



IMPACT OF COVID-19 ON MOBILITY: THE CASE OF LAHORE

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KEYWORDS

covid-19; mobility patterns; Lahore; behavior; traveling.

ABSTRACT

Coronavirus pandemic has caused severe consequences on traveling behavior since its inception into the world in 2019. The government authorities have declared protective means to limit transportation while discouraging community congregations by giving guidelines to have social distancing with maintaining a healthy lifestyle which will lower the growth of the viral infection. This study aims to evaluate and assess the considerable changes in the mobility pattern and travel behavior of the residents of Lahore during lockdown which have slow down the virus' spread. The mobility patterns were studied through Google database 1 in the form of google mobility reports. Data obtained from the COVID-19 website of Pakistan was examined by GIS and converted into statistical data comprising of graphs and figures by authors. The findings of this research are that the COVID-19 pandemic has had a profound impact on transportation and air quality in Lahore, resulting in changes in travel behavior, reduced traffic congestion, and improved air quality, which have both positive and negative effects on public health and the environment. These findings indicate that the implementation of air quality control plans can lead to a significant improvement in air quality in Pakistan. However, the economic hardships caused by the pandemic also need to be addressed. This research shows that the public can adapt to changes in policies and travel behaviors during the pandemic. These implications can be applied to design more sustainable transportation policies in the future.

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INTRODUCTION

The World Health Organization (WHO) declared that the COVID-19 disease caused by the new Coronavirus SARS-CoV-2 was characterized as a pandemic (WHO, 2020). In Pakistan, the first case was confirmed on February 26, 2020, in Karachi. To date March 26, 2020, the virus reaches Lahore. There are now 41,000 confirmed cases in all regions of Pakistan. On March 24, 2020, partial lockdown was ordered by the federal and provincial governments of Pakistan, closing shopping malls, restaurants, fitness centers, elementary, middle and high schools, and universities. Supermarkets and drugstores started working with restrictions concerning person-to-person distance, and public transportation started working with reduced hours. Many countries have closed their borders and imposed curfews resulting in sharp reductions in transport demand also on a regional and continental level. It is highly likely that the coronavirus outbreak will have longer-term impacts on our behavior and lifestyle, the way we work, consume, and travel. Modes of transport are considered the vectors for the distribution of the virus (Wu et al., 2020). Thus, travel bans and individual concerns to avoid

public gatherings leading to reducing ridership and reduced travel and transport demand have helped a lot in tackling the spread of the virus. There are many transports that runs on almost no carbon emission considered to be the most sustainable and clean way to travel (Ma et al., 2020). For this reason, lockdown is considered to be the best mode for lowering emissions while prompting secure commuting especially during such epidemics and pandemics. It will also help in achieving the goals of sustainable development in which 3 is about the wellbeing, 9 is about infrastructure, 11 is for sustainable areas, and 13 is for climatic activities (Meng, 2017).

The outbreak of COVID-19 has changed the way we interact with others and the world around us. It has provoked a shift in many industries. The unexpected pandemic and the measures taken to control the negative consequences have led us to the most significant disruption of the century. The mobility sector has been one of the sectors affected the most by the outbreak. In this research study, the immediate impact of the isolation measures on the transportation sector has discussed (Schneider et al., 2022). The researchers have explored the long term and short-term consequences affecting mobility at the peak of the pandemic when the city is locked down. Of course, this is only a temporary situation, and we can expect that out-of-home activity participation and travel demand will rise again when the measures lifted. However, we do not know how long these measures will last and whether subsequent waves can be expected. Furthermore, people might still fear social contact when social distancing rules are no longer in force, affecting activity participation and travel.

The aim of this study is to evaluate and assess the considerable changes in the mobility pattern and travel behavior of the residents of Lahore during lockdown which have slow down the virus' spread. In this current phase of life when all the cities of world are in crisis, it is crucial to understand and assess the total effect of these combined measures and policies, so that this may help us in future too.

This research helps in understanding the true impact of the COVID-19 pandemic on travel behavior and mobility of Lahore's residents. It provides a deeper insight into how a health crisis can affect daily routines and transportation.

METHOD

Lahore has been taken as a case study area in the present research, as Lahore has been facing the problem of rapid urbanization and congestion for the last decade due to lock down a significant change in mobility have observed, which has affected the environment of Lahore. The mobility patterns were studied through Google database 1 in the form of google mobility reports. Data obtained from the COVID-19 website of Pakistan was examined by GIS and converted into statistical data comprising of graphs and figures by authors.

RESULT AND DISCUSSION

Changes in Mobility patterns

The outbreak of the novel coronavirus COVID-19 has brought profound changes to almost every aspect of transportation. Current research efforts have focused on passenger travel trends in affected cities during the pandemic and the effect of social distancing policies on transit use and mobility patterns (Mukhtar, 2020). The current impact of the coronavirus pandemic can be felt by us all. With travel bans, shopping centers empty, social gatherings prohibited, and many individuals quarantined or only afraid to go out - the disruption to a healthy life is considerable. One of the most impacted fields from the virus is urban transportation. Traffic volumes and travel times have dropped dramatically; commuting activity from the suburbs to Lahore City has drastically decreased, as shown in figure 1.

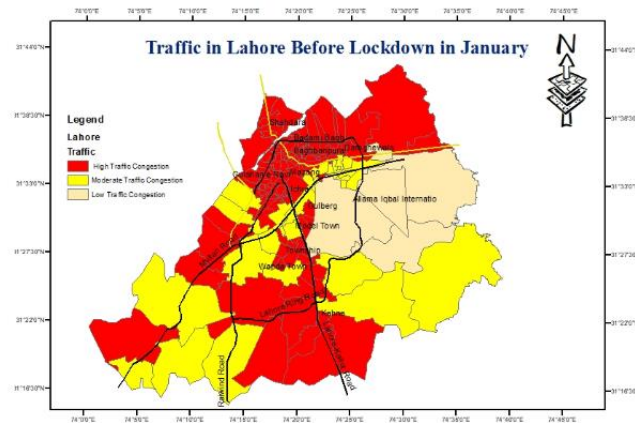


Figure 1. (traffic concentration before lockdown in January; 2020)

Source: by Researchers; 2020

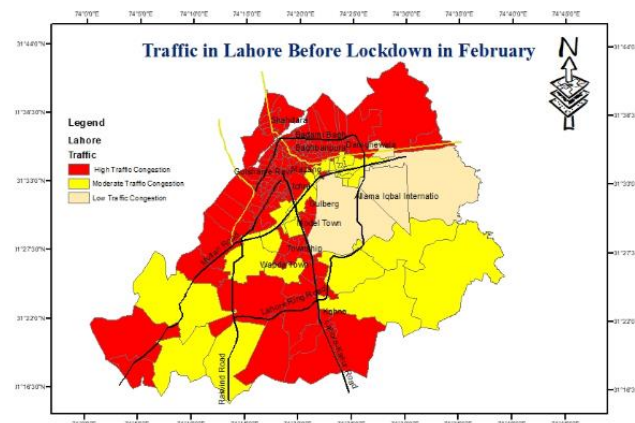


Figure 2. (traffic concentration before lockdown in February; 2020)

Before the full stay-at-home order, researchers observed a shift towards micro-mobility modes and non-mass transit away from densely crowded alternatives. Following the lifting of the stay-at-home order, even as travel trends stabilize, a long-term shift in mobility patterns might emerge. An increase in non-shared modes of travel like bike/scooter and a decrease in shared modes i.e public transportation and ride-sharing have observed by the researchers, which is presented in figures 2, 3, 4 of how mobility patterns got to change before and during the lockdown (Nafees & Khan, 2020). The decrease in home-to-work trips due to increased adoption of working from home. A decrease in tourism, a decrease in travel due to systemic unemployment, and economic slowdown have observed.

Changes in travel behavior

This lockdown resulted lower transport in Lahore, remote working in many offices, and online mode of education in institutions (also called as virtual or e-learning). This makes people satisfied as they spend more time with families and friends while working from home. As a result, there is low vehicular movement specifically at the peak time and lowered the traffic congestion. All kinds of public and private transportation including Airlift, Swvl services etc. are restricted in lockdown. People are inclined to get home-delivery of goods purchased online (e.g., food, clothes), resulting in fewer shopping trips (Favale et al., 2020). Residents are avoiding public transport, as these can be considered a breeding ground for viruses and places where it is difficult to avoid contact with other passengers (Cheval et al., 2021). Those who do not have other options than using public transport try to avoid crowded buses and trains by traveling during off-peak hours. Of course, this is difficult for public transport operators to decrease capacity or frequency due to low ridership. People with access

to a car, are inclined to drive more, as the car "protects" them from other travelers. Because of the reduced travel demand, a higher share of car use will probably not result in more kilometers traveled by car. Therefore, less driving and the lower amount of congestion is observed. People who used public transport are now inclined towards taxis and cab. People now either walk or use bicycles for short distance travelling as social congregations are prohibited during lockdown.

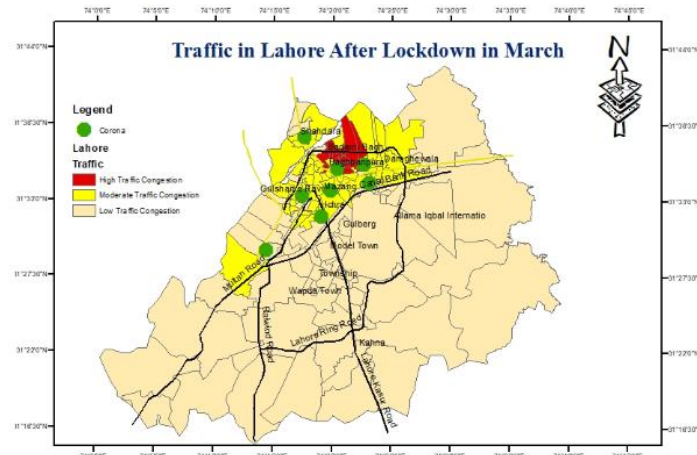


Figure 3. (traffic concentration in March;2020)
 Source: by Researchers;2020

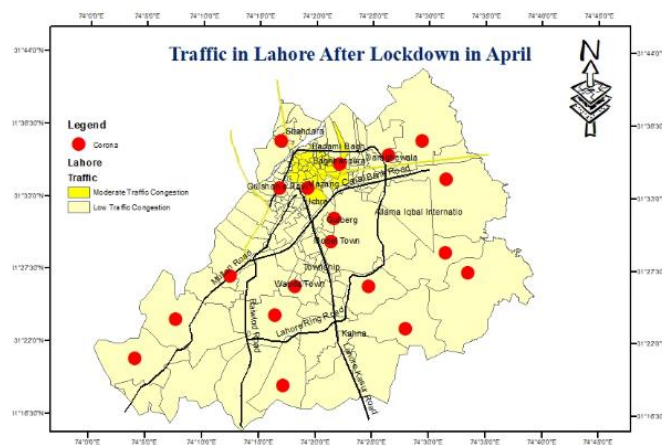


Figure 4. (traffic concentration during the lockdown in April; 2020)
 Source: by Researchers;2020

Effects of changed travel behavior on health

Since people often plan and perform out of home activities to maintain or improve their health. Reduced activity participation because of social distancing has negatively affected subjective wellbeing (Lau et al., 2020). Outside home activities in Lahore is no longer taking place, in case of reduced public transport services, it has become inaccessible for those without a car or their owned conveyance. This isolation has resulted in lower levels of social interaction and self- development and higher levels of stress, boredom, and depression (Brooks et al., 2020). Since people no longer have a lot of destinations to travel to, social distancing has also resulted in more "undirected travel," i.e., trips without a destination. People are now walking, cycling, or jogging and enjoy this as a recreation which gives them proximity to the nature and natural beauty. The recreational commuting is quite vital to maintain a healthy lifestyle as travelling has been observed as a great mode of emotional happiness (Chatterjee et al., 2020), more significantly cycling and walking.

Social distancing measures have apparent, direct positive effects on health and deployed to avoid people getting infected by the COVID-19 virus (Mathieu et al., 2021). However, since people often derive physical activity from participation in certain out-of-home activities (e.g., fitness, sports, work), social distancing might result in a significant drop in physical activity (WHO, 2020). Likewise, reduced demand for (motorized) transport as long it is not compensated too much by a higher share of car use has resulted in fewer car accidents and related injuries and fatalities as well as safer walking and cycling conditions (Frater & Kingham, 2020). Quite a lot of cities already reported significant reductions in traffic accidents. On the other hand, a disadvantage of stopping physical activities is possibly resulting in increased levels of obesity, diabetes, and cardiovascular diseases (Lee et al., 2020).



Figure 5. (Mobility trend from March to April#39; 2020)

Source: Google Mobility Report

The figure 5 shows the mobility pattern from Sunday, March 15 to April 26. The decrease of -63% in Retail and recreation (which include places like restaurants, cafes, shopping centers, theme parks, museums, libraries, and movie theaters) has observed when compared with baseline. The baseline is the median value, for the corresponding day of the week, during the five weeks respectively.

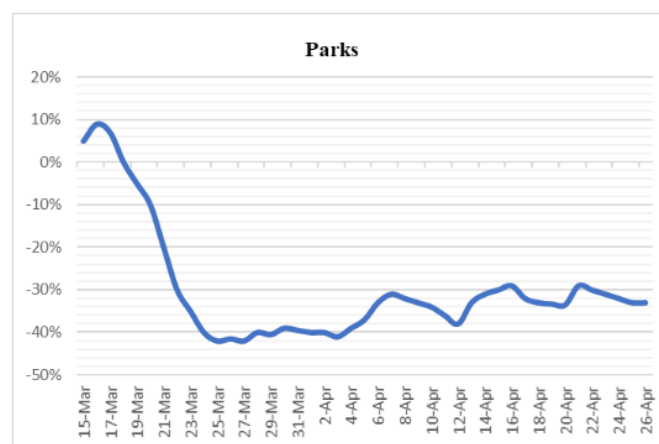


Figure 6 (Mobility trend from March to April#39; 2020)

Source: Google Mobility Report

The figure 6 shows the mobility pattern from Sunday, March 15 to April 26. The decrease of -42% in visiting Parks (which include places like national parks, public beaches, marinas, dog parks, plazas, and public gardens) has observed when compared with baseline.

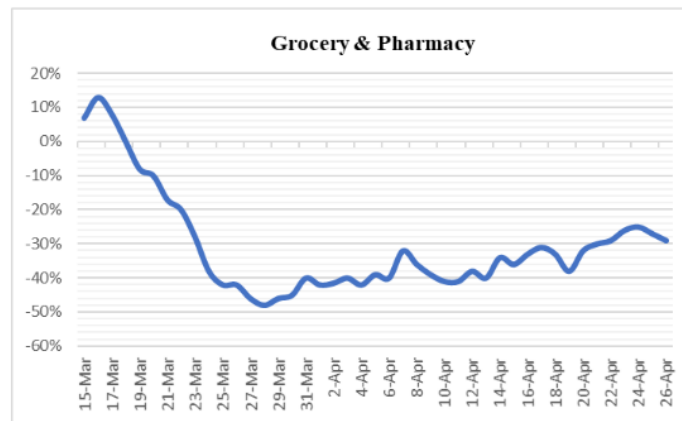


Figure 7. (Mobility trend from March to April 2020)

Source: Google Mobility Report

The figure 7 shows the mobility pattern from Sunday, March 15 to April 26. The decrease of -48% in Grocery and pharmacy (which include markets, food warehouses, farmers’ markets, specialty food shops, drug stores, and pharmacies) has observed when compared with baseline, respectively. Lower traffic results in low carbon emissions which is good for less diseases of respiratory, lung infections, and blood pressure control (WHO, 2020). Altogether, this lowers the chances of global warming yet people are more affected by physical events. The lockdown measures, including gym closures, free movement restrictions, and reduced commuting, have dramatically lessened congestion in the city. More or less: we could see an enduring positive natural change after the pandemic. Be that as it may, it’s everything down to how we proceed onward after lockdown (Peto et al., 2020). The more significant part of these exercises decreased because of across the country lockdown, the outflows have gone down definitely. NO₂ is risky contamination, liable for an expected 120,000 new instances of child asthma and 4,000 unexpected losses for every year in Pakistan. It is likewise a key supporter of PM_{2.5} formation. Lockdown reveals that air quality is associated with the economic events like physical movements, and has a fewer chance of interventions at high levels

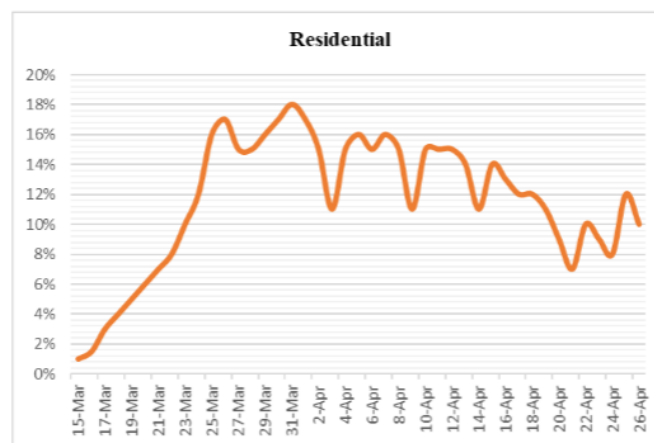


Figure 8. (Mobility trend from March to April 2020)

Source: Google Mobility Report

The Figure 8 shows the mobility pattern from Sunday, March 15 to April 26. The decrease of +17% in Residential has observed when compared with baseline, respectively.



Figure 9. (Mobility trend from March to April#39; 2020)

Source: Google Mobility Report

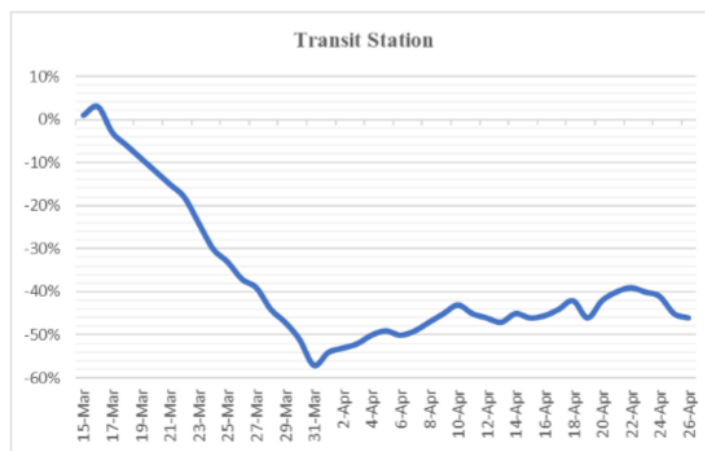


Figure 10. (Mobility trend from March to April#39; 2020)

Source: Google Mobility Report

The figure 10 shows the mobility pattern from Sunday, March 15 to April 26. The decrease of -57% in transit stations (which include places like public transport hubs such as subway, bus, and train stations) has observed when compared with baseline, respectively.

Mobility and environment of Lahore

In Pakistan (especially Lahore) among all contaminations, PM 2.5 had the greatest decrease in many districts during the lockdown. Conversely, there observed increase in Ozone layer due the less CFCs emissions. True to form, a critical decrease in AQI seen in 2020 contrasted with previous years. This examination offers certainty to the administrative bodies that a noteworthy improvement in air quality in Pakistan could be reasonable if severe execution of air quality control plans is actualized (Muhammad et al., 2020). The COVID-19 epidemic forced countries to be under a blockade, restricting or stopping global transportation, agriculture, and industrial activities (Berry, A.A. , Tjaden, A.H. , Renteria, n.d.). Such actions will secure more lives. Many necessary services have ceased, causing people to become more and more uncomfortable, losing their jobs and jobs, and causing economic hardship in the community.

In Pakistan, as of April 21, 2020, more than 9,000 people have been infected, and at least 192 people have been killed. Nowadays, there are sad news all across the world which included environmental pollution list of most contaminated cities of Pakistan are in the report on World Air Quality in 2019 in which Pakistan being the most levels of air quality. Due to the reduction of fossil fuel consumption in transportation, industry and power plants and the reduction of other sources of

pollution, the level of air pollution in various regions has been greatly reduced. The blockade in Pakistan has led to a sharp drop in pollution levels in many cities in the country. Before lockdown, the two regions in the northwest and south of Lahore regions having oil plants are the main points of causing air pollution which is now reduced due to ban in operations. Another reason for the marginal changes in NO₂ emissions is the sudden drop in urban traffic, which by some estimates declined as much as 65% across Pakistan. Using anonymized geo-location data, Google estimates that Pakistanis under the lockdown mostly stayed away from businesses, parks, shopping centers, and workplaces. Poor fuel quality and increasing vehicle concentration have been blamed as the primary cause of poor air quality in Pakistan, and the drastic decrease in vehicular mobility has cut down a significant proportion of urban emissions.

CONCLUSION

The era of social distancing has led to reduced travel among residents, with a preference for walking or using private cars over public transportation for short distances. This decreased demand for travel has resulted in less participation in activities outside the home. Walking and cycling have emerged as crucial activities in maintaining well-being and physical fitness while reducing the risk of obesity. To support those without cars or physical disabilities, public transport operators must prioritize safety measures, including reducing passenger loads and maintaining vehicles to ensure safe travel. Financial support from the government may be necessary to help struggling public transport operators cope with falling revenues. In the long term, urban planners and policymakers should focus on creating more public green spaces within cities to promote active transportation and discourage car-dependent lifestyles. Incorporating dedicated cycling and walking lanes in congested areas and implementing temporary measures like converting car lanes into pedestrian and bike lanes can significantly improve urban mobility and safety. These initiatives, along with reduced car access on certain streets, increased bicycle parking, and efficient pedestrian crossings, can encourage active travel and contribute to healthier and more sustainable cities.

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