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EMPIRICAL STUDY OF COVID-19'S INFLUENCE ON TRAVEL BEHAVIOR IN SRI LANKA

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ABSTRACT - The objective of this study is to explore the impact of COVID-19 on travel behavior (TB) including mode choice, travel frequency and travel distance) in Sri Lanka (SL). Further, the study investigates changes in TB in terms of socio-economic characteristics of travelers. The data were collected from online surveys (N=496). Descriptive statistics, boxplot charts, Multivariate Analysis of Variance (MANOVA) were applied to analysis. The study found a remarkable reduction in travel frequency, distance, and public transport mode share during the COVID-19 pandemic. Further, results indicated that social-economic factors such as age, income, vehicle ownership, and type of job significantly influenced those changes. Furthermore, results indicated that travel behavior changes due to COVID-19 have been significantly influenced by socio-economic characteristics of travelers and their level of protection motivation in three stages of the pandemic first wave (Before March 2020), after first wave (March-May, May-September) and second wave (September-Today onwards). The findings of this study will make a significant contribution to the transport planning and management in general, and especially in SL, during the pandemic and/or new-normal situation. The key findings of the study can be incorporated to solve. possible transport concerns in a new-normal situation and any future pandemic situation.

Keywords: COVID-19; Travel Behavior; Travelers Characteristics Transport Planning; Sri Lanka.

1. INTRODUCTION

The first case of COVID-19 in SL was reported on March 3, 2020, and the first COVID-19 related death was reported in mid-April. Since then, the pandemic has spread at a high rate threatening the health of residents all around SL. As a result, the government had to take drastic measures to curb this. National mobility restrictions in response to COVID-19 have resulted in drastic changes in TB. The Google COVID-19 Community Mobility Report (Aktay, et al., 2020), indicated that COVID-19 has resulted in drastic changes in TB in SL. Accordingly, many researchers argue that COVID-19 created a cyclic impact on TB [1]. Mobility restrictions reduced mobility preferences of local community and many people avoided crowds and started working from home, focusing on in-home leisure activities, and switched to online shopping. As a result, mode travel frequency (TF) and travel distance (TD) decreased. Accordingly, people have been forced into new TB, creating a series of new challenges for transport and city planners and managers [2]. De Vos [3], Muley, et al., [4], Peixoto, et al., [5] studies identified that travel restricted during the pandemic situation has significantly changed the TB of people.

However, many researchers [1], [2] and [3] emphasize that limited research so far has conducted to explore the impact of COVID-19 pandemic situation on TB of different socio-demographic groups and there is inevitable need to conduct such research to explore impact of COVID-19 pandemic situation on TB of different socio-demographic groups in different context. Further, another set researchers

highlighted [3], [6] that most contemporary research studies on COVID 19's impact on transport sector are limited to developed countries and that limited studies were carried out in developing countries, where such studies were needed most. When it comes to SL, the author confirmed that limited studies carried out on these issues. URSL [7] also emphasized the need to carry out SL-specific studies to investigate impact of COVID-19 on the transport sector. Accordingly, the objective of this to explore the impact of COVID-19 on TB (including mode choice, travel frequency and travel distance) in SL. Further, the study investigates the changes in TB in terms of socio-economic characteristics of SL travelers.

2. MATERIALS AND METHODS

The conceptual framework is developed based on key findings of literature review on theories related to TB and recent empirical findings on impact of pandemic situations on TB. Accordingly, first the hypothesis of the study is that TB (mode choice, TF, TD) of SL travelers changed due to COVID-19 and this varies based the magnitude of the situation. The study considers four time-periods as before COVID-19, during the first wave (March – May), during before the second wave (May – September) and during the second wave (October - Now). The second hypothesis of the study is that TB socio-economic groups were impacted differently due to COVID-19 in SL.

The study collected the data using an online survey that was posted on a certain social media platform and share by email. This is the only possible, and cost and time effective method for author in the given situation. Out of the SL population, people who are the permanent residents in SL was targeted. Prior to the formal survey, a pilot survey was conducted with 20 respondents to test the suitability of the questionnaire. Afterwards, the formal survey was conducted from January 10 to February 10, 2021: approximately 10 months after the imposition of quarantine restrictions in SL. This study implemented a random sampling method to ensure data quality. First, the required sample was calculated using a sample calculator. The study found that most suitable sample size is 385 for 21.8 million population with 95% confidence level and 5% margin of error. Second, the sample was selected from 25 districts, considering significant differences in population ratios of SL. 1500 questionnaires were distributed, and 496 responses were returned, which is approximately 33.33% in percentage terms. About 520 people responded, but out of these 20 questionnaires had to be removed due to language deficiencies, rapid responses, and pattern answers. Subsequently, 496 responses were retained for final analysis. The study tries best to represent the sample as per the socio-economic characteristics of SL population.

3. RESULTS AND DISCUSSION

Reliability Analysis indicated the accepted level internal consistency (Cronbach's Alpha = 0.933) and adequate sample size (Kaiser-Meyer-Olkin = 0.876). Initial analysis indicated that more than 65% of the respondents travel daily to work, but during the first COVID-19 curfew period it dropped to 11.5%. Also, after that period, the number of people going to work daily gradually increased by about 40%, but again dropped to about 20% after the BRANDIX event. Further, more than 50% of the respondents travel daily or few days of the week to purchase essential goods, but when the government imposed the first COVID-19 curfew throughout the country, it dropped to 8%. After the first wave trip frequency gradually increased by about 30%, but again dropped to about 20% during the second wave. A similar phenomenon can be observed in travel to purchase shopping goods. The number of trips made to purchase luxury items had also declined sharply in the first and second wave. Results indicate a significant reduction of long-distance travel due to COVID-19. Before this pandemic, most travelers

used to travel 10 km or more, whereas during the first wave most travelers used to travel less than 3 km. During the second stage, it had gradually increased; but with the second wave, travelers reduced their TD again. Most respondents (about 50%) specified that they were using PT for their travel such as work, purchasing goods, obtaining services etc. before COVID-19. A sharp decline in PT use was observed during COVID-19, i.e., less than 10% of respondents used PT. In contrast, the use of private vehicles such as cars, motorbikes etc. increased from 30% before COVID-19 to 40% during COVID-19. In general, people tend to avoid PT during pandemics [8]. This finding confirms the first hypothesis.

In testing the second hypothesis, a two-way multivariate (MANOVA) analysis of variance was performed, to show how socio-economic characteristics affect the change in TB. Table 1 summarized the key findings of MANOVA analysis. Accordingly, out of nine groups of socio-economic variables, Monthly Household Income and Vehicle Availability were found to have significant effects on changes in all three-TB characteristics, frequency, distance, and mode (at the $p<0.05$ level), while insignificant results were gained for Gender, and Marital Status for all three TB characteristics. It proves the second hypothesis.

Table 3. Summary Results of MANOVA

	Travel Behaviour		
Socio-economic variable	Frequency	Distance	Mode
Gender	✗	✗	✗
Age	✓	✓	✗
Marital Status	✗	✗	✗
Level of Education	✓	✗	✗
Employment Status	✓	✗	✗
Essential Worker	✓	✗	✓
Household Income	✓	✓	✓
Vehicle Ownership	✓	✓	✓
Province of Residents	✓	✓	✗

Note: Significant effects (✓) and Insignificant effects (✗)

4. CONCLUSION

This study was able to quantify the TB changes due COVID-19 in SL, which include TF, TD, and travel mode and to identify the impact level and significant level of socio-economic factors on the TB changes due to COVID-19. Key findings of the study related to TB changes and travelers' requirements can be incorporated to solve possible transport concerns in a new-normal situation and any future pandemics. Furthermore, the findings of this study provide theoretical and practical insights to derive new strategies and policies to overcome certain problems created due to the COVID-19 pandemic situation, and plan and manage transport systems in the new normal era, such as how to control the increased use of private vehicles and make PT modes safer during a pandemic situation, while adopting effective and efficient preventive measures. Moreover, the study indicated that people may adapt to less frequent and short distance travel in the new normal era, where cities will have less traffic that will have a significant impact on current travel and traffic foresting models. Also, how to improve the socio-economic situation of the people, so that they can come back to normal travel behavior. It should be noted that there are limitations associated with this study in relation to sample size and qualitative in-depth investigation and recommends carrying out future studies, overcoming these two limitations.

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