Testing The Significance Of Covid-19 On Online Food Delivery Apps Through Statistical Techniques

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ABSTRACT

<u>Introduction</u>: COVID-19 is a highly contagious disease that emerged in 2019 in Wuhan, China and caused a huge death toll all over the world.

<u>Objective</u>: This study aims to analyze the impact of Covid-19 on Online Food Delivery Applications.

<u>Target Audience and Methods</u>: This study was based on a sample of 583 people above 18 years of age and of all genders. Classification was based on different factors like eating preferences, food delivery app used, etc. Statistical analysis was performed using Microsoft Excel, SPSS and Jupyter.

<u>Conclusion</u>: Consumer experience was found to have a significant impact by COVID-19 through statistical analysis helping the Mobile food delivery apps establish a long term relationship with the customers.

Keywords: Covid-19 Pandemic Corona Virus Food Delivery Apps Statistical Analysis Digital Platforms

INTRODUCTION

About COVID-19: Covid-19, commonly known as Coronavirus Disease, is a highly contagious respiratory disease. It started in Wuhan, China where the first known case was observed in December, 2019. Many failed attempts were made to contain this airborne and contactable disease, yet it managed to spread worldwide resulting in the death of millions. It is one of the deadliest diseases in the world.

In India, the very first case was observed in the state Kerala in late January, 2020. As the country has a very large population, it was very hard to contain the virus initially which resulted in mass death toll. It had created a state of panic and wreaked havoc amongst people. A state of acute shortage occurred for necessary things like medicines and oxygen cylinders due to excessive hoarding. Hospitals had an inflow of patients to the point that it was uncontrollable.

The symptoms of this disease vary widely but often include fever, cough and loss of taste, shortness of breath, sore throat and congestion, muscle/body aches. There is no proper treatment of COVID-19, but common treatments include rest, hydration, antiviral medication and medication for short relief like fever reducers, cough suppressants, etc. Even though this disease does not have a treatment, it does have certain preventive measures that can be taken in order to reduce the chances of contracting it. These measures include getting the vaccination shot, social distancing and maintaining proper hygiene.

The COVID-19 pandemic had a profound impact on the food industry, reshaping everything from production and supply chains to consumer behavior and regulatory standards. Lockdowns and restrictions led to an immediate disruption in the supply chain, with farmers, manufacturers, and distributors facing unprecedented challenges. Supply issues arose as labor shortages affected food production, especially in sectors reliant on migrant and seasonal workers. Additionally, shipping delays, border closures, and disruptions at processing plants led to a domino effect, creating significant bottlenecks. Many perishable goods were left to spoil due to distribution hurdles, and producers faced losses even as consumer demand surged for essential items. Grocery stores saw an increase in demand for shelf-stable products, while restaurants, especially small, independent establishments, struggled to stay afloat with reduced foot traffic and seating limitations. In response, many restaurants quickly adapted by offering delivery and takeout services, while grocery stores bolstered online ordering and delivery options to meet consumer needs. Consumer behavior shifted dramatically as well, with people cooking more at home due to restaurant closures and safety concerns. This led to a spike in demand for certain ingredients and prepared meals, while simultaneously affecting the demand for dine-in restaurant experiences. Health and hygiene concerns became paramount, leading to changes in food safety protocols across the industry. Businesses had to invest in protective equipment and sanitation measures, which increased operational costs. The rise of e-commerce and meal delivery services accelerated, and many restaurants and grocery chains invested heavily in digital platforms to cater to these demands. Despite these adaptations, the foodservice sector, including catering and event-based food businesses, was hit hard and struggled to recover as in-person events were canceled or postponed. The pandemic underscored the need for greater resilience and flexibility in the food industry, prompting companies to rethink their approaches to supply chain management, labor sourcing, and consumer engagement for the future.

According to the research conducted by Research Scholar Parul Sharma and Professor Shreya Bhargav, it was concluded that during COVID-19, customer satisfaction was significantly impacted by price, service quality, website quality and convenience and also that the feeling of satisfaction after a purchase comes from a pleasant customer experience. Some researchers have performed a study on why people chose to use online food delivery applications or not during the world-wide disaster- COVID19. While others have focused their studies on customer satisfaction with app based food delivery system in general. Whereas, this study is performed to

look for difference between ordering patterns during and after COVID-19.

METHODOLOGY

Data Collection

Data collection is the basis and one of the major elements of statistical research. Data collection has two types, primary data and secondary data. Primary data is the type of data that is collected directly from the main sources by researchers through surveys, experiments, interviews, etc. Whereas, secondary data is the type of data that is available for researchers to use and has already been collected through primary sources. For this research paper, primary source of data collection has been used with the help of google forms in the form of questionnaire. 584 people of various age groups and genders were part of this data collection.

OBJECTIVES

The main objective of this study is to assess and analyze the relation between COVID-19 pandemic and the online food delivery system and the changes that occurred because of it using Regression Analysis and Chi-square statistics. Other objectives of this study includes:

To know whether people preferred home-cooked meals, eating outside or ordering online during the pandemic

To know the average expenditure of each respondent

To find out what modes of payment were preferred by respondents

To know the factors influencing ordering online during the pandemic

To know the overall experience of people with food delivery apps during Covid-19

METHODS

Study Design

With the questionnaire, 583 people were asked 12 questions based on different factors for the study. These factors are age, gender, eating preferences during Covid, effect of Covid on Food delivery application usage, Food delivery application used, factors influencing online ordering during Covid-19, frequency of ordering online, expenditure per order, mode of payment, precautions being followed by delivery agents or not, overall experience with food delivery applications during Covid and change in frequency of using these applications after Covid.

We are using the following methods for statistical analysis:

Regression Analysis

Chi-Square Test

Correlation

STATISTICAL ANALYSIS

The data used in the study has been collected through a questionnaire on Google Forms. All of the statistical analysis has been performed using SPSS. For graphing purposes, Jupyter was used.

In regression analysis, the food delivery app used has been taken as the dependent variable and all of the remaining variables are independent.

Correlation has been calculated between gender and frequency of usage of food delivery apps to check the interdependency of the 2 variables on each other.

For the Chi-square test, a confidence level of 95% has been taken and the hypothesis is defined as:

H_0 (Null Hypothesis): Frequency of using food delivery apps has not changed after Covid-19 i.e. there has been no impact of pandemic on online food delivery system.

H_1 (Alternative Hypothesis): Frequency of using food delivery apps has changed after Covid-19 i.e. there has been an impact of pandemic on online food delivery system.

ABOUT THE DATASET

To conduct research specific to ordering from online and using food delivery apps, we have removed the entries which preferred home-cooked meals and eating outside. 301 of the total sample preferred home-cooked meals and 21 preferred eating outside. This means that

the final sample size is of about 261 people that preferred ordering food online.

To make it easier for statistical analysis, all factors were converted from String to Numerical as follows:

Gender- Male:1, Female:2, Others:3

Effect of COVID on usage of Food Delivery Apps- Increase:1, Decrease:2, Remained the same:3

Expenditure per Order- Less than 500:1, 500-1000:2, 1000-1500:3, More than 1500:4

Frequency of Ordering Online- Daily:1, Weekly:2, Monthly:3, Rarely:4

Food Delivery App Used- Swiggy:1, Zomato:2, Eat Sure:3, Pizza Hut:4, Dominos:5

Precautions Taken or not- Yes:1, No:2, Maybe:3

Usage of Food Delivery Apps after COVID- Yes:1, No:2

Overall Experience with Food Delivery Apps- Very Bad:1, Bad:2, Average:3, Good:4, Very Good:5

RESULT

Table 1: Descriptive Statistics for various Factors

Descriptive Statistics						
	N	Range	Minimum	Maximum	Mean	Std. Deviation
How was your overall experience with food delivery apps during Covid-19	261	4	1	5	3.04	1.364
How did Covid effect your usage of Food Delivery Apps?	261	2	1	3	1.82	0.787
How often did you use online food delivery apps during Covid	261	3	1	4	2.46	1.148
Expenditure per Order	261	3	1	4	1.94	0.809
Covid-19 precautions being followed or not	261	2	1	3	2.00	0.801
Do you still use Food delivery apps as frequently as you did during Covid-19?	261	1	1	2	1.48	0.501
What Food Delivery App did you use	261	4	1	5	1.99	1.104
Valid N (listwise)	261					

Interpretation: From the above descriptive table, it can be seen that on a scale of 1 to 5, the average overall experience was moderately positive (mean = 3.04). Covid-19 affected app usage minimally to moderately (mean = 1.82, SD = 0.787), while usage frequency averaged 2.46 on a 1-4 scale, showing moderate use. Participants typically spent less per order i.e. less than Rs.1000 and rated Covid-19 precautions as adequately followed. After Covid-19, usage frequency decreased). Overall, the data indicate moderate satisfaction with food delivery services, with considerable variability in usage patterns, expenditure, and app preferences among individuals.

Table 2: Regression Analysis-

It shows the relation between the variable 'food delivery app used' and other independent variables.

Coefficientsᵃ		Unstandardized Coefficients		Standardized Coefficients			
Model		B	Std. Error	Beta		t	Sig.
1	(Constant)	2.272	0.417			5.451	0.000
	How did Covid effect your usage of Food Delivery Apps?	-0.042	0.087	-0.030		-0.476	0.634
	Covid-19 precautions being followed or not	-0.078	0.085	-0.057		-0.919	0.359
	Do you still use Food delivery apps as frequently as you did during Covid-19?	6.846E-06	0.136	0.000		0.000	1.000
	How was your overall experience with food delivery apps during Covid-19	-0.104	0.050	-0.128		-2.076	0.039
	How often did you use online food delivery apps during Covid	0.116	0.060	0.121		1.944	0.053
	Expenditure per Order	-0.011	0.084	-0.008		-0.129	0.897

Interpretation: This table displays a regression analysis examining factors that influence which food delivery app participants used during Covid-19. The constant (B = 2.272, p < .001) is significant, suggesting a baseline tendency independent of the other variables. Variables, such as "Effect of Covid on app usage," "Covid-19 precautions," "Frequency of current usage compared to during Covid," "Usage frequency during Covid," and "Expenditure per order," were not statistically significant (p > .05), indicating these factors did not significantly impact the choice of food delivery app. Among the predictors, "Overall experience with food delivery apps during Covid-19" shows a small but statistically significant effect (B = -0.104, p = .039), implying that we can reject the null hypothesis here.

Table 3: Correlation

Correlations			Gender	How often did you use online food delivery apps during Covid
Gender	Pearson Correlation		1	0.083
	Sig. (2-tailed)			0.183
	N		261	261
How often did you use online food delivery apps during Covid	Pearson Correlation		0.083	1
	Sig. (2-tailed)		0.183	
	N		261	261

Interpretation: The correlation analysis reveals a weak, non-significant positive correlation (r = 0.083, p = 0.183) between gender and the frequency of online food delivery app usage during Covid-19. This suggests that there is no meaningful relationship between gender and the frequency of using food delivery apps during the pandemic in this sample.

Table 4: Chi-Square Test

Do you still use Food delivery apps as frequently as you did during Covid-19?			
	Observed N	Expected N	Residual
Yes	135	130.5	4.5
No	126	130.5	-4.5
Total	261		

Test Statistics	
	Do you still use Food delivery apps as frequently as you did during Covid-19?
Chi-Square	.310ª
df	1
Asymp. Sig.	0.577

Interpretation: The chi-square test examines whether there is a significant difference between observed and expected frequencies regarding the continued use of food delivery apps at the same rate as during Covid-19. The observed counts show that 135 participants answered "Yes" (observed frequency of 1), while 126 answered "No" (observed frequency of 2). The chi-square value is 0.310 with 1 degree of freedom and a p-value of 0.577, which is not statistically significant ($p > 0.05$). This indicates that there is no significant difference between observed and expected frequencies, suggesting that participants were roughly split on whether they continued using food delivery apps as frequently as during the pandemic. Therefore, we fail to reject null hypothesis, here.

GRAPHS AND CHARTS

Here are a few graphs obtained from the data set. These graphs indicate different results which help in better understanding of the data.

Graph 1: Preference of Eating Methods During Covid-19

Before delving into the graphs related to the main sample, the following is the graph that shows the original sample with all three eating preferences of people during Covid-19.
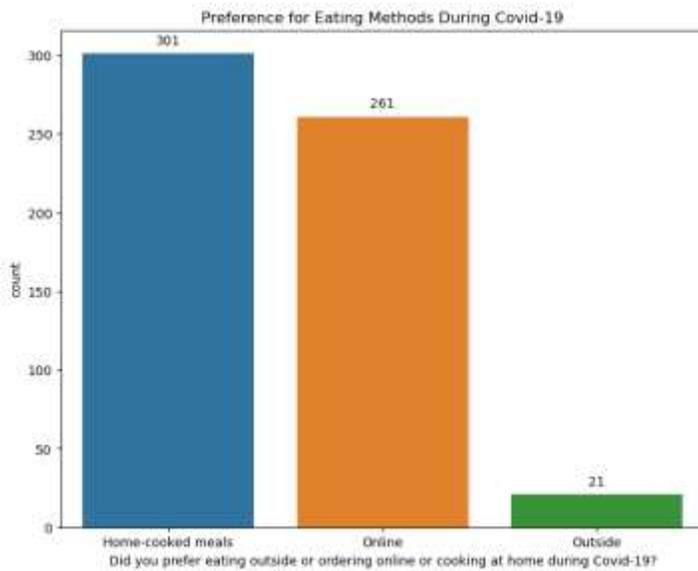
Interpretation: The chart shows that during Covid-19, the majority preferred 'home-cooked meals' (301 people), followed by 'online orders' (261 people), while 'eating outside' was the least favored (21 people). This trend suggests a shift towards safer, home-based eating habits, likely due to health concerns and restrictions during the pandemic.

Graph 2: Preferred Mode of Payment
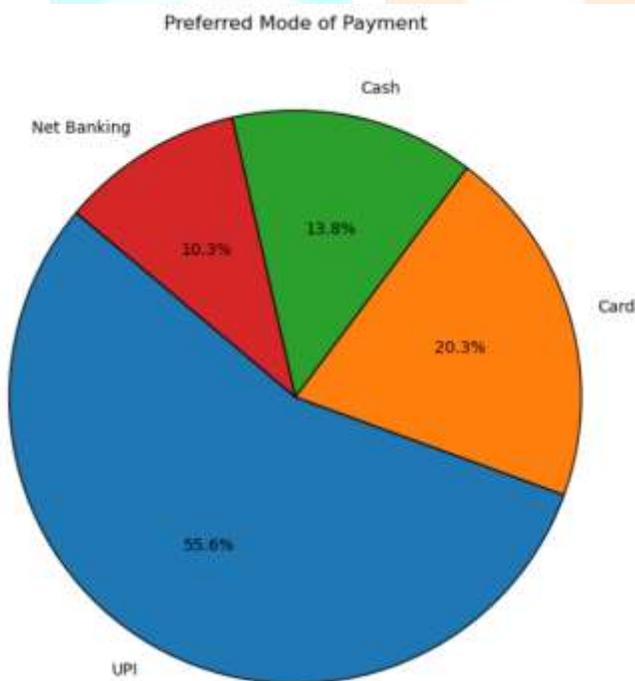
Interpretation: This pie chart shows the preferred modes of payment. 'UPI' is the most popular, accounting for 55.6% of payments, followed by 'Card' at 20.3%. 'Cash' and 'Net Banking' are less common, with 13.8% and 10.3%, respectively. This indicates a strong preference for digital payments, particularly UPI, over traditional methods.

Graph 3: Overall Experience with Food Delivery Apps during Covid-19

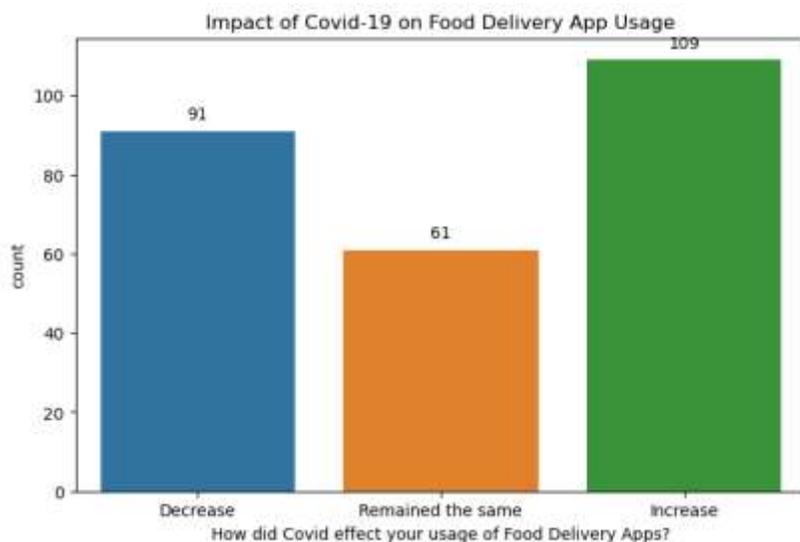Overall Experience with Food Delivery Apps During Covid-19
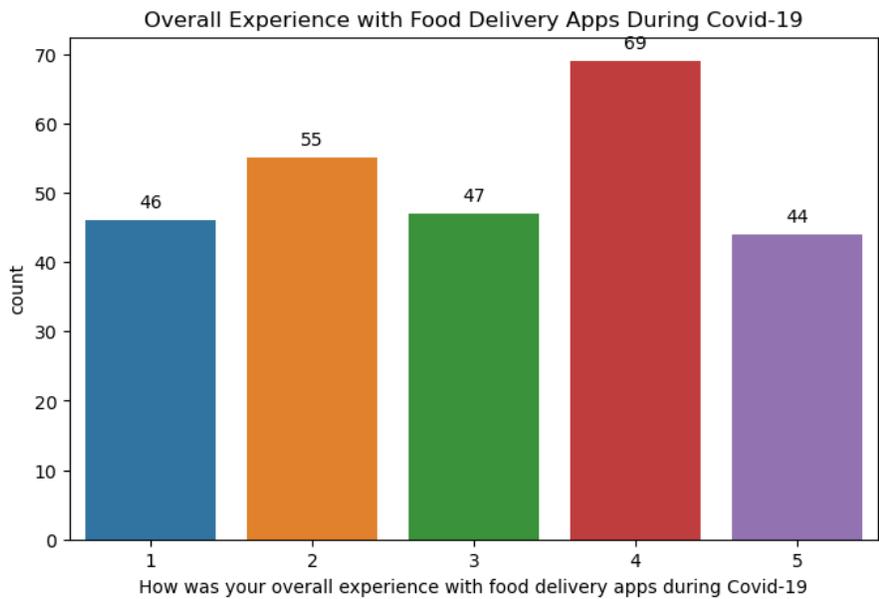
Interpretation: This bar chart represents users' overall experience with food delivery apps during Covid-19 on a scale from 1 to 5. The highest count is for a rating of '4/Good', with 69 responses, indicating a generally positive experience. Ratings of '2/Bad' and '3/Average' received moderate responses (55 and 47, respectively), while ratings of '1/Very Bad' and '5/Very Good' were less common, with 46 and 44 responses each. Overall, users tended to have a favorably good experience with food delivery services.

Graph 4: Expenditure per Order

Expenditure per Order
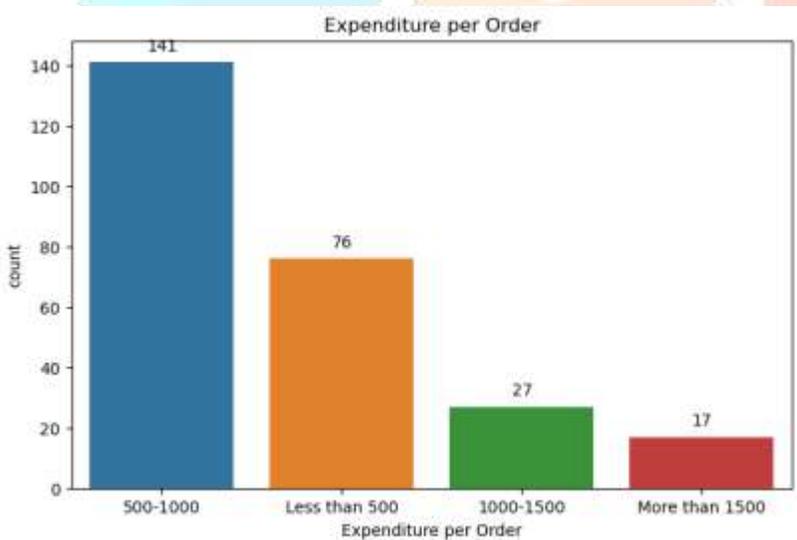
Interpretation: This bar chart shows the expenditure per order during a specific period. The majority of people spent between '500-1000' per order, with 141 responses, followed by 'less than 500' with 76 responses. Higher expenditure ranges, '1000-1500' and 'more than 1500', were less common, with 27 and 17 responses, respectively. This suggests that most users preferred to keep their spending within the 500-1000 range per order.

Graph 5: Impact of Covid-19 on Food Delivery App Usage

Impact of Covid-19 on Food Delivery App Usage

Interpretation: This bar chart illustrates the impact of Covid-19 on food delivery app usage. The highest response, with 109 individuals, indicated an 'increase' in usage, while 91 respondents reported a 'decrease'. Meanwhile, 61 individuals mentioned that their usage 'remained the same'. Overall, the chart suggests that more people relied on food delivery apps during the pandemic, though a significant number also reduced their usage.

CONCLUSIONS

Participants had a moderate overall experience with food delivery apps during Covid-19 (mean = 3.04). Covid-19 minimally impacted usage patterns, with a mean effect score of 1.82. Average frequency of food delivery app usage during Covid-19 was moderate (mean = 2.46). Only the "Overall experience with food delivery apps during Covid-19" had a statistically significant effect on app choice (p = 0.039). Other factors, including Covid-19 precautions and expenditure per order, did not significantly impact the choice of food delivery app. There was no significant correlation between gender and the frequency of food delivery app usage during Covid-19 (r = 0.083, p = 0.183). This indicates that gender did not play a role in determining how often participants used food delivery apps during the pandemic. The chi-square test revealed no significant difference in whether participants continued using food delivery apps as frequently post-pandemic as during the pandemic ($\chi^2 = 0.310$, p = 0.577). This suggests that participants were roughly divided on maintaining the same usage frequency post-pandemic, with no strong trend in either direction. Hence, we failed to reject the null hypothesis. Even though it was not significant, the sale value for these Food Delivery Apps collectively has increased overtime. The majority preferred home-cooked meals, followed by ordering food online, with a minimal preference for dining outside. UPI was the most popular payment method, indicating a preference for digital transactions over traditional methods like cash and net banking. Most users had a positive experience with food delivery apps during Covid-19, as reflected by the high ratings. A significant portion of users preferred to spend between 500-1000 per order, with fewer people opting for higher spending ranges. Food delivery app usage increased for a large number of users during the pandemic, though some also reported a decrease in usage. Concluding, it has been found that COVID-19 has had a significant impact on the experience of consumers with Online Food Delivery Applications. It can be safe to assume that these applications could build a positive and strong reputation to attract clients.

STUDY LIMITATIONS

- Since the objective of the study focused on the group of people that ordered online during the pandemic, it was not possible to include the groups of people who preferred eating at home or go outside to eat.
- Some of the information given by respondents might be biased.

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- "Online Food Ordering and Delivery Applications: An Empirical Study of the Factors Affecting Intention to Reuse" by Evangelia Ganou et al. (April 2022). This study investigates the determinants influencing users' intentions to continue using online food delivery platforms, emphasizing the importance of application quality and service factors.
- "#SupportLocal: How Online Food Delivery Services Leveraged the COVID-19 Pandemic to Promote Food and Beverages on Instagram" by Julia C. Stafford et al. (October 2021). This research explores how online food delivery services utilized social media marketing during the pandemic to influence consumer behavior.
- "Impact of COVID-19 Pandemic on Online Food Delivery Ordering (OFDO) Services Among Consumer Satisfactions" by Parul Sharma, Research Scholar and Dr. Shreya Bhargav, Professor, of Poornima University, Jaipur. This study looks at user satisfaction with pandemic-related digital meal courier services.