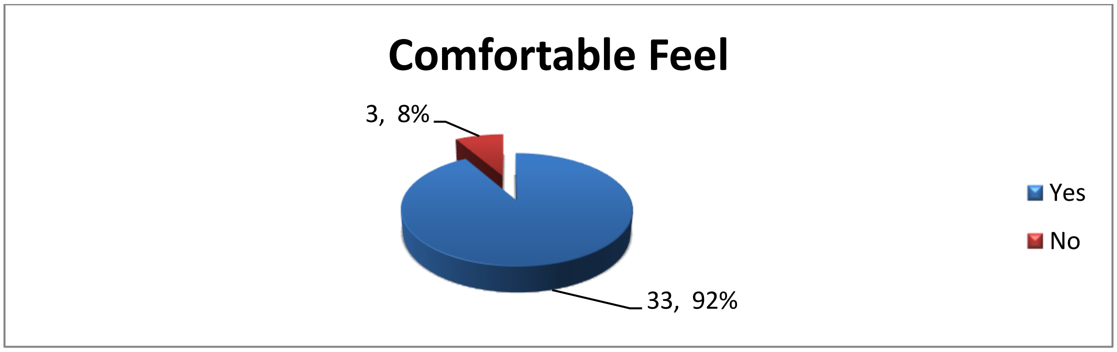


Figure 4.67: Comfortable Feel

Figure 4.67, we saw that the percentage of passengers comfortable in this bus

- Almost 92% passengers said that they feel comfortable in this bus
- 8% said they never comfortable

Question-10: Are there any ticketing system?

i. Yes = 36
ii. No = 0

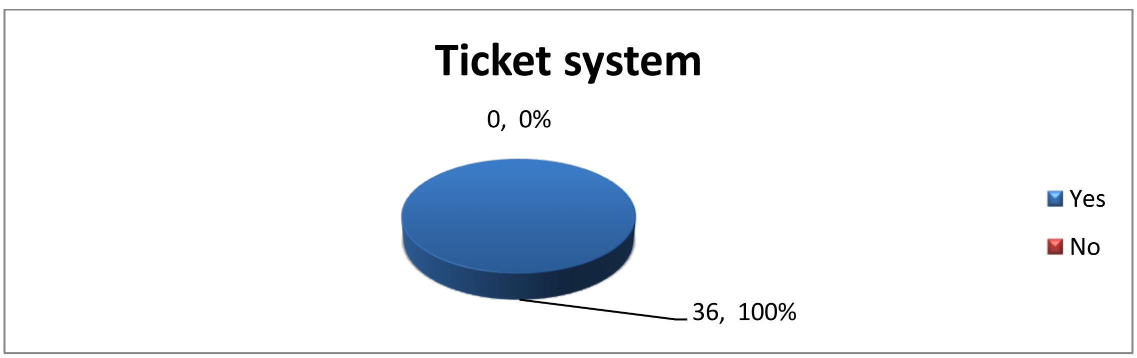


Figure 4.68: Ticket System

Figure 4.68, we saw that the percentage of ticketing system

- 100% passengers said Yes

Question-11: Do you feel buses are overcrowded in peak hours?

i. Yes = 03
ii. No = 33

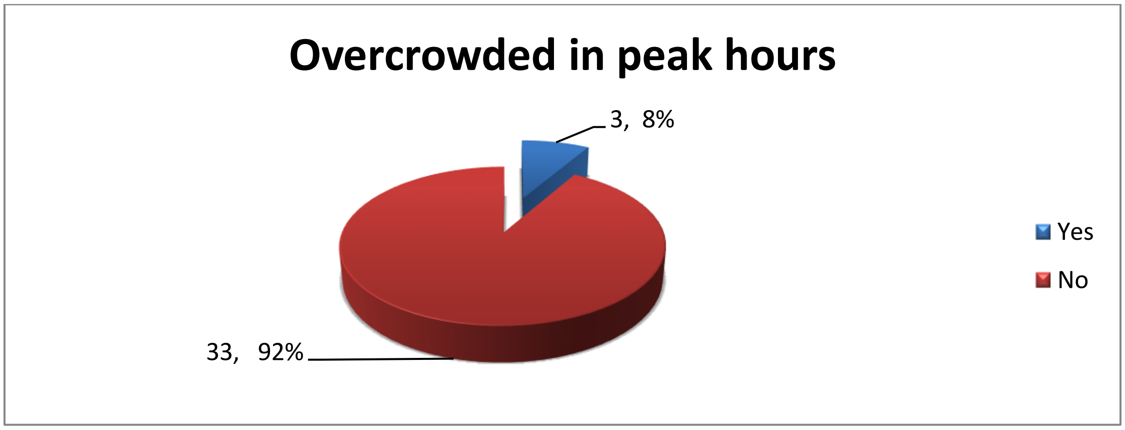


Figure 4.69: Overcrowded in peak hours

Figure 4.69, we saw that the percentage of busses are overcrowded in peak hours

- 92% passengers said No
- 8% said Yes

Question-12: Have you ever faced any bad situation?

i. Yes = 22
ii. No = 14

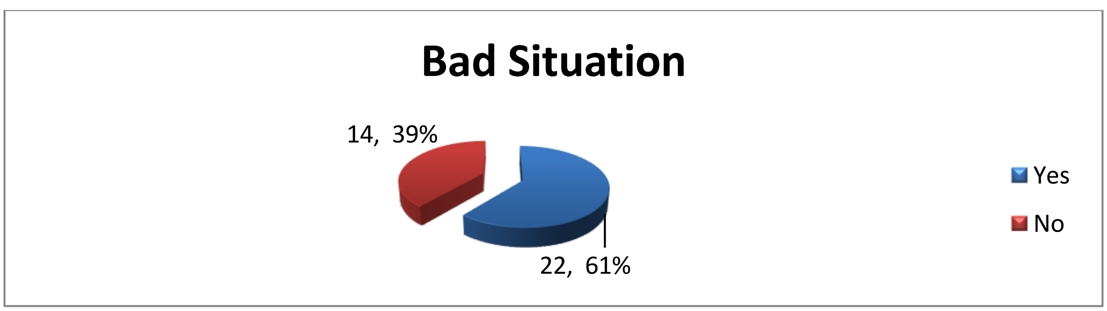


Figure 4.70: Bad Situation

Figure 4.70, we saw the percentage of passengers faced bad situation.

- 61% passengers said that they faced some unwanted situation.
- 39% said No

Question-13: Information system

i. Boards = 0
ii. Wireless = 32
iii. Personal communication = 0
iv. Video monitor = 04

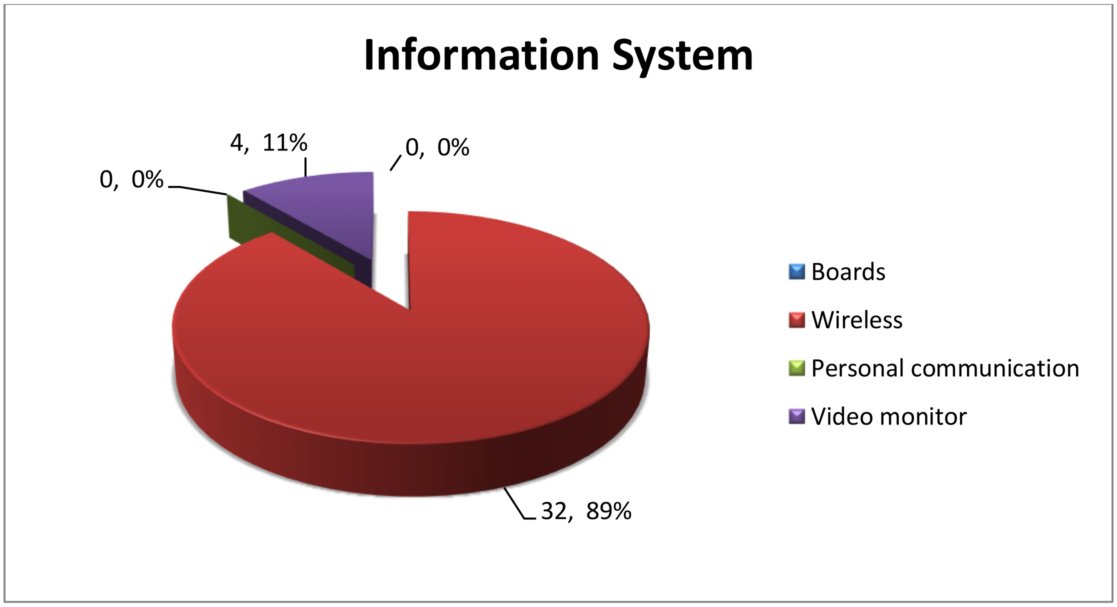


Figure 4.71: Information System

Figure 4.71, we find out the percentage of information system

- By Wireless its 89%
- Video monitor 11%
- By Personal communication 0%

Question-14: What type of transport you like most in Dhaka City?

i. Pathao/Uber = 13
ii. CNG = 07
iii. Private car = 03
iv. A/C bus = 13

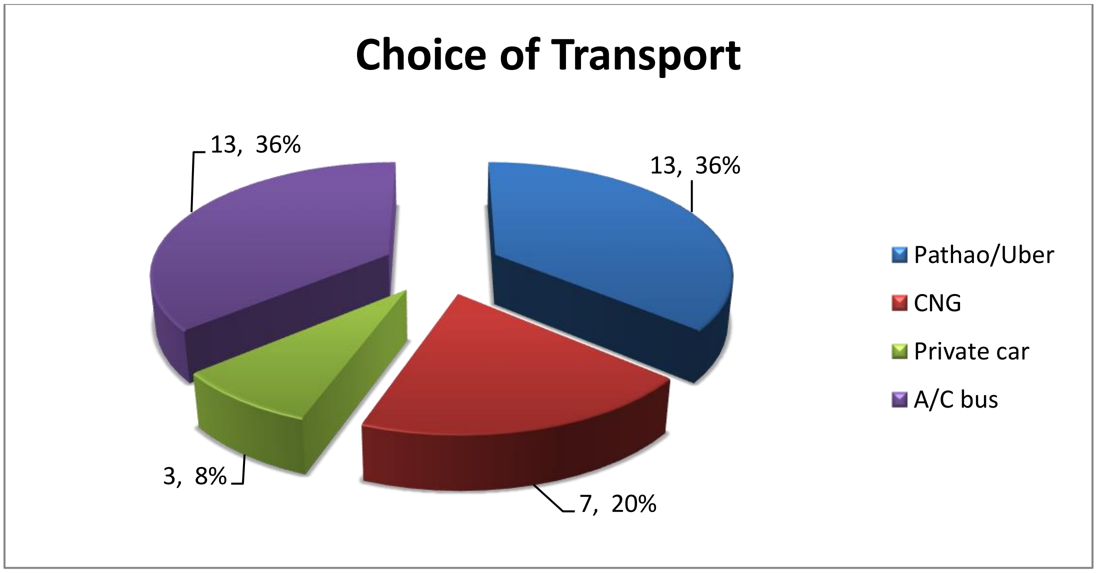


Figure 4.72: Choice of Transport

Figure 4.72, we saw that the percentage of passenger most like transport

- About 36% passengers were most like Pathao/Uber
- Also 36% like A/C bus service
- 20% like CNG
- 8% like Private car

Question-15: What do you think about the public transportation in Dhaka city?

i. Very bad = 12
ii. Poor = 10
iii. Good = 04
iv. Mixed = 10

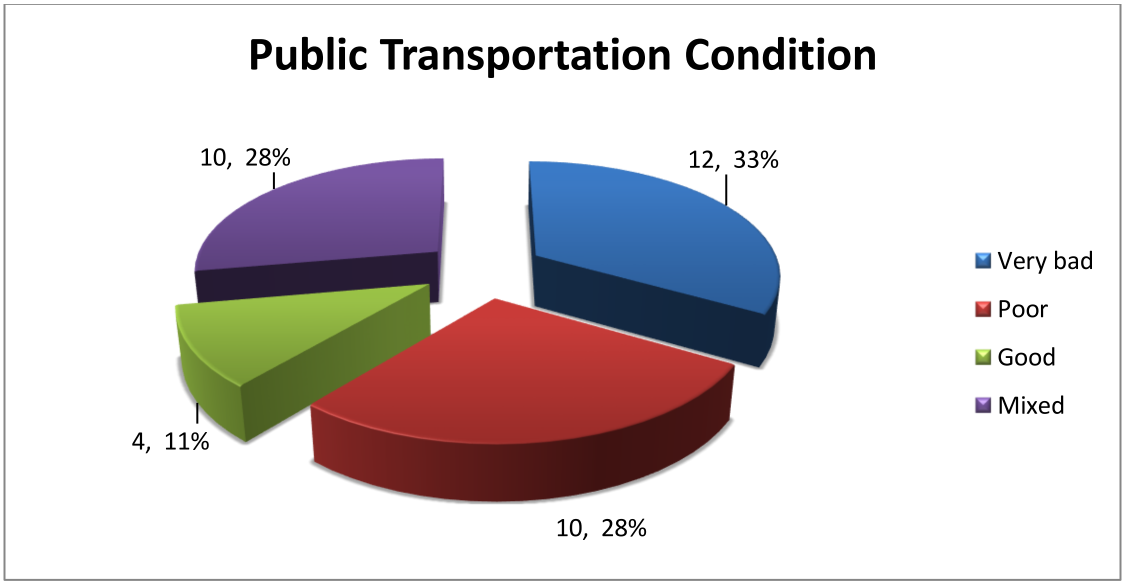


Figure 4.73: Public Transportation Condition

Figure 4.73, we find out the percentage of public transportation condition

- About 33% passengers said very bad condition
- 28% said poor condition
- Also 28% said mixed condition
- 11% said good condition

Question-16: If available would you like to use local services on holiday?

i. Yes = 30
ii. No = 06

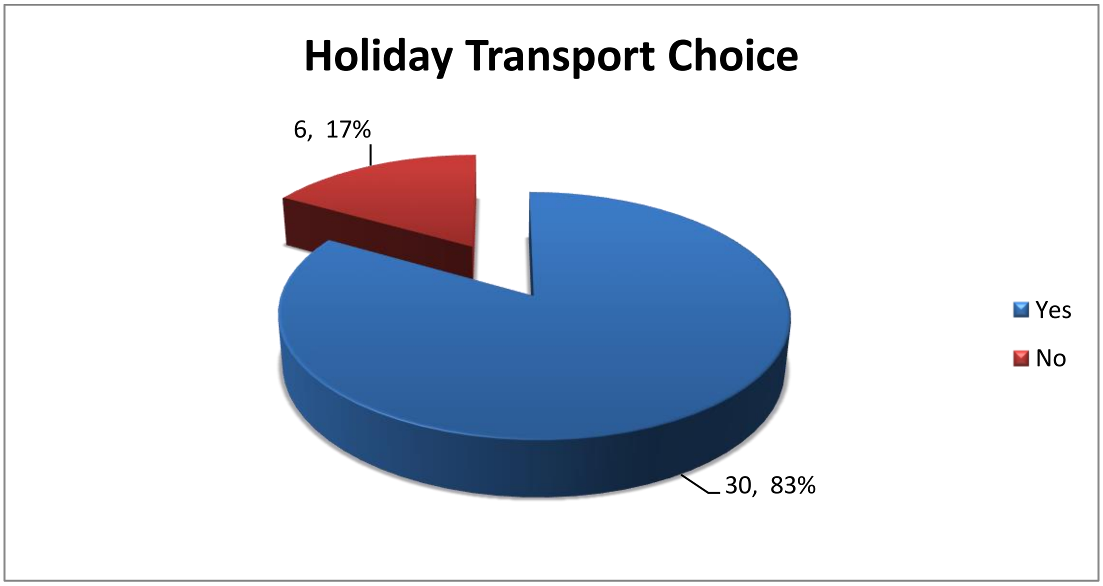


Figure 4.74: Holiday Transport Choice

Figure 4.74, we saw that the percentage of holyday transport choice

- About 83% passengers said that they like to use this service
- 17% said No

Question-17: What do you think about the price of ticket?

i. Low = 06
ii. Medium = 25
iii. High = 05

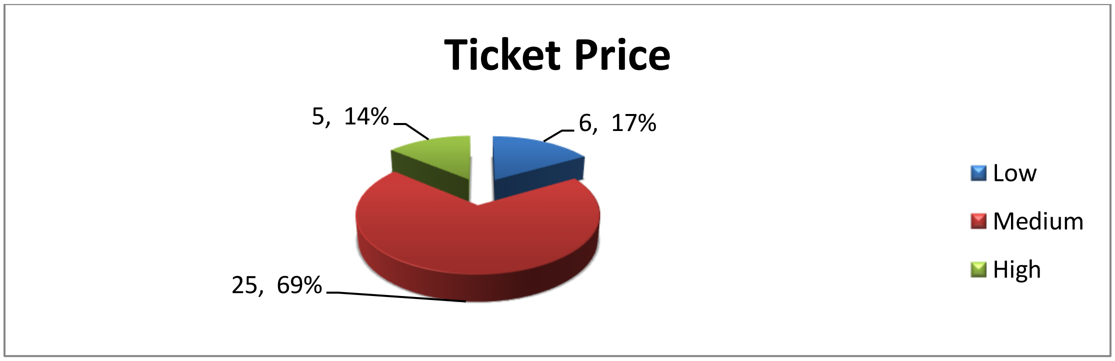


Figure 4.75: Ticket Price

Figure 4.75, we saw that the percentage of ticket price in this service

- About 69% passenger said ticket price is Medium
- 17% said Low
- 14% said High

Question-18: Are you satisfied with this service?

i. Yes = 28
ii. No = 08

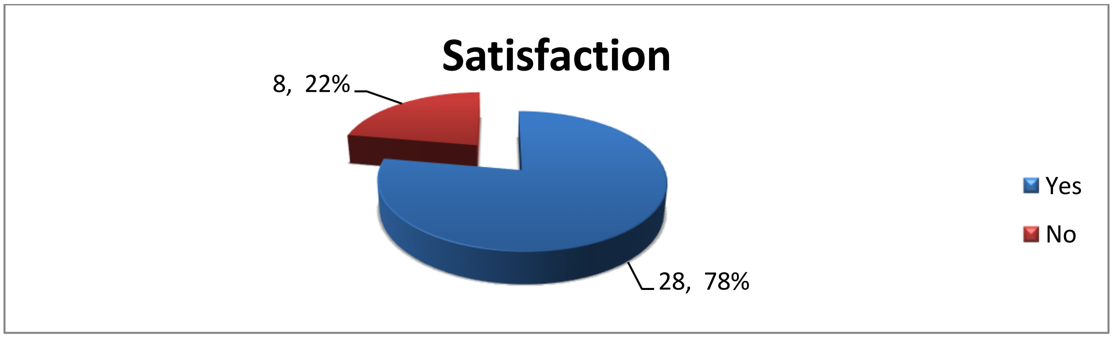


Figure 4.76: Satisfaction

Figure 4.76, we saw that the percentage of passengers satisfaction of this service

- About 78% passengers said that they satisfied of this service
- 22% said No

Question-19: Will you recommend A/C bus service to other?

i. Yes = 32
ii. No = 04

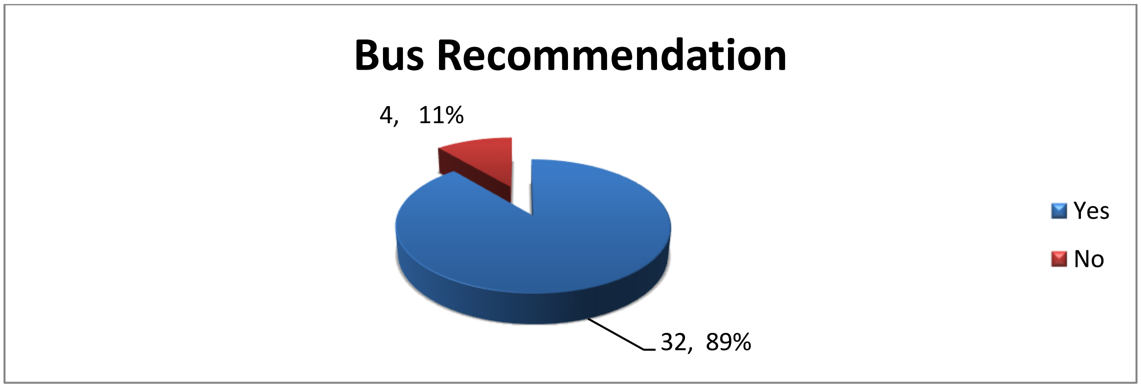


Figure 4.77: Bus Recommendation

Figure 4.77, we saw that the percentage of passengers were recommended A/C service

- About 89% passengers said Yes
- 11% said No

Question-20: How the new bus service been successful?

i. Yes = 31
ii. No = 05

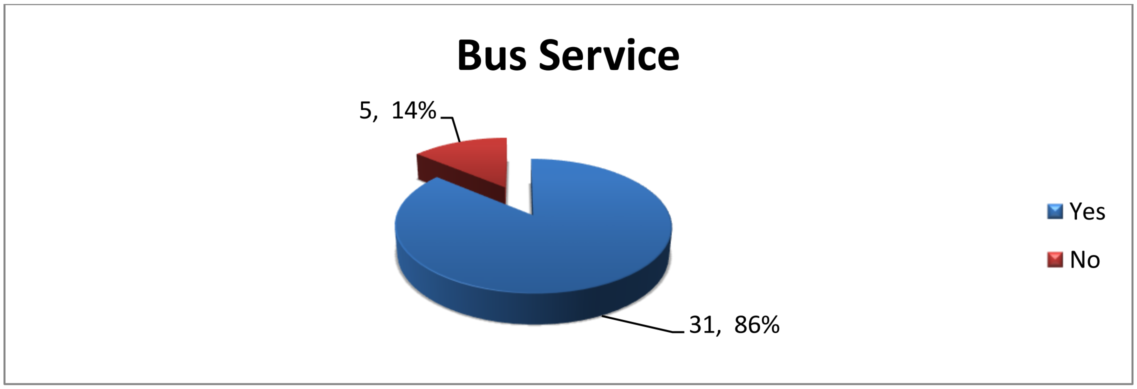


Figure 4.78: Bus Service

Figure 4.78, we saw that the percentage of passengers about new bus service

- About 86% passengers said that this service were successful
- 14% said No

Question-21: Are there any amenities for student?

Answer: There is no half pass for the student.

Question-22: Suggestion about the mass transit in Dhaka City.

i. Reduce old local buses, car, rickshaw
ii. Sitting service
iii. Ticketing system
iv. Improve traffic rules

4.4.6 Comparisons between BRTC & Local Bus Service

No	Parameter	BRTC Bus	Local Bus
01	Gender: i. Male ii. Female	 87% 13%	 85% 15%
02	Satisfaction Level i. Male ii. Female	 85% satisfied 78% satisfied	 70% unsatisfied 78% unsatisfied
03	Cleanliness	85% satisfied	76% unsatisfied
04	Behavior i. Male ii. Female	 85% satisfied 78% satisfied	 56% unsatisfied 70% unsatisfied
05	Comfort i. Male ii. Female	 87% satisfied 76% satisfied	 70% unsatisfied 68% unsatisfied
06	Physical Condition of Bus	85% satisfied	70% unsatisfied
07	Waiting Time	60%(0-3)min	70%(8-10)min
08	Terminal Time	85%(0-2)min	75%(0-5)min
09	Delay (Peak Hour)	65%(0-5)min	68%(0-10)min
10	Fare Rate	60% satisfied	85% satisfied
11	Safety i. Female	 78% feeling safe	 70% feeling unsafe

Summary of the questionnaire survey of Drivers:

- The passengers have faced congestion and they are not comfortable with it. The drivers give some points to release Congestion and Improving Passenger's Satisfaction. Private Car Reduce, Ticketing System, Improving Traffic System and Management, Increase Bypass road and modify the Transport Planning System.
- The Drivers has been given some suggestion about Service Improvement. Proper Maintenance of buses, Maintain the Ticketing System, Increasing Seat Capacity, Sitting Service and Gate Lock Service.

Summary of the questionnaire survey of Helpers:

- Weak public mass transport, ineffective traffic control, the mix of motorized and non motorized vehicles, poor road manners, illegal parking and the presence of hawkers contribute to excessive traffic congestion.
- Banned the illegal bus companies, improving Traffic management system, remove the illegal parking besides routes, increasing seat capacity of the buses, Fixed women seats, good behavior with passengers. If it will maintain than increase the transport facility and passenger's satisfaction.

Summary of the questionnaire survey of passengers:

- The passenger's has been given some suggestion to improve bus terminal. They said to increase space capacity for parking and maintenance, required nice Environment, Improve maintenance system than the public transport will perform well and given the satisfaction to the passengers.
- The passengers also given some suggestion about bus service condition. These are improving maintenance system, Increase seat capacity of buses, Arrange sitting service, and Ticketing system.

4.5 Photographic Survey

Photographic survey is the important part of the data collection. In this survey we collect data by the taking photograph from the different areas. Photograph survey make easy to analysis data.

4.5.1 Photographic Survey for Local Bus

<u>Bus Terminal</u>:

Photo 4.1: Bus on road traffic Photo **4.2: Overtaking Tendency**

Photo 4.3: CNG & Local bus on road traffic

Photo 4.4: Bus on road traffic

<u>Summary from Anabil Super</u>

- Non AC
- Gate Lock
- No Ticketing System
- Photo 4.1

<u>Summary from Raida Enterprise</u>

- Non AC
- No Ticketing System
- Route Distribution-DiabariChowrasta-Uttara-Airport-Kuril Flyover-Badda-Khilgaon-Titipara-Sayedabad-Jatrabari-Postogola.
- Photo 4.2

Summary from Salsabil Paribahan

- Non AC
- No Ticketing System
- Photo 4.3

Summary from Turag Paribahan

- Non AC
- Local Type
- No Ticketing System
- Route Distribution - Tongi- Abdullapur – Airport - kuril - Natun Bazar – Badda Rampura – Malibag – Khilgaon – Bashabo – Mugda – Maniknagar – Sayedabad - Jatrabari
- Photo 4.4

Traffic Signal:

Photo 4.5: Khilgaon signal post

Photo 4.6: Mouchak signal post

Photo 4.7: Mouchak signal post

<u>Summary of Traffic Signal</u>:

- Traffic signal is control devices that are most commonly installed at arterial roadway intersections to carry traffic from local streets to highways.
- Traffic signal controllers and detection devices are incorporated into a variety of different arrangement in order to accommodate the needs of each arterial roadway intersection.

STOP	STOP Prepare to go	GO	STOP if safe to do so

Road Sign:

Photo 4.8: Indicate sign at Khilgaon

Photo 4.9: Warning sign at Kamlapur footover

Photo 4.10: Restricted sign at Khilgaon Flyover

Photo 4.11: Pedestrian movementsign at Mouchak

Road Sign:

Photo 4.12: Rail crossing sign at Malibag Rail gate

Photo 4.13: Speed limit sign at Khilgaon Flyover

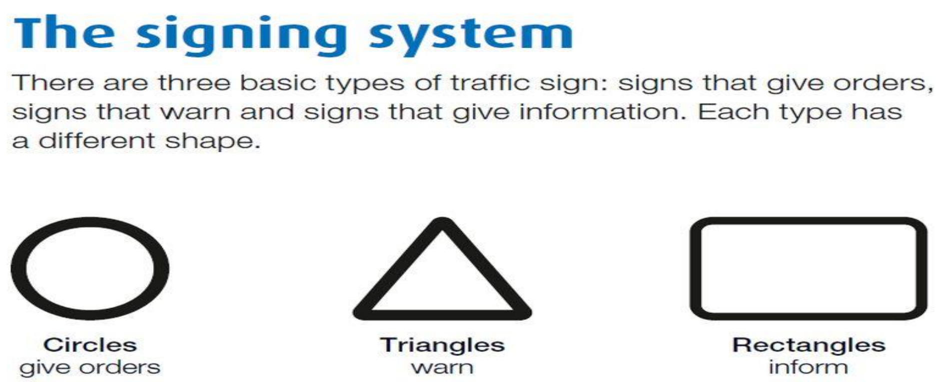
Photo 4.14: Direction sign at Khilgaon Flyover

Photo 4.15: Turning sign at Khilgaon

Summary of Road Sign:

- In photo 4.8 indicate the Kamlapur Railway station and Khilgaon Flyover.
- In photo 4.9 warning sign, and to be safe and use the Foot over bridge.
- In photo 4.10 restricted sign for no movement for pedestrian and rickshaw.
- In photo 4.11 is movement for pedestrian
- In photo 4.12 shows a rail crossing.
- In photo 4.13 shows speed limit(30km)
- In photo 4.14 shows the direction of Rajarbag and Malibag.
- In photo 4.15 shows turning point direction of roads.

Shape of Signs:



Road marking:

Photo 4.16: Zebra Crossing

Photo 4.17: Left Marking Sign

Photo 4.18: Speed Braker

Summary of Road Marking:

- In photo 4.16 shows a (zebra crossing) for movement for peddestrain.
- In photo 4.17 shows a left marking sign which indicate that, there must a left road.
- In photo4.18 shows a speed braker.

Physical Condition of Road:

Photo 4.19: Damage Road & Stagnant Water

Photo 4.20: Construction Work on Road

<u>Physical Condition Of Road</u>:

Photo 4.21: Construction Work on Road

Photo 4.22: Road Side Damage

Summary of physical condition of roads:

- In photo 4.19, 4.20, 4.21, 4.22 Shows the physical condition of road.
- This condition of roads can make a big impact for transportation system and facilities.
- In photo 4.20 & 4.21 shows that, this route is under construction. Because of this the route widths is reduced, and that's why congestion is increase. The drivers cannot use the full widths of the routes.
- In photo 4.19 we saw that, the water logging. The drivers can use that side because of this water logging. That's why width is reduced and congestion increasing day by day. The passengers have to face the traffic jam.
- In photo 4.22 we saw that, road side are damaged.

Foot over Bridge:

Photo 4.23: Illegal rickshaw parking

Photo 4.24: Foot over bridge is blocked by raw materials

Photo 4.25: Foot over bridge is blocked by raw materials

Summary of Foot-over Bridge:

- In photo 4.23 Shows that there are some space between barrier and pedestrian are crossing the road. This is very risky and this can make a big impact for vehicle movement and facilities.
- Foot over bridge is blocked by the raw materials and hampers the public movement (photo 4.24 & 4.25)

Lighting:

Photo 4.26: Lighting signal at Malibag

Photo 4.27: Lighting signal at Jatrabari Mayor MohammadHanif flyover

Photo 4.28: Mouchak flyover

Photo 4.29: Lighting at Hatirjheel

<u>Summary of street lighting</u>:

- Street lighting provides a number of important benefits. It Can be use to promote security in urban areas and increase the quality of life by artificially extending the hours in which it is light so that activity can take place.
- Street lighting also improve safety for drivers, riders and pedestrians.
- Pedestrians and vulnerable road users suffer from decrease visibility in the dark too.

Mouchak Flyover:

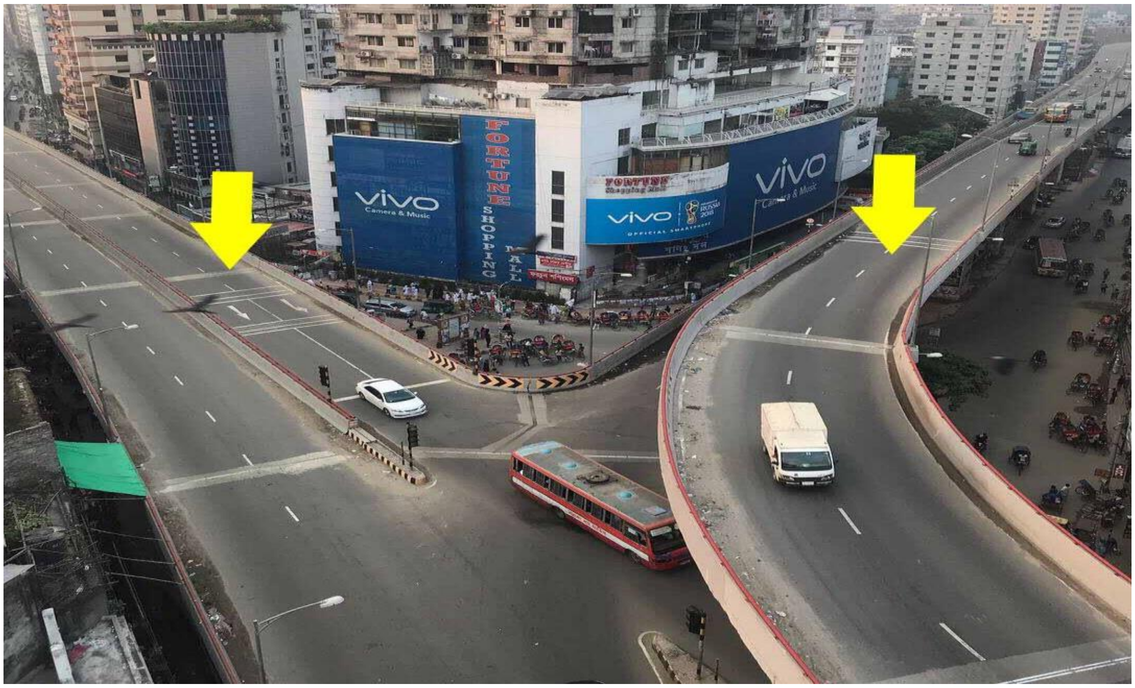
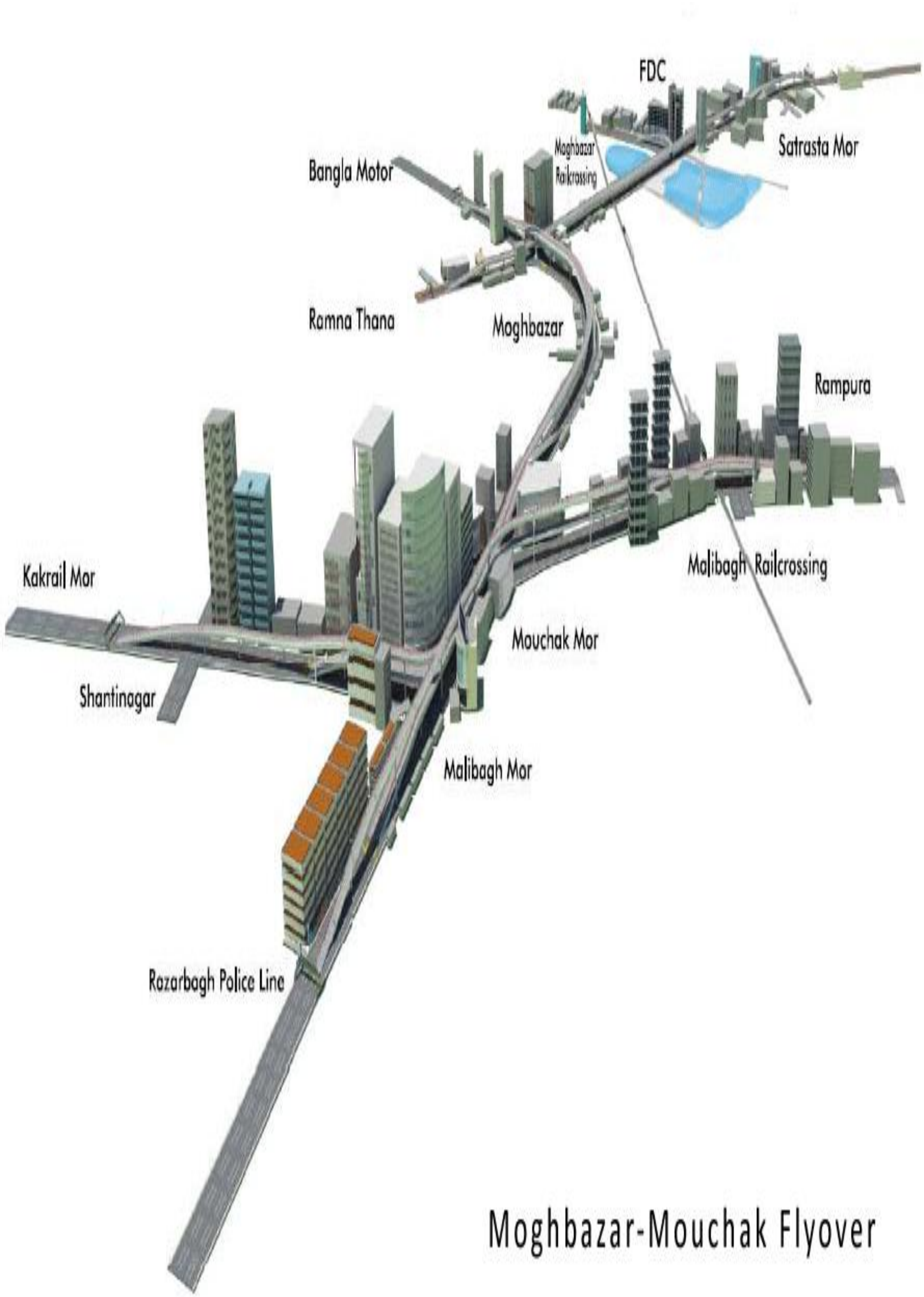


Photo 4.30: Mouchak Flyover

Photo 4.31: Mouchak Flyover

Su mmary of Mouchak Flyover --Road are connected:



<u>MeyorHanif Flyover</u>:

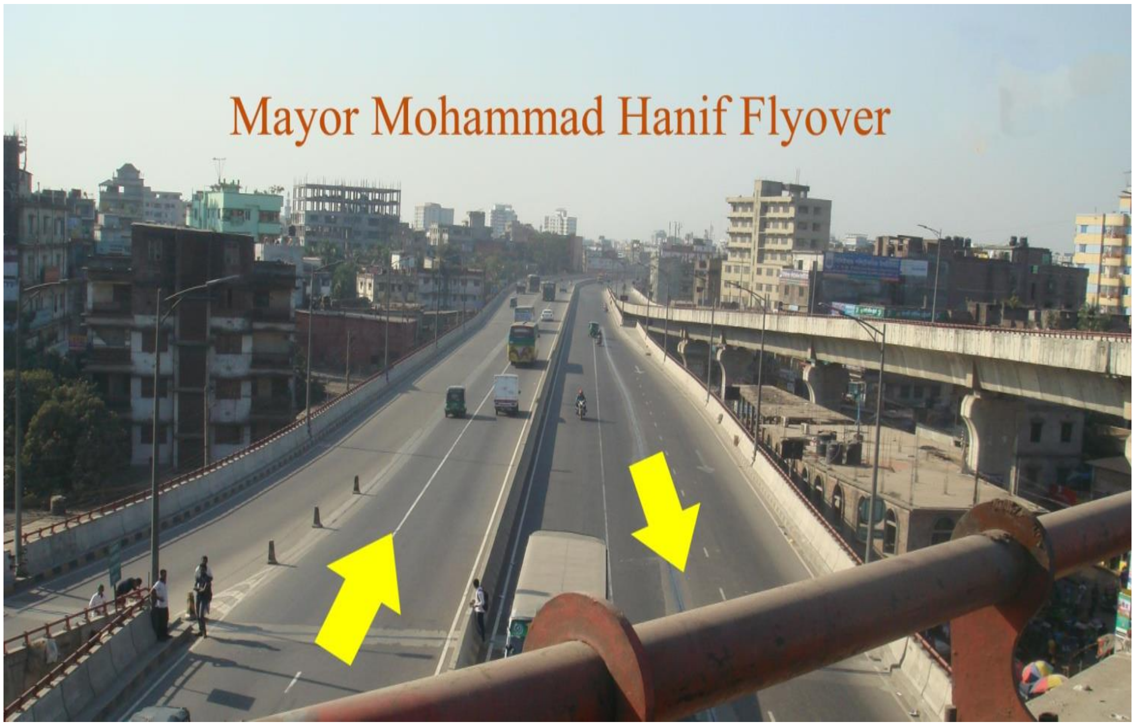


Photo 4.32: Mayor Mohammad Hanif Flyover

Photo 4.33: Mayor Mohammad Hanif Flyover Toll Box

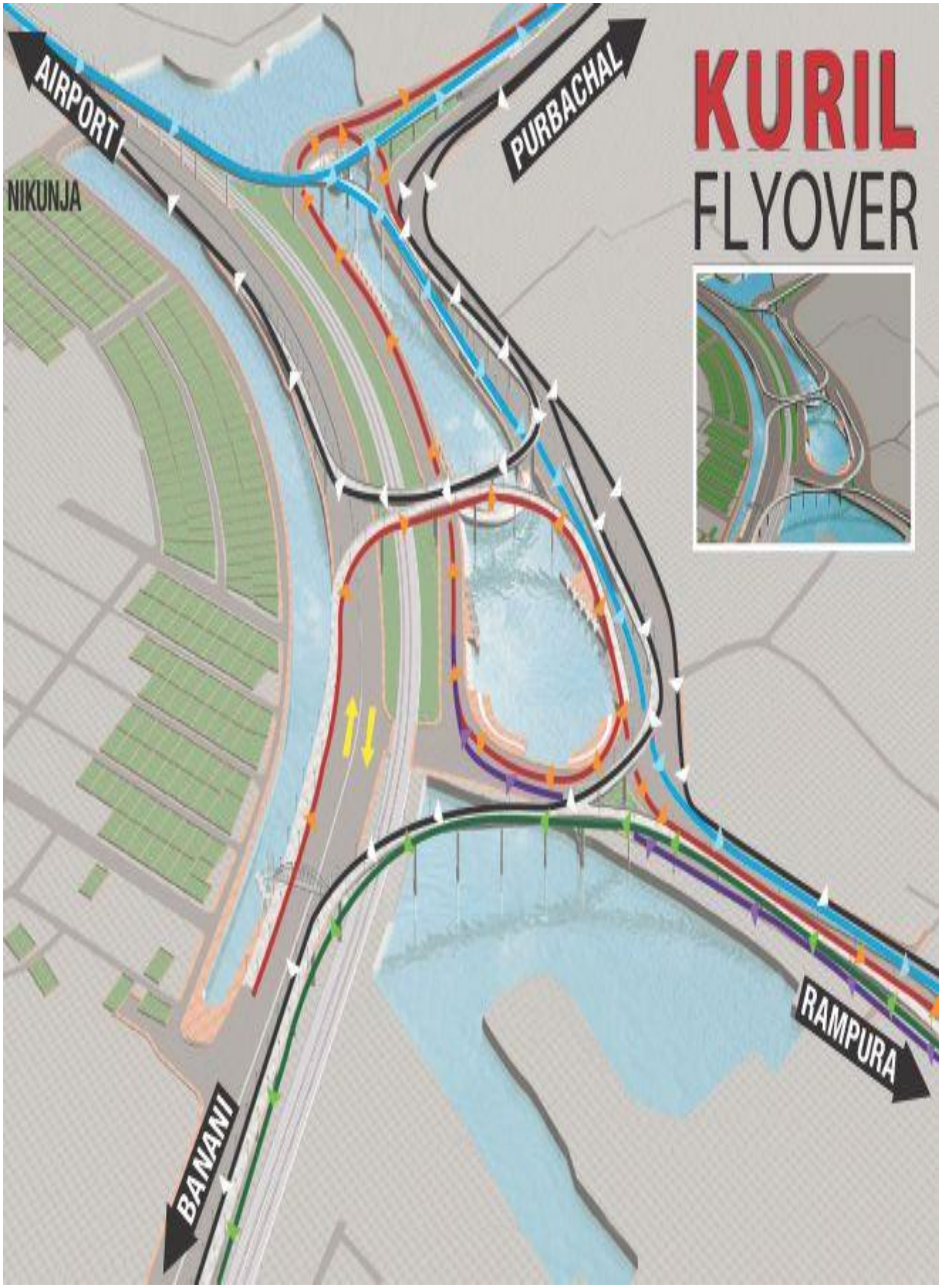
Summary of Meyor Hanif Flyover—Connection of Routes:

Kuril Flyover:

Photo 4.34: Kuril Flyover

Photo 4.35: Kuril Flyover

Summary of Kuril Flyover—Connection of Routes:



<u>Geometric Condition of Road</u>:

Photo 4.36: Indicate the Direction of Left

Photo 4.37: Left Turn

Photo 4.38: Straight or Turn Left

<u>Summary Of Geometric condition</u>:

- These photos indicate the direction of routes which is curved for different directions.

4.5.2 Photographic Survey for BRTC

<u>Bus Terminal</u>:

Photo 4.39: Parking in Road Side

Photo 4.40: Left the Bus Stoppage

Photo 4.41: Bus on Road Traffic

Photo 4.42: Passengers Loading/Unloading

<u>Advantages of BRTC Bus Services</u>:

Photo 4.43: First Aid

Photo 4.44: Emergency Exit Door

Photo 4.45: Fire Hydrant

Photo 4.46: Wireless & Video Camera

<u>Summary of Mohammodpur to Kamlapur BRTC</u>:

- AC Services
- Ticketing system
- Fire hydrant
- First Aid
- Wireless
- Video Camera
- Emergency Exit Door
- Back Side Camera
- LED Monitoring System
- LED TV
- Auto Door
- Road distribution-Mohammadpur-Zigatola-Sciencelab-Sahabag-Gulistan-Motijheel-Kamlapur

<u>Summary of Dhanmondi to Azimpur BRTC</u>:

- AC Services
- Ticketing system
- Fire hydrant
- First Aid
- Wireless
- Video Camera
- Emergency Exit Door
- Back Side Camera
- LED Monitoring System
- LED TV
- Auto Door
- Road distribution-Mohammodpur–Asadgate–Zigatola-Sukrabad-Kolabagan-Sciencelab-Newmarket-Azimpur-Polashi-Katabon-Citycollege-Kolabagan-Asadgate-Mohammodpur.

4.6 Findings of the Study

We have done the survey on Mass Transit System in Dhaka City. For the survey we have taken major roads from Dhaka City routes and according the routes we collect data for study.

1. From analysis of survey result, we find the actual situation of present mass transit system is very bad because of traffic jam, poor road condition and huge motorize and non-motorize vehicles
2. After analysis from survey data, we want to know how much vehicles need for particular route.
3. From analysis we found large number buses, large number of private car, large number of rickshaw and operating speed. As a result in particular route, we have to use excess vehicles than actual situation.
4. From the analysis we found poor road space, road side construction, damage road. That's why create traffic jam and we can't reach our destination timely. If we could provide good road condition and less traffic jam we would need less buses.
5. From analysis we found that old buses and private car ownership increase day by day. We have face problem daily.
6. Motorize and non-motorize vehicles ply on the same roads at the same time.

4.7 Overview

This chapter described the data collection and analysis from questionnaire and photographic survey. We collect data from the field by asking question to the passengers, helpers, drivers and taking photograph of buses, road conditions and sign signal etc. We analysis data and finding the problem of the bus service in Dhaka City. We also compare local service and BRTC bus service in major routes of Dhaka City.

CHAPTER FIVE

CONCLUSIONS & RECOMMENDATIONS

CHAPTER V

CONCLUSIONS & RECOMMENDATIONS

5.1 General

Buses are the only organized mass public transport system available now in Dhaka City. The paper explored the overall situation of bus service; particularly the major problems the passengers are facing, based on their experience and gave some suggestions for improving the services quality. The outcome might be helpful for the service providers to know what the passengers mostly expect and thus improve the delivery of bus services. It was observed that the existing bus service quality is very poor. There is no specified time schedule for the buses operating; hence passengers waiting time at station is longer. Except a few bus of seating service all the buses carry extra passengers than the seat capacity and always remain over-crowded.

The mass transit systems of the city failed to serve the needs of mass people and also failed to maintain an adequate level of service at prices affordable for the poor. It was found that most of the respondents are very unsatisfied with the waiting time as they have to wait for a longer time for the bus. The number of high capacity buses and their service level need to be increased to cope with the current demand. Hence, transport facilities of the city should be provided keeping in mind the population growth, economic development, and future travel demand of the city.

5.2 Findings/Conclusions

The transport system has become one of the major problems in Dhaka City. We find out some problems by questionnaire and photographic survey. We surveyed under two bus services one of them local buses and another one BRTC A/C bus services at the different routes in the Dhaka city. The level of services of these two buses we find out some parameters these are, users (male/female),satisfaction level, cleanliness, behavior, comfort, physical condition of bus, waiting time, terminal time, delay, fare rate, safety of women etc. Most of the passengers chosen the BRTC A/C bus service because of their service quality.

Local buses are always crowded. The physical condition of BRTC A/C bus service is better than local service. BRTC A/C buses are well cleaned. Most of the passengers satisfied of the BRTC A/C service. Women passengers are feel safe in BRTC A/C service. The passengers also said the behavior of helpers were better than local buses.

5.2.1 Findings from Questionnaire Survey

- The drivers have faced problems and they are not comfortable with it. The problems are huge private cars, inadequate traffic system and management, few bypass road, huge rickshaws, no ticketing system, illegal parking and presence of hawkers.
- The helpers also faced problems in the transport sector. They said the problems that they have faced weak public mass transport, mixed of motorized and non-motorized vehicle, poor road conditions, illegal parking, no fixed women seat, inadequate seat capacity, misbehaves of passengers.
- In the mass transport passengers also faced many problems. The problems are terminal and waiting time are excessively, inadequate seat capacity, poor maintenance, no ticketing system except some buses, no sitting service except some buses, no women seat, no parking facilities, no proper monitoring by the authority.

5.2.2 Observation from Photographic Survey

- We observed the actual situation of present mass transit system is very bad because of traffic jam, poor road condition and huge motorize and non-motorize vehicles
- We observed the large number buses, large number of private car, large number of rickshaw and operating speed. As a result in particular route, we have to use excess vehicles than actual situation.
- We observed the poor road space, road side construction, damage road. That’s why create traffic jam and we can’t reach our destination timely. If we could provide good road condition and less traffic jam we would need less buses.
- Motorize and non-motorize vehicles ply on the same roads at the same time.

5.3 Recommendations for Future Study

The prevailing situation is worsened by the sharing of this inadequate space by motorized and non-motorized traffic. The existing mass transit system could not solve the existing problem of Dhaka City. A number of transit proposal are available to communities to help address growing traffic congestion.

1. The quality and design of buses would have to be significantly upgraded with a view to providing comfort to the riders and thereby make bus travel a part of and efficient mass public transport system which could also help reduce private vehicle usage.
2. Discourage private transport imposing higher tax, congestion charge and higher parking fee.
3. Sharing of time and space by staggering office hour, school and university time can greatly reduce the peak hour traffic volume.
4. Provide overpass/underpass at major roadway intersections for efficient movement of pedestrians.
5. Limiting hawkers to specific locations, rehabilitation and free the footpaths as much as possible.

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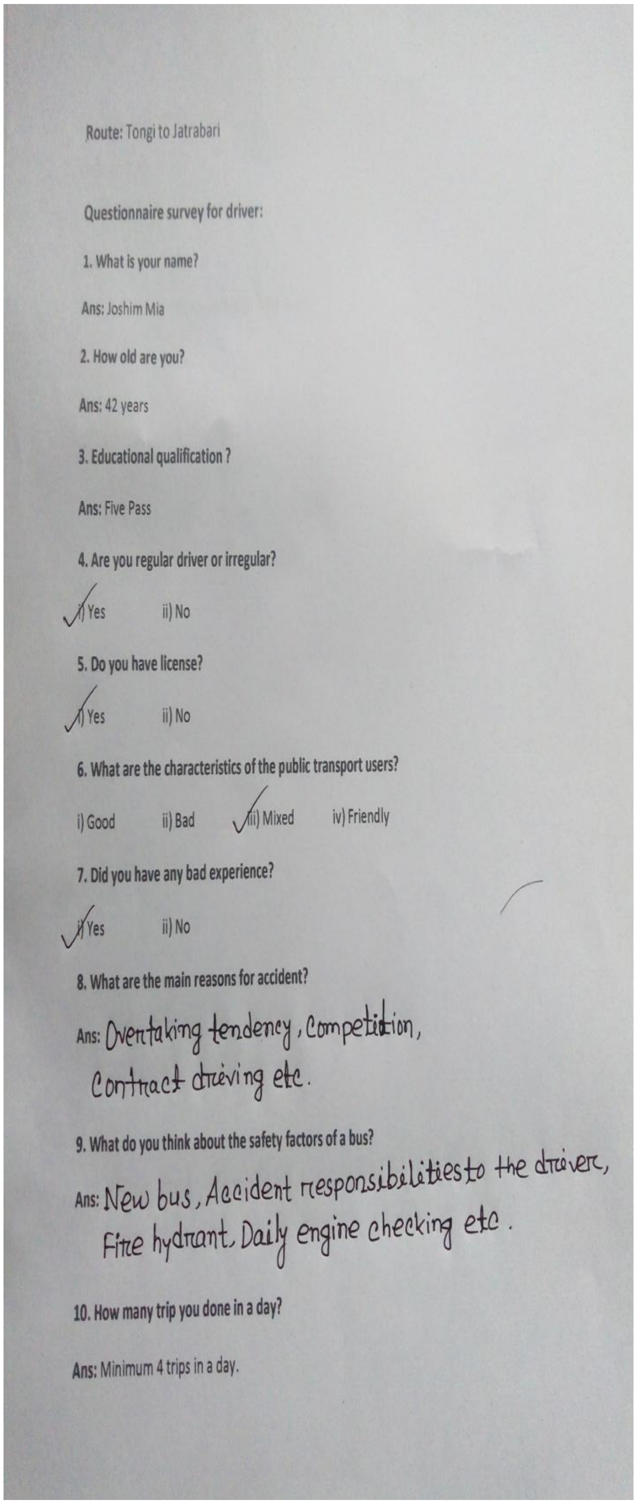
APPENDIX

Questionnaire Survey for Driver:



Route: Tongi to Jatrabari

Questionnaire survey for driver:

1. What is your name?

Ans: Joshim Mia

2. How old are you?

Ans: 42 years

3. Educational qualification ?

Ans: Five Pass

4. Are you regular driver or irregular?

✓ i) Yes ii) No

5. Do you have license?

✓ i) Yes ii) No

6. What are the characteristics of the public transport users?

i) Good ii) Bad ✓ iii) Mixed iv) Friendly

7. Did you have any bad experience?

✓ i) Yes ii) No

8. What are the main reasons for accident?

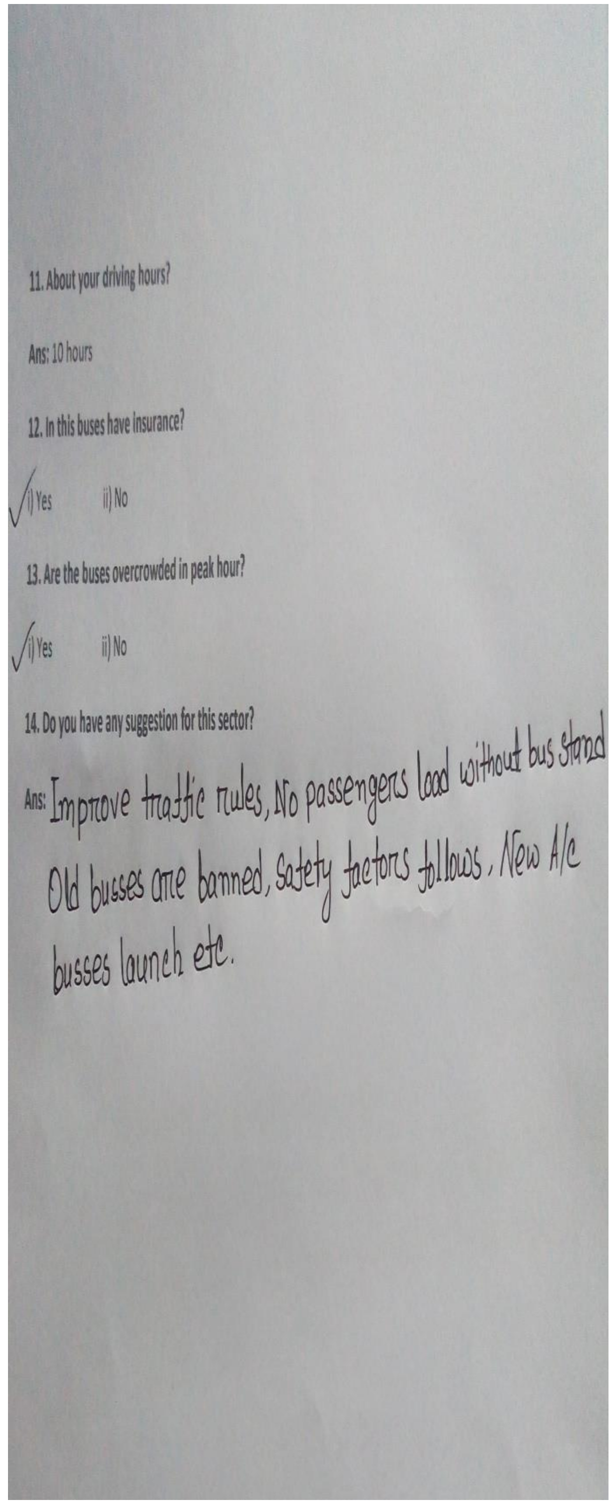
Ans: Overtaking tendency, Competition, Contract driving etc.

9. What do you think about the safety factors of a bus?

Ans: New bus, Accident responsibilities to the driver, Fire hydrant, Daily engine checking etc.

10. How many trip you done in a day?

Ans: Minimum 4 trips in a day.



11. About your driving hours?

Ans: 10 hours

12. In this buses have insurance?

✓ i) Yes ii) No

13. Are the buses overcrowded in peak hour?

✓ i) Yes ii) No

14. Do you have any suggestion for this sector?

Ans: Improve traffic rules, No passengers load without bus stand, Old busses are banned, Safety factors follows, New A/c busses launch etc.

Questionnaire Survey for Helpers:

Questionnaire survey for helpers:

1. **What is your name?**

Ans: Md. Zahirul Islam

2. **How old are you?**

Ans: 27 years

3. **Educational qualification?**

Ans: Five pass

4. **How many years of your experience in this position?**

Ans: Five years

5. **Have you any bad experience?**

✓ i) Yes ii) No

6. **How is the relation with your driver?**

✓ i) Good ii) Bad iii) Average

7. **How passengers behave properly with you?**

i) Good ii) Bad ✓ iii) Average

8. **Loading/Unloading passengers in proper place**

i) Yes ✓ ii) No

9. **Are there any ticketing system?**

i) Yes ✓ ii) No

10. **Do you have any suggestion for this sector?**

Ans: Improve traffic rules, Increase seat capacity, Sitting service, Ticketing system, Reduces private cars and Rickshaw.

Questionnaire Survey for Passengers:

Questionnaire survey for passenger:

1. What is your name?

Ans: Md. Ahadul Islam

2. How old are you?

Ans: 30 years

3. How often do you use public transport?

Ans: Everyday

4. Where are you coming from?

✓i) Home ii) Work iii) Shopping iv) School /College

5. At which bus stop did you get on the bus?

Ans: Malibagh

6. At which bus stop will you get off the bus?

Ans: Uttara

7. Did you ride this bus every day?

✓i) Yes ii) No

8. What is your bus route?

Ans: Malibag to Uttara

9. Do you have own car?

i) Yes ✓ii) No

10. What type of transport you like most?

Ans: Pathao, CNG

11. Are you satisfied with this service?

i) Yes ✓ii) No

12. Do you agree that local buses are always crowed?

✓i) Agree ii) Disagree iii) Neutral

13. What do you think about the public transportation in Dhaka city?

Ans: Very bad but need to improve.

14. If available would you use local service on holidays and weekends?

i) Yes ✓ii) No

15. How does reduced or no public transport service affect your daily activities?

✓i) Work ii) Shopping iii) Study iv) Recreation

16. Will you recommend local bus service to other?

i) Yes ✓ii) No

17. Do you have any suggestion to improve the public transport system?

Ans: Improve traffic rules, No passengers load without bus stand, Old busses are banned, Safety factors follows, New A/c busses launch etc.

Some Raw Photographs of Bus

Some Raw Photographs of Signal

<u>Some raw photographs of Sign</u>