IMPACT OF COVID-19 ON THE FOOD INDUSTRY AND ONLINE FOOD DELIVERY SYSTEM

ABSTRACT

Introduction:

Coronavirus disease 2019 (COVID-19) is a contagious disease caused by a virus, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The first known case was identified in Wuhan, China, in December 2019. The disease spread worldwide, leading to the COVID-19 pandemic. This widespread pandemic has impacted various industries across the globe and brought about many changes in the food industry as well. Regression is a statistical method used in finance, investing, and other disciplines that attempts to determine the strength and character of the relationship between one dependent variable (usually denoted by Y) and a series of other variables (known as independent variables). In this research paper, we make use of regression analysis to analyze the various factors affecting the online food delivery industry and overall impact of Covid-19 pandemic on it.

Objective

The main objective of this research paper is to assess and analyze the effect of disastrously spreading covid-19 on the food industry and how it influenced the choice of customers with respect to online food delivery system and restaurants.

Target audience & methods:

This study is based on a sample of a total of 271 people of various age groups. They were classified on the basis of different factors like preferring ordering food online or going out, food delivery app used etc. All the statistical analysis has been performed using two softwares- Microsoft Excel and IBM SPSS.

Conclusion:

Frequency of increase in online food orders after covid-19 pandemic (181 out of 271) is greater than the frequency of decrease in orders.There is a significant increase in online food orders after Covid 19 pandemic.

INTRODUCTION

COVID-19

Coronavirus Disease, also known as Covid-19, is an acute respiratory contagious disease. Its first ever known case was found in Wuhan, China in December 2019. Attempts were made to contain the virus there itself, but they failed, allowing it to expand massively. After that, this disease spread worldwide causing a huge ongoing pandemic. This virus has been declared one of the deadliest in history.

COVID IN INDIA

In India, the first case was reported in Kerala, on 30 January 2020. Due to the large population of the country, it has been very hard to stop the virus from spreading vastly. It caused havoc in the entire country which created a state of panic. It was uncontrollable to the point that hospitals were overflowing with patients, there was an acute shortage of necessary medicines and oxygen cylinders due to excessive hoarding.

SYMPTOMS AND TREATMENT

The symptoms of this disease are variable, but often include fever, cough, headache, fatigue, difficulty in breathing, loss of smell and taste. The symptoms of it might go unnoticed. About a third of people who are infected have unnoticeable symptoms. This disease might develop severe symptoms including pneumonia, hypoxia, respiratory diseases, etc. Old people are highly likely to get infected by severe symptoms. People can contain this virus upto 20 days and can spread it without having the symptoms. The only ways to have less chances to be infected by this virus are being sanitized properly, a social distance to the best one can, covering the nose and mouth when with someone and to get vaccinated. As far as treatment is concerned, there is no specific effective treatment or cure for COVID-19.

HOW DID COVID AFFECT THE FOOD INDUSTRY?

The outbreak of Covid-19 led to an unprecedented economic crisis, affecting almost every sector of the economy. The food industry plays a significant role in a country's economy. It contributes to 14% of the GDP and 13% of India's total food exports, being the fifth largest industry in terms of production, consumption, export and expected growth in the country. However, the pandemic led to closure of restaurants and in turn, completely changed the face of the entire food industry, also affecting the associated industries such as food production, liquor, wine, and beer production, food and beverage shipping, fishing, and farming. In June 2020, the United Nations warned that the world was facing the worst food crisis in half a century due to the recession caused by the pandemic. From street vendors and restaurant owners to

food supply chains like McDonald's and Domino's, everyone faced the wrath of Covid-19 with a sharp decline in their sales. A number of factors that led to these changes are: restrictions in movement of workers, changes in demand of consumers, closure of food outlets, restricted food trade policies and financial pressures in the food supply chain.

Due to the shortage of workforce as a result of illness and physical distance to be maintained during production, the crisis weakens the ability of farms and agricultural businesses to work. A major role was played by the shift of consumers' choice to healthier options, while most of them bought only the necessary stuff, thereby declining the demand for processed food. These conditions retarded the delivery of food and agricultural inputs and created problems in providing continuous food supply to markets. Soon, efforts were made and safety measures adopted to ensure the continuity of food flow, which focused on food employee's health issues, personal hygiene, using personal protective equipment such as helmets and gloves, sanitization of surfaces and working environments, safe handling/ preparation/ delivery of food, and maintenance of social distance. To ensure social distancing and due to the fear of catching the infection by going out in public, people also started to prefer online delivery systems to a great extent. Zomato and Swiggy gained popularity over time, as food outlets got back to work gradually.

METHODOLOGY

DATA COLLECTION

One of the major elements and basis of statistical research is data collection. There are two types of data that can be collected first is primary data and second is secondary data. Primary data is a type of data that is collected by researchers directly from main sources through interviews, surveys, experiments etc. And secondary data is the type of data that has already been collected through primary sources and made readily available for researchers to use.Type of data collection used for the research paper is primary data. Data is collected through a questionnaire formed on google forms. A total sample of 271 people of various age groups is gathered.

OBJECTIVES

In this research article, we have tried to assess and analyze the impact of covid 19 pandemic on the food industry and online food delivery system using Regression Analysis, Sampling distribution of Chi-square statistics. Also, we have obtained various descriptives, correlation, pie chart and bar graphs to find the interrelationship among these factors.

METHODS

Study Design

The study sample includes 271 people. In the data we have 14 different factors. These factors are age, gender, frequency of ordering online, application used for online order, frequency of eating from outside, pros of online food delivery system, cons of food delivery system, expenditure per order, mode of payment, changes in online food orders after covid19, covid 19 precautions being followed at food outlets, preferences when eating from outside and views on whether online food delivery apps cover discounts with taxes or not.

Regression Analysis

Regression Analysis is a set of statistical processes for estimating the relationships between a dependent variable and one or more independent variable.

We apply the following formula for regression analysis: $Y = a + bX + \in$

Where Y – is the dependent variable

X is the independent (explanatory) variable

a is the intercept

b is the slope

$\in$ is the residual (error)

Chi-square Test

Chi-square test is a statistical test used to examine the differences between categorical variables from a random sample in order to judge goodness of fit between expected and observed values. We apply the following formula for calculation:

Test Statistic $\chi^2 = \sum \dfrac{(o_i - E_i)^2}{(E_i)}$

Where O_i -> observed frequencies

E_i -> expected frequencies

Conditions for validity of Chi-square test are:

1. The sample observations should be independent.
2. Constraints on the cell frequencies, if any, should be linear, eg., $\sum ni = \sum \lambda i$ or $\sum Oi = \sum Ei$.
3. N, the total frequency should be reasonably large, say, greater than 50.
4. No theoretical cell frequency should be less than
5. Distribution is essentially a continuous distribution but it cannot maintain its character of continuity if cell frequency is less than 5, then for the application of chi square test, it is pooled with the preceding or succeeding frequency so that the pooled frequency is more than 5

and finally adjust for the degrees of freedom lost in pooling.

Correlation

Correlation is a statistical measure that expresses the extent to which two variables are linearly related. We apply the following formula for correlation: $\rho_{xy} = \frac{Cov(r_x, r_y)}{\sigma_x \sigma_y}$

ρxy = Correlation between two variables

Cov (rx, ry) = Covariance of return X and Covariance of return of Y

σx = Standard deviation of X

σy = Standard deviation of Y

STATISTICAL ANALYSIS

The data used in the study has been collected by us through a questionnaire. All the statistical analysis has been performed using the IBM SPSS Software.

In regression analysis, choice of food delivery app used is taken as the dependent variable and rest all variables as independent.

Correlation has been calculated between gender and frequency of ordering online as well as gender and frequency of going out 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 increase and decrease in online ordering, during covid pandemic, is equal i.e. there has been no impact of pandemic on online food delivery system.

H_1(Alternative Hypothesis): Frequency of increase and decrease in online ordering ,during covid pandemic, is not equal i.e. there has been an impact of pandemic on online food delivery system.

RESULT

Table 1: Descriptive statistics for various factors

It shows various descriptives such as Mean, Standard Deviation, Range and Maximum & Minimum.

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
AGE	271	48.0	12.0	60.0	23.007	7.2943
Frequency of ordering online	271	2.0	1.0	3.0	2.173	.8539
Food delivery app	271	3.0	1.0	4.0	2.214	.9955
Frequency of going out	271	3.0	1.0	4.0	2.476	.8018
Expenditure per order	271	3.0	1.0	4.0	2.373	.8593
Are Online Food Delivery apps eating into the business of small scale restaurants?	271	4.0	1.0	5.0	3.439	1.0933
No discounts, charge high and then give discounts equalling to the normal price	271	1.0	1.0	2.0	1.314	.4648
Covid-19 precautions are being followed	271	4.0	1.0	5.0	3.177	.9339
Valid N (listwise)	271					

Table 2: Regression Analysis

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

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Covid-19 precautions are being followed, Pros of online food delivery system, Frequency of going out, Are Online Food Delivery apps eating into the business of small scale restaurants?, Gender , Preference when eating from outside, No discounts, charge high and then give discounts equalling to the normal price, Expenditure per order, Mode of payment, Changes in your online food orders, AGE, Frequency of ordering online, Cons of online food delivery system[b]	.	Enter

a. Dependent Variable: Food delivery app

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.250[a]	.063	.015	.9880

a. Predictors: (Constant), Covid-19 precautions are being followed, Pros of online food delivery system, Frequency of going out, Are Online Food Delivery apps eating into the business of small scale restaurants?, Gender , Preference when eating from outside, No discounts, charge high and then give discounts equalling to the normal price, Expenditure per order, Mode of payment, Changes in your online food orders, AGE, Frequency of ordering online, Cons of online food delivery system

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.728	13	1.287	1.318	.202[b]
	Residual	250.859	257	.976		
	Total	267.587	270			

a. Dependent Variable: Food delivery app

b. Predictors: (Constant), Covid-19 precautions are being followed, Pros of online food delivery system, Frequency of going out, Are Online Food Delivery apps eating into the business of small scale restaurants?, Gender , Preference when eating from outside, No discounts, charge high and then give discounts equalling to the normal price, Expenditure per order, Mode of payment, Changes in your online food orders, AGE, Frequency of ordering online, Cons of online food delivery system

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.423	.611		3.962	.000
	AGE	.005	.009	.039	.615	.539
	Gender	-.112	.137	-.051	-.815	.416
	Preference when eating from outside	.268	.130	.129	2.063	.040
	Frequency of ordering online	-.101	.079	-.087	-1.283	.200
	Frequency of going out	.032	.079	.026	.410	.682
	Pros of online food delivery system	-.091	.074	-.082	-1.229	.220
	Cons of online food delivery system	-.142	.079	-.121	-1.791	.074
	Expenditure per order	.087	.073	.075	1.197	.233
	Mode of payment	-.052	.126	-.026	-.416	.678
	Are Online Food Delivery apps eating into the business of small scale restaurants?	-.041	.056	-.045	-.722	.471
	No discounts, charge high and then give discounts equalling to the normal price	.151	.135	.071	1.123	.262
	Changes in your online food orders	.080	.136	.037	.588	.557
	Covid-19 precautions are being followed	-.049	.066	-.046	-.747	.456

a. Dependent Variable: Food delivery app

Table 3: Correlation

It defines interrelationship between various variables.

Correlations

		Gender	Frequency of ordering online
Gender	Pearson Correlation	1	-.124*
	Sig. (2-tailed)		.042
	N	271	271
Frequency of ordering online	Pearson Correlation	-.124*	1
	Sig. (2-tailed)	.042	
	N	271	271

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

		Gender	Frequency of going out
Gender	Pearson Correlation	1	-.008
	Sig. (2-tailed)		.890
	N	271	271
Frequency of going out	Pearson Correlation	-.008	1
	Sig. (2-tailed)	.890	
	N	271	271

Table 4: Chi-square Test

Frequencies

Changes in your online food orders

	Observed N	Expected N	Residual
INCREASED	187	135.5	51.5
DECREASED	84	135.5	-51.5
Total	271		

Test Statistics

	Changes in your online food orders
Chi-Square	39.148[a]
df	1
Asymp. Sig.	.000

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 135.5.
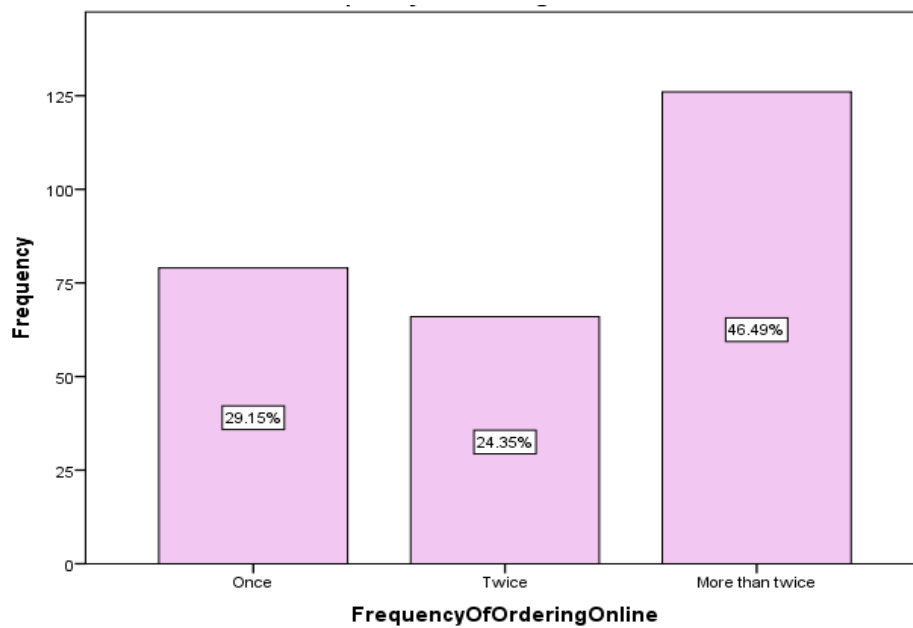
GRAPHS AND CHARTS

Here are a few graphs obtained from the data set. These graphs indicate different results which help in better understanding of the data.
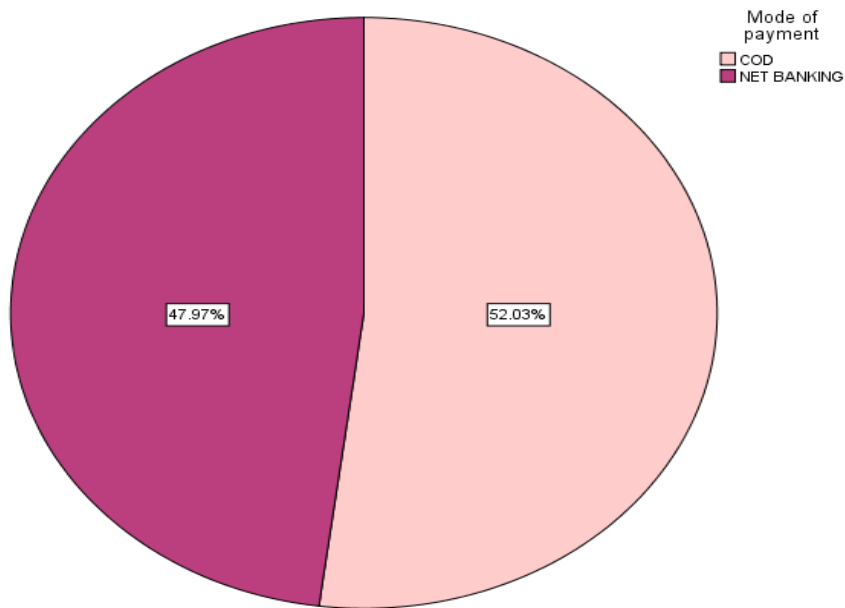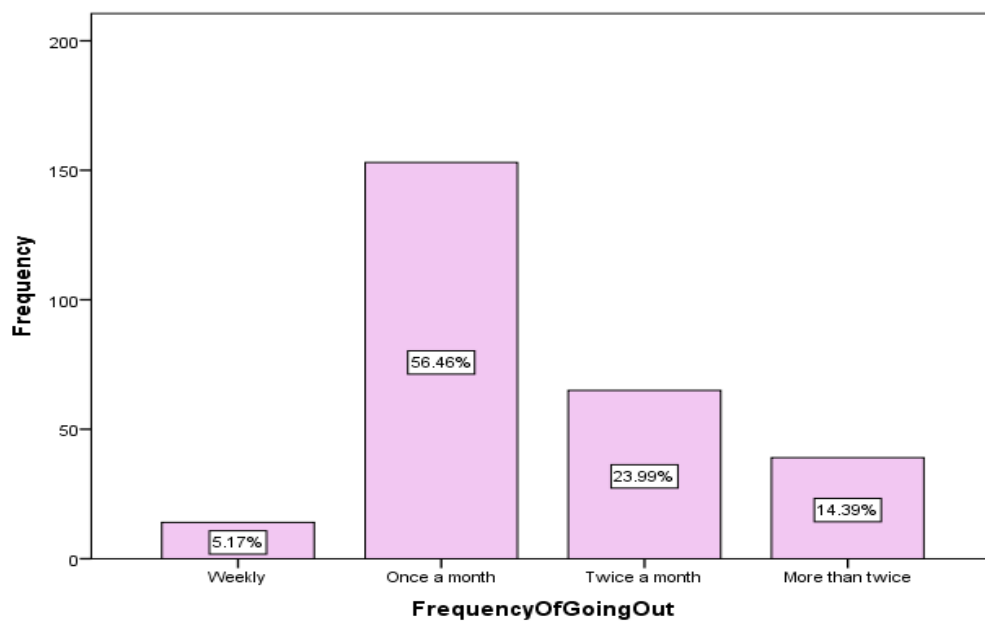
GRAPH 1: Online food delivery app used
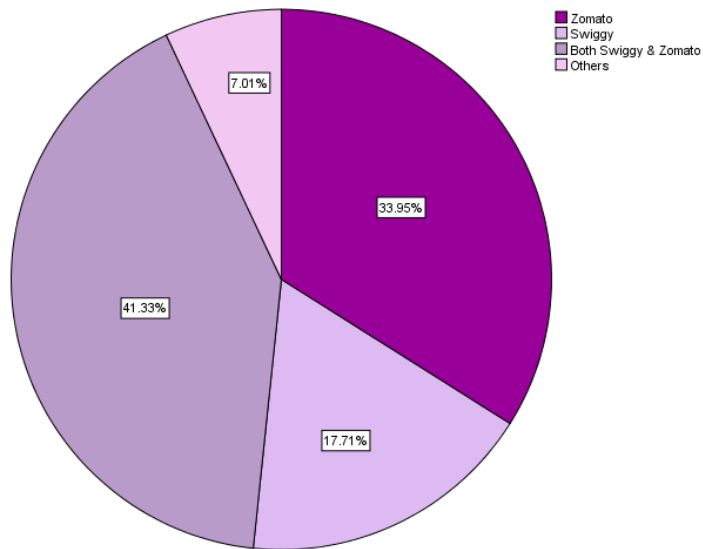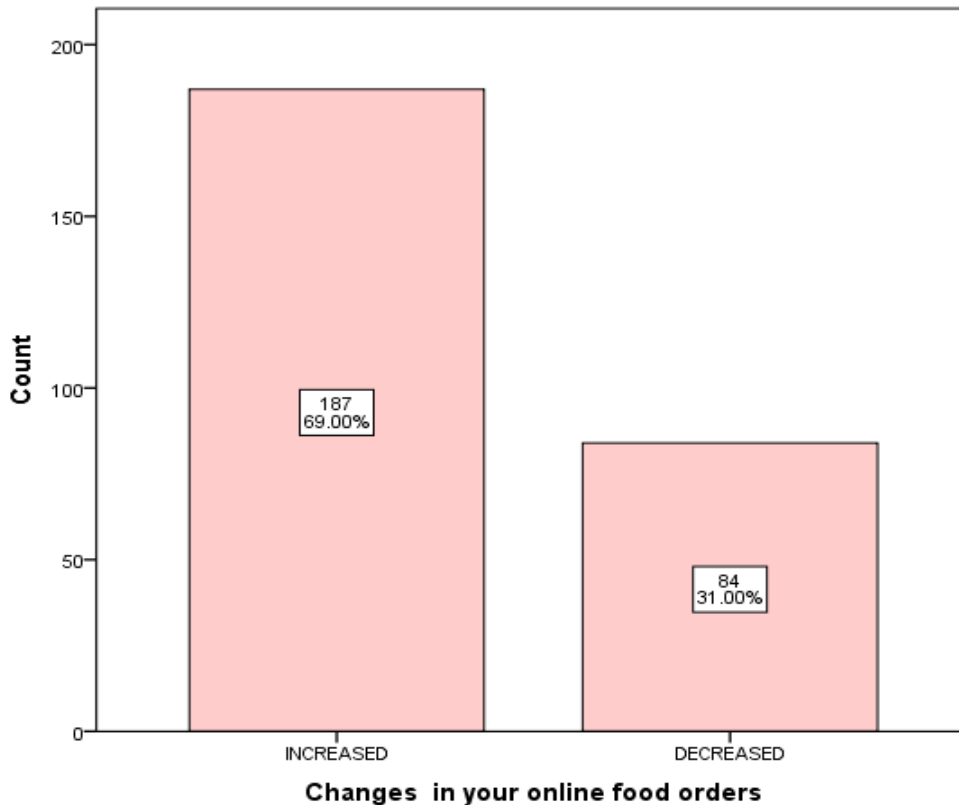

GRAPH 2: Frequency of Ordering Online

Graph 3: Frequency of going to eating outlets.

Mode of payment
☐ COD
■ NET BANKING

47.97%   52.03%

GRAPH 4: Mode of payment used by people

FrequencyOfGoingOut

Weekly: 5.17%
Once a month: 56.46%
Twice a month: 23.99%
More than twice: 14.39%

GRAPH 5: Depicts changes in online food orders after Covid19 pandemic.

Conclusion

- In this study we conclude that the significant factors with respect to food delivery applications are age, gender, frequency of ordering online, frequency of going to eating outlets, pros of online food delivery system, cons of online food delivery system, expenditure per order, mode of payment, impact of online food delivery system on small scale eating outlets, views on whether online food delivery apps cover discounts with taxes or not, changes in online food orders due to covid, whether covid19 precautions are being followed or not.

- There is a negative correlation between the factors Gender and frequency of going to eating outlets , which implies that there is no linear relationship between them. Also, there is a negative

correlation between the factors Gender and frequency of ordering online showing that there is no linear relationship between them.

- Most of the respondents (about61%) prefer going to the restaurant over ordering online (34%) when eating from outside.
- About 52.03% of the respondents prefer cash on delivery as their mode of payment over net banking (which includes credit cards, UPI etc.).
- About 33.95% of the respondents use Zomato, 17.71% use Swiggy, 41.33% use both Zomato and Swiggy and 7.01% use other food delivery apps for ordering food online. Other food delivery apps include a particular restaurant app, food panda, magic pin etc.
- Majority of the respondents (46.49%) order food online more than two times a month, followed by 29.15% respondents who order once a month and 24.35% who order food online two times a month.
- We see that 56.46% people from the sample go out to food outlets once a month. 23.99% go twice a month, 14.39% go more than twice a month and 5.17% people go weekly to an eating joint.
- Majority of the respondents feel that the chief advantage of online food delivery system is that it makes the ordering process easier followed by receiving discounts/rebates.
- The main disadvantage of online food delivery system according to most respondents is that the food costs more due to unnecessary taxes and other charges followed by issues related to food quality.
- On an average, expenditure per order of the respondents is between Rs200 - Rs500.
- On a scale of 5, more than 70% people agreed that online food delivery apps are eating into the business of small scale restaurants.
- On a scale of 5, most people are neutral about whether proper Covid-19 precautions are being followed by restaurants and food delivery apps.
- In Chi-square test, the calculated value for χ^2 obtained is 39.148. Since this value is greater than the tabulated value of χ^2 for 1 d.f at 5% level of significance (which is 3.841), therefore we reject the null hypothesis that there has been no impact of pandemic on online food delivery system. Also, it can be clearly seen from Graph 5 that frequency of increase in online food orders after covid-19 pandemic (181 out of 271) is greater than the frequency of decrease in orders. Thus, we can conclude that there has been a significant increase in online food ordering after the Covid-19 Pandemic.

STUDY LIMITATIONS

We could not target the population who do not eat from outside or do not prefer online food delivery system.

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