

# ***Impact of Covid-19 on the Indian restaurant industry***

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*“Impact of Covid-19 on the Indian restaurant industry”*

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# Abstract

Covid-19 has impacted every major industry globally. One of the industries that suffered a lot of loss due to covid-19 in India was the restaurant industry. The restaurant industry has experienced significant growth over the past decade. During covid restaurants were either completely shut down or only accepted online orders due to several government restrictions and social distancing. This was a major blow to the income of these restaurants. Since Covid-19, restaurant owners have struggled with cash shortages and negative cash flows, leading to restaurant closures and unemployment. This research paper focuses on analysing the impact of covid-19 on Indian restaurants using various statistical tests.

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# Impact of Covid-19 on the Indian Restaurant Industry

## Introduction

India has faced multiple challenges due COVID-19. India is known for its various food varieties, and food holds a special place in Indian society's heritage and culture.

The lockdown regulations of the two pandemic waves in India had a severe impact on the dine-out culture, with industry associations estimating that 25% to 30% of the outlets have shut down in the 2021.

To cope with this pandemic, restaurant companies have been implementing strategies such as initiating or expanding take-out and delivery options. However, inevitably, countless restaurant employees have been laid off or furloughed because of the unparalleled hardship caused by the pandemic.

After easing of the restrictions, the restaurant industry is gradually getting back on its feet. The dine-in restaurants in India were not allowed to reopen for 6 months, which has left them with zero savings and has led to mass unemployment.

The challenges faced by these restaurants during the pandemic are different from other types of restaurants as they do not have corporate safety nets or huge funds to help them out in such situations. These SME restaurants run these businesses with the help of their own funds or borrowed funds, but they make an important contribution to the economy of India.

The restaurants are witnessing a considerable decline in consumer footfall, as the home dining trend increases because of the fear created by the pandemic. The Indian restaurant industry is witnessing a 50% - 60% decline in revenues in this year because of the problems caused by the pandemic. During the pandemic, the restaurants had zero cash flows as they were shut, which made it very difficult for the restaurant owners to sustain these businesses. As the economy tries to recover, it is unpredictable and slow to return to the pre-pandemic levels.

## Research objectives

- 1.To determine and analyse the difference in the number of employees before and after Covid.
- 2.To determine and analyse the difference in the number of customers visiting per day before and after Covid.
- 3.To determine and analyse the difference in the number of online orders before and after Covid.
- 4.To determine and analyse the difference in the Turnover before and after Covid.
- 5.To determine and analyse the average monthly salary of an employee before and after Covid.
- 6.To determine and analyse the average cost of consumption (for 2 people) before and after Covid.

# Research Methodology

For this research paper we have collected primary data with the help of a questionnaire created using google forms and interview method. Through these two methods we were able to collect the required data of 41 restaurants in Mumbai. We have collected the following data:

## Information Data:

Year of establishment of the restaurant
Monthly rent
Monthly expenses of the restaurant
Effect of online orders on the income of the restaurant

## Comparison Data:

Monthly salary of an employee before covid	Monthly salary of an employee after covid
Cost of consumption (For 2 people) before covid	Cost of consumption (For 2 people) after covid
Turnover before covid	Turnover after covid
Number of employees working in the restaurant before covid	Number of employees working in the restaurant after covid
Number of online orders before covid	Number of online orders after covid
Average number of customers per day before covid	Average number of customers per day after covid

## ***Test for Comparing the Means of Two Dependent Samples***

Assuming that these two samples are dependent, for statistical analysis we have used paired t-test to determine if there is any impact on restaurants because of Covid-19. Paired T-test is most suitable as we have the data of these restaurants before and after Covid-19.

We use paired t-test when we have before and after values of the same data. This research paper focuses on analysing the impact of covid-19 on Indian restaurants using various statistical tests.

### **Paired t-Test**

Suppose there are two dependent continuous random variables,

**X and Y with  $E(X) = \mu_X$ ,  $E(Y) = \mu_Y$**

They could be dependent because we measure the same variable twice on the same subjects at different times. Typically, this is the case in pre–post experiments, for example when we measure the weight of a person before starting a special diet and after finishing the diet; or when evaluating household expenditures on electronic appliances in two consecutive years. We then say that the samples are paired, or dependent.

Since the same variable is measured twice on the same subject, it makes sense to calculate a difference between the two respective values.

Let  $D = X - Y$  denote the random variable “Difference of X and Y”.

If  **$H_0: \mu_X = \mu_Y$**  is true, then the expected difference is zero

we get  $E(D) = \mu_D = 0$

This means testing  **$H_0: \mu_X = \mu_Y$**  is identical to testing  $\mu_X - \mu_Y = \mu_D = 0$ .

We further assume that D is normally distributed if  **$H_0: \mu_X = \mu_Y$**  is true (or equivalently if

**$H_0: \mu_D = 0$**  is true), i.e.,  $D \sim N(0, \sigma_D^2)$ .

For a random sample  $(D_1, D_2, \dots, D_n)$  of the differences, the test statistic is

$$T(X, Y) = T(D) = \frac{\bar{D}}{S_D} \sqrt{n}$$

is  $t$ -distributed with  $n-1$  degrees of freedom. The sample mean is

$$\bar{D} = \frac{\sum_{i=1}^n D_i}{n}$$

and the sample mean square is,

$$s_D^2 = \frac{\sum_{i=1}^n (D_i - \bar{D})^2}{n-1}$$

which is an estimator of  $\sigma_D^2$ . The realised test statistic is thus,

$$t(d) = \frac{\bar{d}}{s_d} \sqrt{n}$$

where  $\bar{d} = \sum_{i=1}^n d_i / n$  and  $s_d^2 = \sum_{i=1}^n (d_i - \bar{d})^2 / n - 1$ .

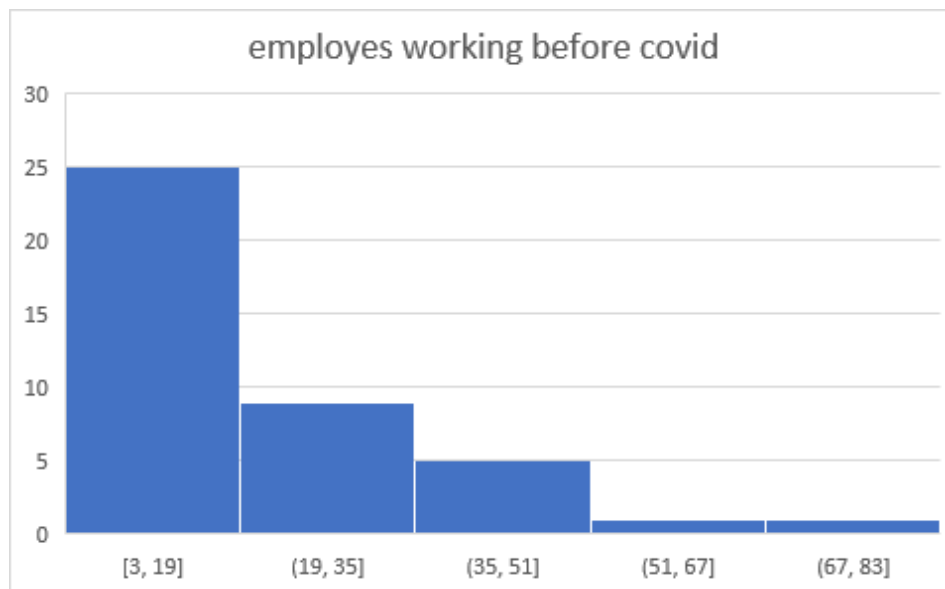
# Exploratory Data Analysis

From sample of size 41, this is the exploratory data analysis for each variable:

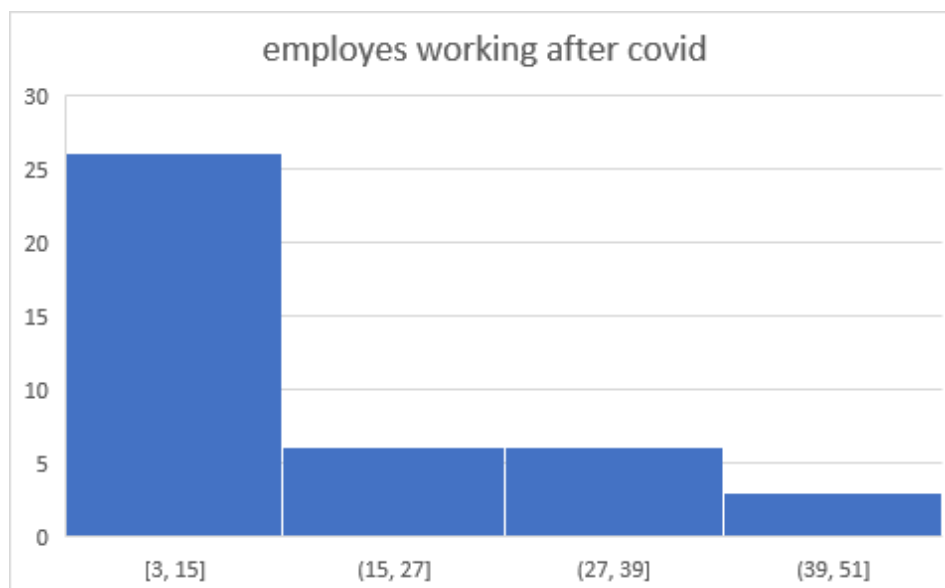
## 1. Number of employees working:

We can see that the data for number of employees before and after covid is quantitative and discrete.

- **Before Covid:**

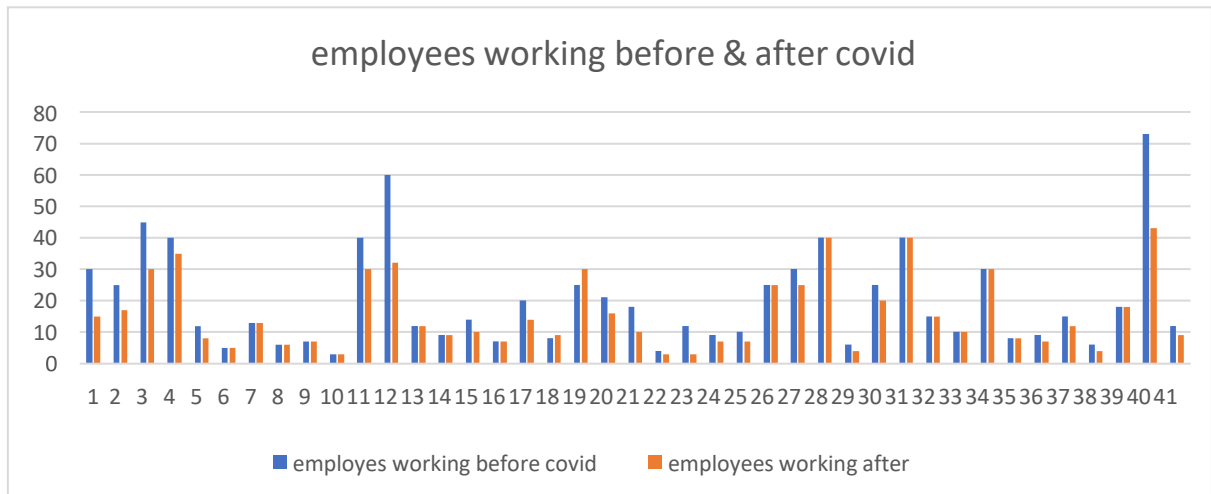


- **After Covid:**





	Employees working before covid:	Employees working after covid:
<b>Mean</b>	19.92682927	15.80487805
<b>Standard Error</b>	2.46694989	1.800142106
<b>Median</b>	14	12
<b>Mode</b>	25	7
<b>Standard Deviation</b>	15.79618663	11.52653355
<b>Sample Variance</b>	249.5195122	132.8609756
<b>Kurtosis</b>	2.396858654	-0.26995269
<b>Skewness</b>	1.526075516	0.944160364
<b>Range</b>	70	40
<b>Minimum</b>	3	3
<b>Maximum</b>	73	43
<b>Sum</b>	817	648
<b>Count</b>	41	41

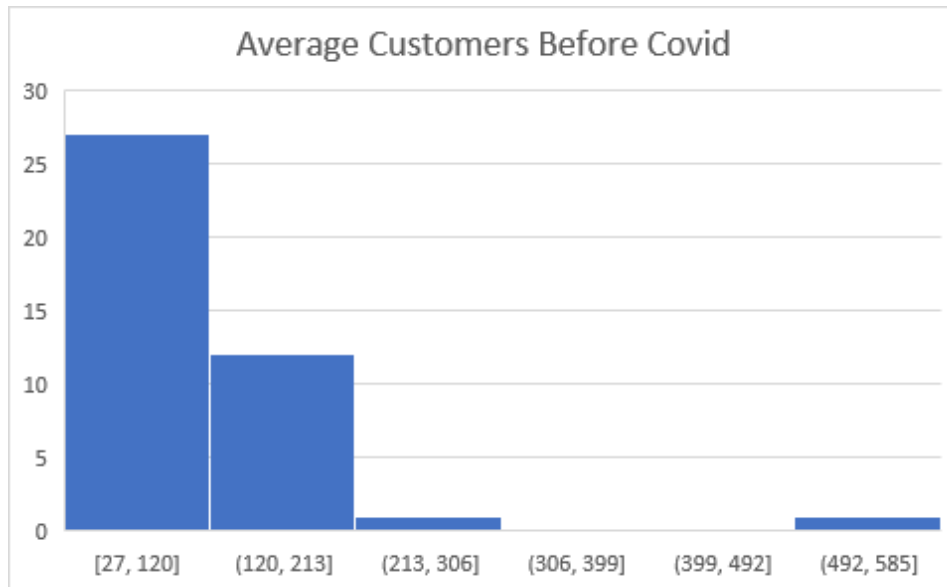


Here, we can see that there is a mean decrease in number of employees before covid (20) to after covid (16).

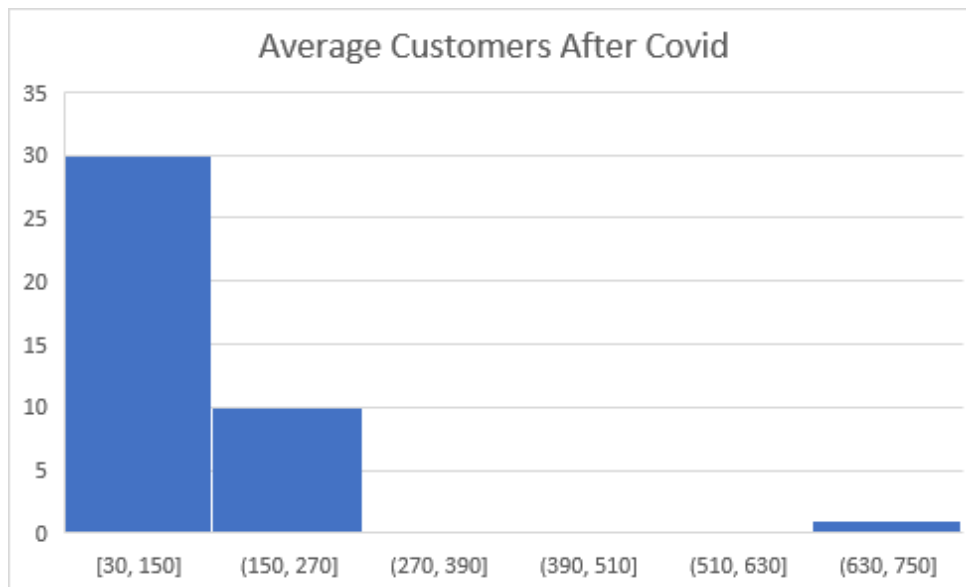
## 2. Average Customer per day:

We can see that the data for average customers per day before and after covid is quantitative and discrete.

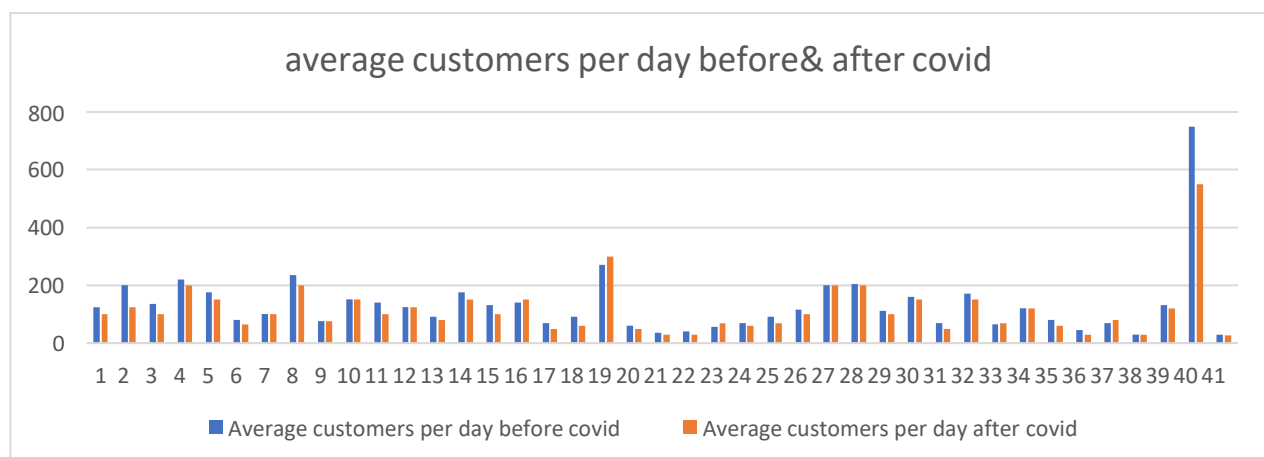
- **Before Covid:**



- **. After covid**



	Average customers per day before covid:	Average customers per day after covid:
<b>Mean</b>	132.3170732	115.2926829
<b>Standard Error</b>	18.03629265	14.23968364
<b>Median</b>	115	100
<b>Mode</b>	70	100
<b>Standard Deviation</b>	115.4886226	91.17846344
<b>Sample Variance</b>	13337.62195	8313.512195
<b>Kurtosis</b>	20.73194443	12.5090698
<b>Skewness</b>	3.990719305	2.983057351
<b>Range</b>	720	523
<b>Minimum</b>	30	27
<b>Maximum</b>	750	550
<b>Sum</b>	5425	4727
<b>Count</b>	41	41



From the data above we can see that the mean of average customer per day decreases from before covid (132) to after covid (115).

### 3. Expenses:

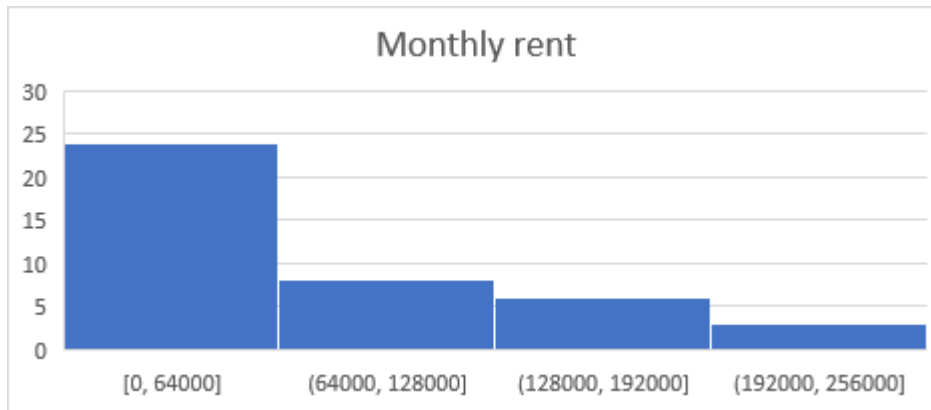
We can see that the data for monthly expenses and monthly rent is quantitative and continuous.

- **Monthly Expenses:**

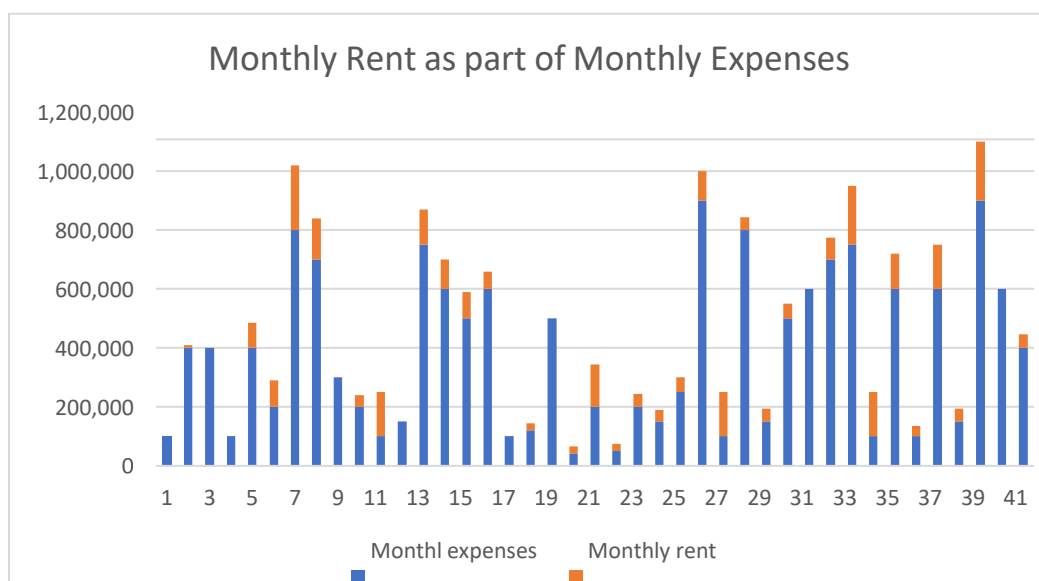


Monthly expenses:	
Mean	386878.0488
Standard Error	42119.92453
Median	400000
Mode	100000
Standard Deviation	269699.1097
Sample Variance	72737609756
Kurtosis	-1.25592008
Skewness	0.38154881
Range	858000
Minimum	42000
Maximum	900000
Sum	15862000
Count	41

- **Monthly Rent:**



<i>Monthly rent:</i>	
Mean	70024.39024
Standard Error	9909.682861
Median	46000
Mode	0
Standard Deviation	63452.93051
Sample Variance	4026274390
Kurtosis	-0.448038235
Skewness	0.733182325
Range	220000
Minimum	0
Maximum	220000
Sum	2871000
Count	41

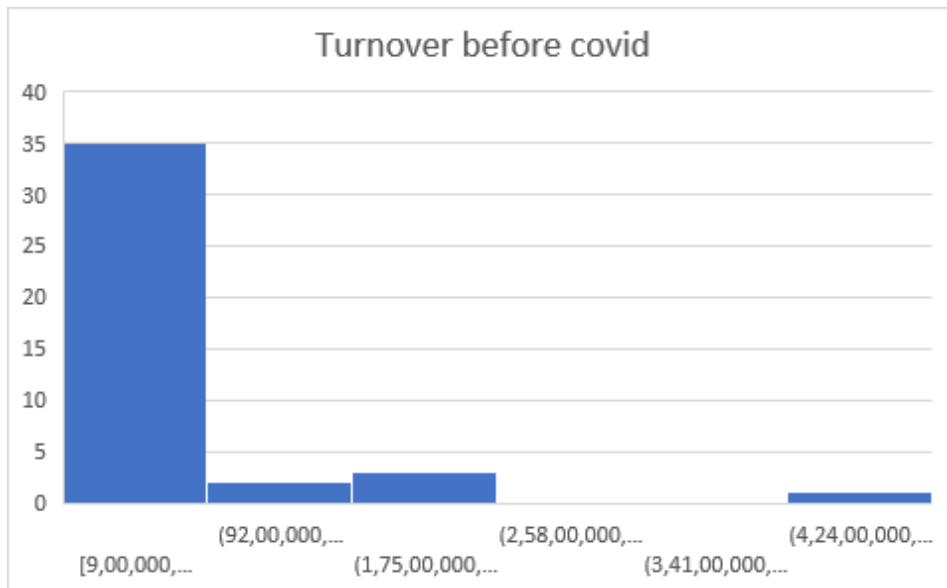


Here, we can see the proportion of monthly rent in monthly expenses

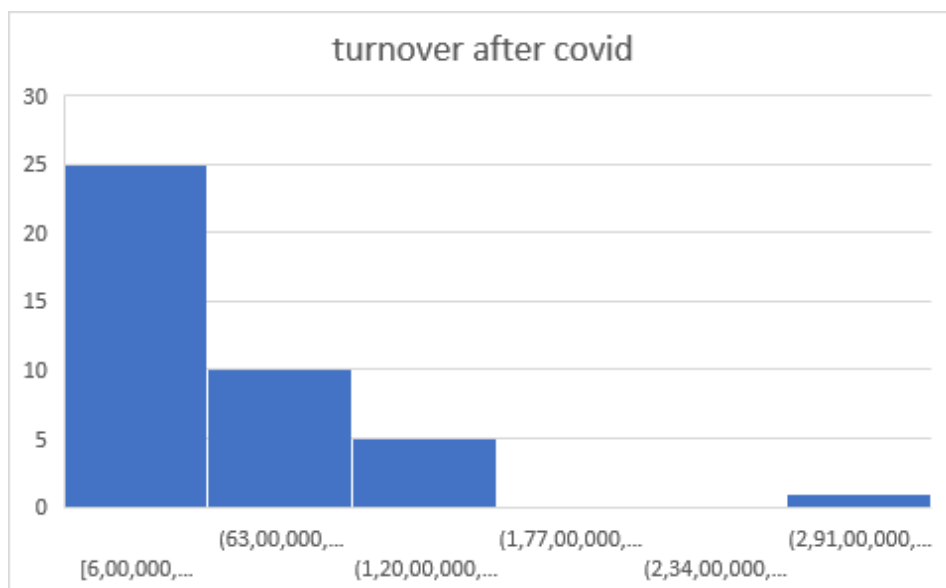
## 4. Turnover:

We can see that the data for turnover before and after covid is quantitative and continuous.

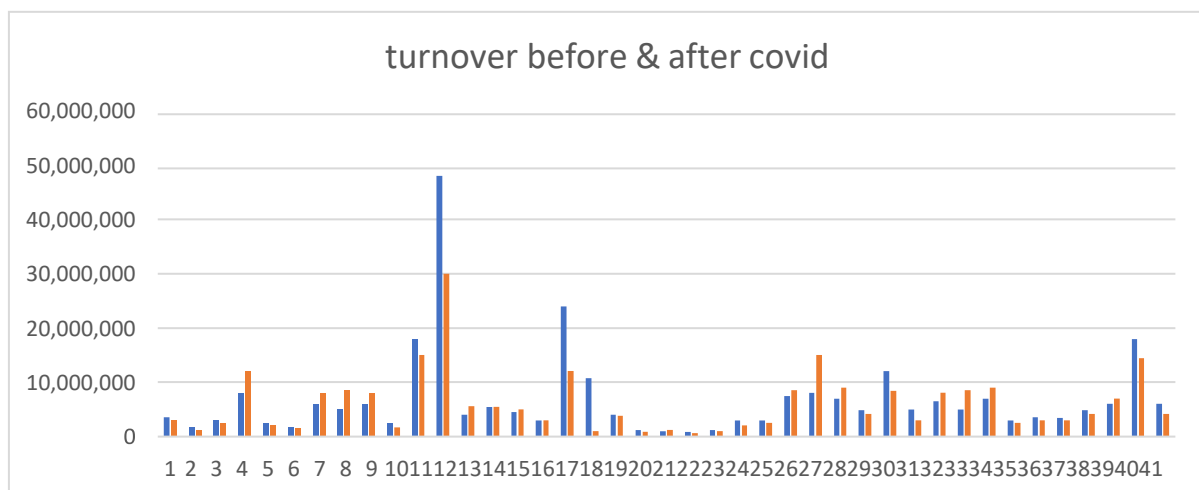
- **Before Covid:**



- **After Covid:**



	Turnover before covid:	Turnover after covid :
<b>Mean</b>	6826829.268	6081707.317
<b>Standard Error</b>	1272691.714	875137.195
<b>Median</b>	4800000	4200000
<b>Mode</b>	3000000	3000000
<b>Standard Deviation</b>	8149203.163	5603612.184
<b>Sample Variance</b>	6.64095E+13	3.14005E+13
<b>Kurtosis</b>	16.52755018	7.190135387
<b>Skewness</b>	3.700056093	2.207896267
<b>Range</b>	47100000	29400000
<b>Minimum</b>	900000	600000
<b>Maximum</b>	48000000	30000000
<b>Sum</b>	279900000	249350000
<b>Count</b>	41	41

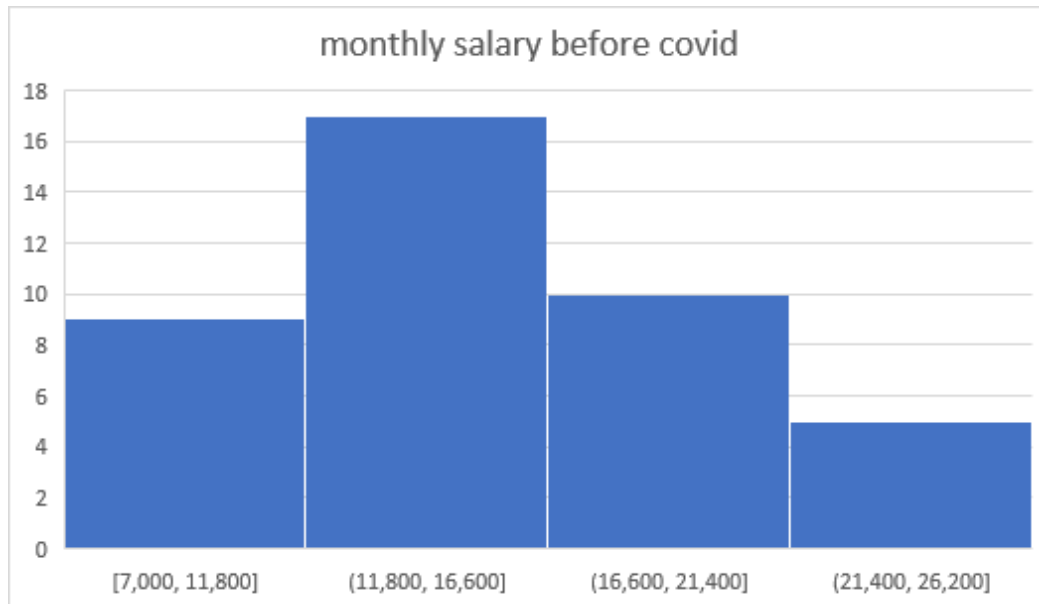


Here, we can see that the mean for turnover decreases from before covid (6826829) to after covid (6081707).

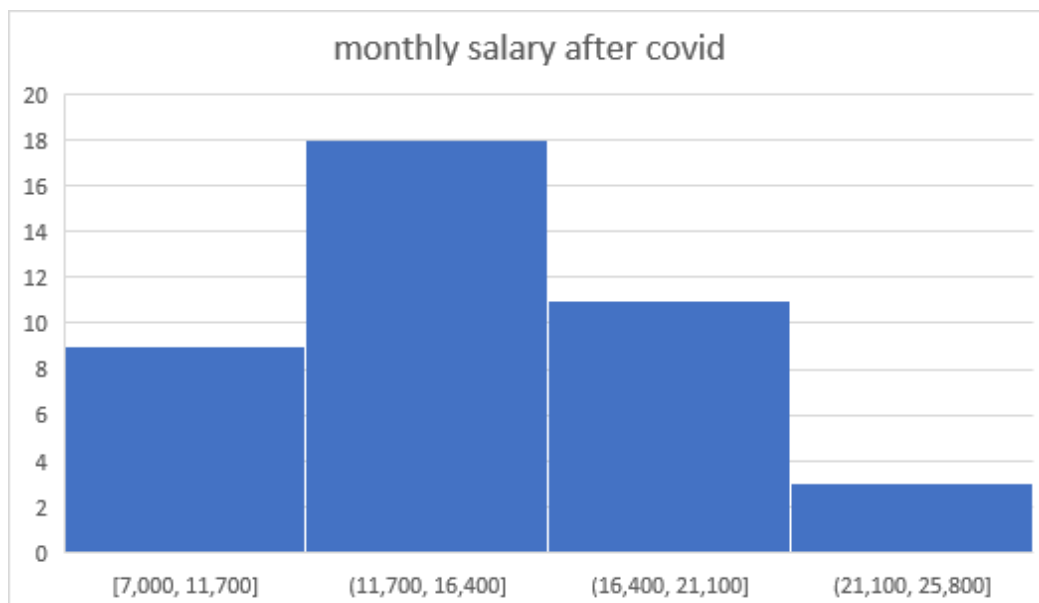
## 5. Monthly Salary of Employee:

We can see that the data for Monthly expenses before and after covid is quantitative and continuous.

- **Before Covid:**

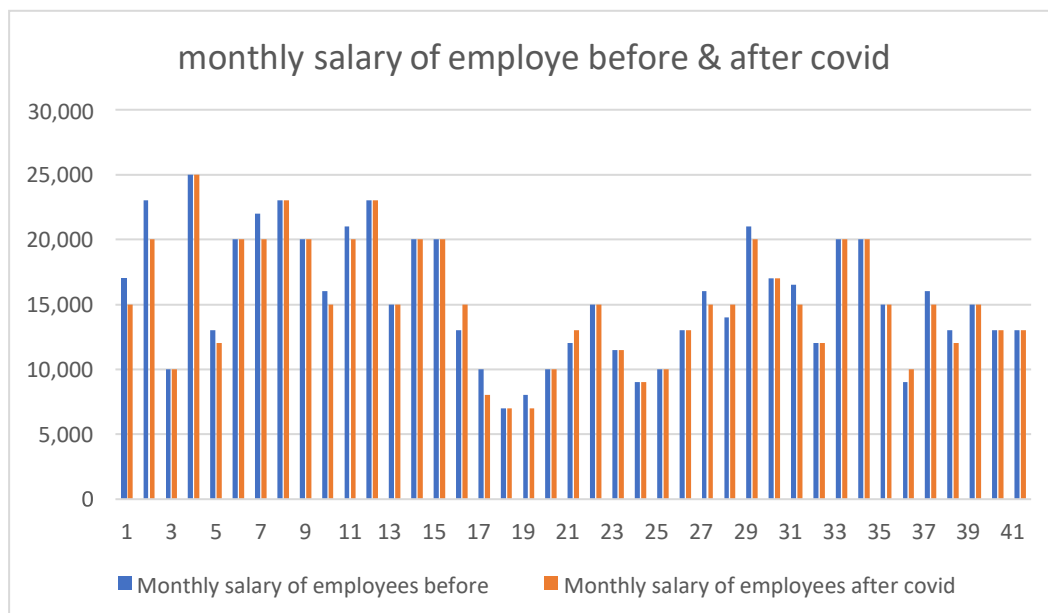


- **After Covid:**





	Monthly salary of employees before:	Monthly salary of employees after covid :
<b>Mean</b>	15536.58537	15207.31707
<b>Standard Error</b>	742.7269802	719.2847925
<b>Median</b>	15000	15000
<b>Mode</b>	13000	15000
<b>Standard Deviation</b>	4755.773128	4605.669889
<b>Sample Variance</b>	22617378.05	21212195.12
<b>Kurtosis</b>	-0.965925158	-0.743157749
<b>Skewness</b>	0.168064199	0.138555312
<b>Range</b>	18000	18000
<b>Minimum</b>	7000	7000
<b>Maximum</b>	25000	25000
<b>Sum</b>	637000	623500
<b>Count</b>	41	41

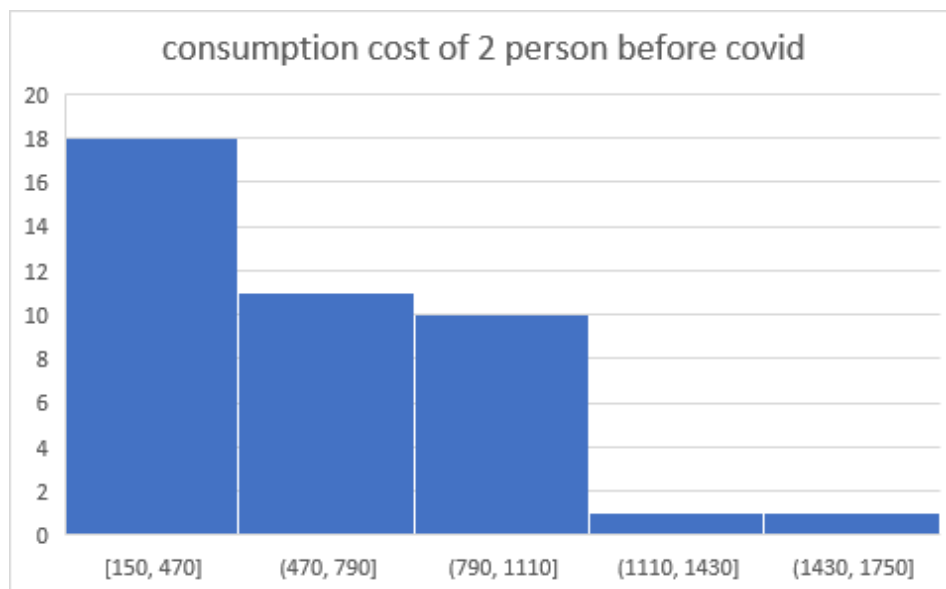


Here, we can see that mean for monthly salary of employees decreases from before covid (15537) to after covid (15207).

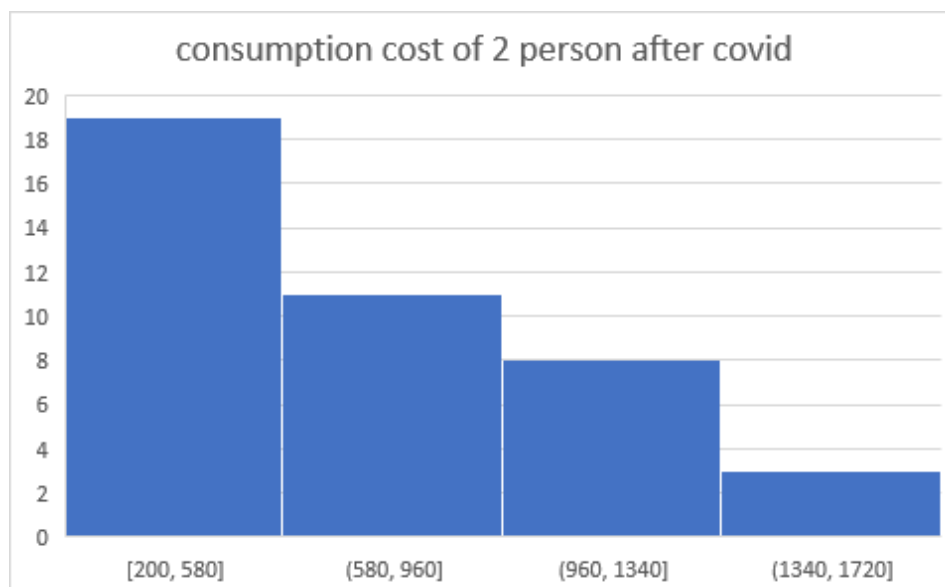
## 6. Average Consumption Cost for two people:

We can see that the data for average consumption for 2 people before and after covid is quantitative and continuous.

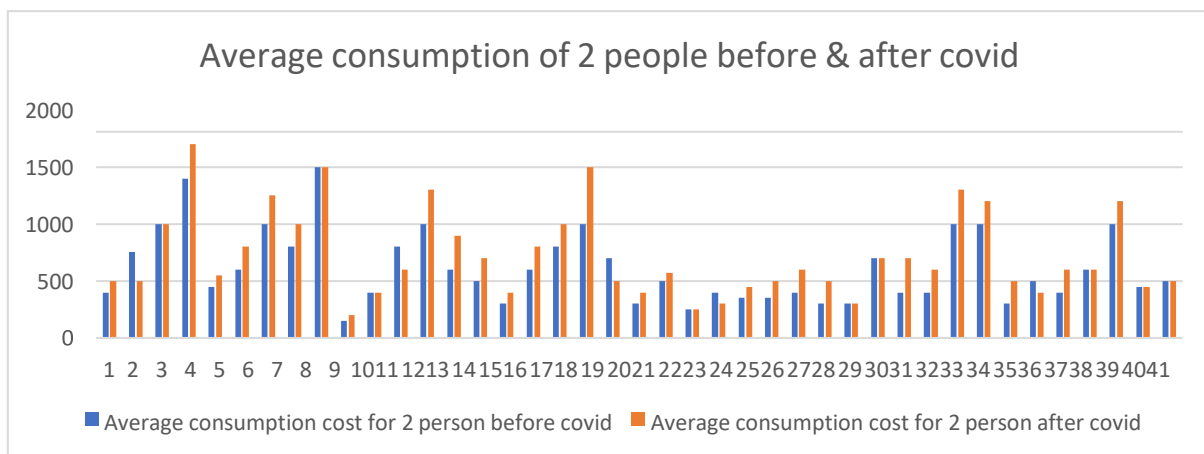
- **Before Covid:**



- **After Covid:**



Average consumption cost for 2 people after covid:	
Mean	724.8780488
Standard Error	59.12999523
Median	600
Mode	500
Standard Deviation	378.6167056
Sample Variance	143350.6098
Kurtosis	0.02596748
Skewness	0.961138631
Range	1500
Minimum	200
Maximum	1700
Sum	29720
Count	41

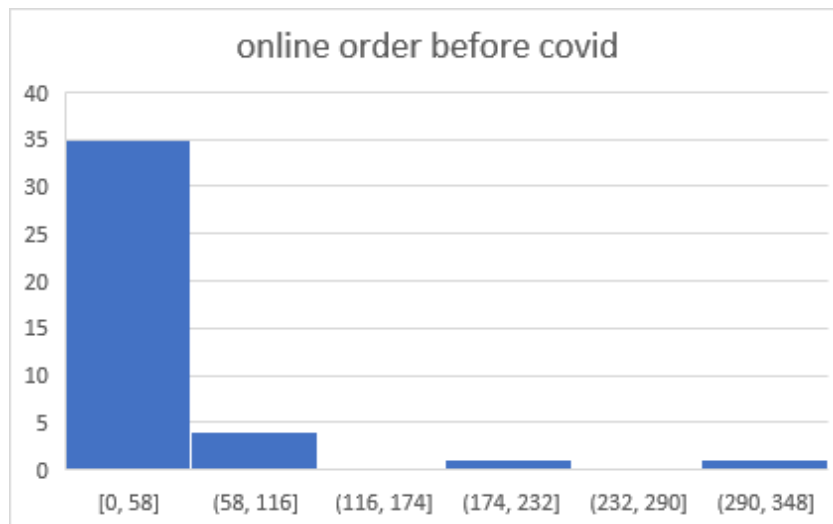


Here, we can see that the mean for average consumption cost for two person increases from before covid (61) to after covid (724).

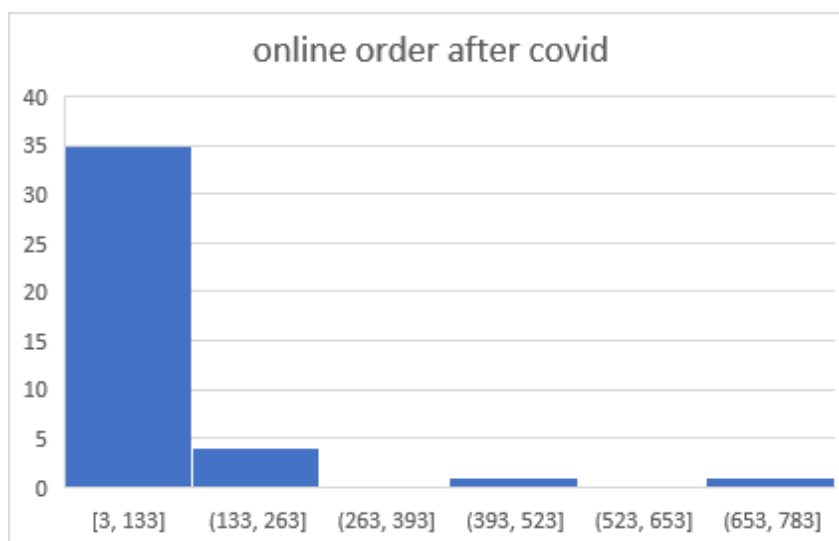
## 7. Number of Online Order:

We can see that the data for online order before and after covid is quantitative and continuous.

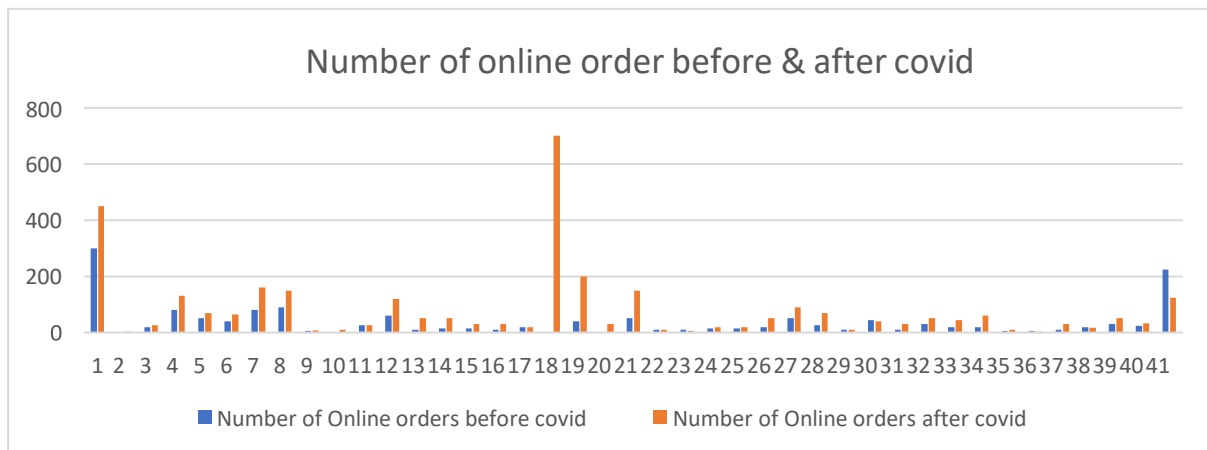
- Before Covid:



- After Covid:



	Number of Online orders before covid	Number of Online orders after covid
Mean	36.7804878	79.17073171
Standard Error	8.904610494	19.81259462
Median	20	40
Mode	10	50
Standard Deviation	57.01732728	126.8625048
Sample Variance	3250.97561	16094.09512
Kurtosis	13.48915003	15.61413655
Skewness	3.50659762	3.713994385
Range	300	697
Minimum	0	3
Maximum	300	700
Sum	1508	3246
Count	41	41



Here, we can see the mean for number of online orders increases from before covid (37) to after covid (79).

# DATA ANALYSIS

We are performing paired t-Test to the following 41 dataset to fulfil the objective of our research:

## 1. Number of employees working before and after covid

$H_0$ : Difference between Number of Employees working is zero

$H_1$ : Difference between Number of Employees working is not zero

$H_0$ :  $d = 0$

$H_1$ :  $d \neq 0$

**Degree Of Freedom: 40**

### Paired T- test

	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	19.92682927	15.80487805
<b>Variance</b>	249.5195122	132.8609756
<b>Observations</b>	41	41
<b>Pearson Correlation</b>	0.913827348	
<b>Hypothesized Mean Difference</b>	0	
<b>df</b>	40	
<b>t Stat</b>	<b>3.747237593</b>	
<b>P(T&lt;=t) one-tail</b>	0.000282271	
<b>t Critical one-tail</b>	1.683851013	
<b>P(T&lt;=t) two-tail</b>	0.000564541	
<b>t Critical two-tail</b>	<b>2.02107539</b>	

**Decision:** calculated  $|t| >$  tabulated (t), so we reject the hypothesis at 5% LOS

**Conclusion:** Therefore, it means that there is a significant difference in employees working in a restaurant.

## 2. Turnover of restaurant before and after covid

$H_0$ : Difference between turnover is zero

$H_1$ : Difference between turnover is not zero

$H_0$ :  $d = 0$

$H_1$ :  $d \neq 0$

**Degree Of Freedom: 40**

<b>Paired T-test</b>		
	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	6826829	6081707
<b>Variance</b>	6.64E+13	3.14E+13
<b>Observations</b>	41	41
<b>Pearson Correlation</b>	0.879049	
<b>Hypothesized Mean Difference</b>	0	
<b>df</b>	40	
<b>t Stat</b>	<b>1.139651</b>	
<b>P(T&lt;=t) one-tail</b>	0.130605	
<b>t Critical one-tail</b>	1.683851	
<b>P(T&lt;=t) two-tail</b>	0.26121	
<b>t Critical two-tail</b>	<b>2.021075</b>	

**Decision:** calculated  $|t| < \text{tabulated } (t)$ , therefore we accept the hypothesis at 5% LOS.

**Conclusion:** Therefore, it means that there is a no significant difference in turnover of a restaurant before and after covid.

### 3. Average customers per day

$H_0$ : Difference between average Customer per day is zero

$H_1$ : Difference between average Customer per day is not zero

$H_0$ :  $d = 0$

$H_1$ :  $d \neq 0$

**Degree Of Freedom: 40**

<b>Paired T-Test</b>		
	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	132.3170732	115.2926829
<b>Variance</b>	13337.62195	8313.512195
<b>Observations</b>	41	41
<b>Pearson Correlation</b>	0.972683455	
<b>Hypothesized Mean Difference</b>	0	
<b>df</b>	40	
<b>t Stat</b>	<b>3.192001778</b>	

<b>P(T≤t) one-tail</b>	0.001375279	
<b>t Critical one-tail</b>	1.683851013	
<b>P(T≤t) two-tail</b>	0.002750559	
<b>t Critical two-tail</b>	<b>2.02107539</b>	

**Decision:** calculated  $|t| >$  tabulated (t), so we reject the hypothesis at 5% LOS.

**Conclusion:** Therefore, it means that there is a significant difference in average customer of a restaurant per day before and after covid.

#### 4. Average consumption cost for 2 people before and after covid

$H_0$ : Difference between average consumption cost for 2 people is zero

$H_1$ : Difference between average consumption cost for 2 people is not zero

$H_0$ :  $d = 0$

$H_1$ :  $d \neq 0$

**Degree Of Freedom:** 40

#### Paired T-Test

	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	613.4146	724.878
<b>Variance</b>	99753.05	143350.6
<b>Observations</b>	41	41
<b>Pearson Correlation</b>	0.914508	
<b>Hypothesized Mean Difference</b>	0	
<b>df</b>	40	
<b>t Stat</b>	<b>-4.57023</b>	
<b>P(T≤t) one-tail</b>	2.3E-05	
<b>t Critical one-tail</b>	1.683851	
<b>P(T≤t) two-tail</b>	4.6E-05	
<b>t Critical two-tail</b>	<b>2.021075</b>	

**Decision:** calculated  $|t| >$  tabulated (t), so we reject the hypothesis at 5% LOS

**Conclusion:** Therefore, it means that there is a significant difference in average consumption cost for 2 people at a restaurant before and after covid.



## 5. Online order received by restaurant before and after covid

$H_0$ : Difference between online orders received is zero

$H_1$ : Difference between online orders received is not zero

$H_0: d = 0$

$H_1: d \neq 0$

**Degree Of Freedom: 40**

### Paired T-Test

	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	36.78049	79.17073
<b>Variance</b>	3250.976	16094.1
<b>Observations</b>	41	41
<b>Pearson Correlation</b>	0.447871	
<b>Hypothesized Mean Difference</b>	0	
<b>df</b>	40	
<b>t Stat</b>	<b>-2.39298</b>	
<b>P(T&lt;=t) one-tail</b>	0.010748	
<b>t Critical one-tail</b>	1.683851	
<b>P(T&lt;=t) two-tail</b>	0.021497	
<b>t Critical two-tail</b>	<b>2.021075</b>	

**Decision:** calculated  $|t| >$  tabulated (t), so we reject the hypothesis at 5% LOS

**Conclusion:** Therefore, it means that there is a significant difference in online orders received by restaurants before and after covid.

## 6. Monthly salary of employees before and after

$H_0$ : Difference between Monthly salary of an employee is zero

$H_1$ : Difference between Monthly salary of an employee is not zero

$H_0: d = 0$

$H_1: d \neq 0$

**Degree Of Freedom: 40**

### Paired T-Test

	<i>Variable 1</i>	<i>Variable 2</i>
<b>Mean</b>	15536.59	15207.32
<b>Variance</b>	22617378	21212195
<b>Observations</b>	41	41
<b>Pearson Correlation</b>	0.981222	
<b>Hypothesized Mean Difference</b>	0	
<b>df</b>	40	
<b>t Stat</b>	<b>2.293412</b>	
<b>P(T&lt;=t) one-tail</b>	0.013579	
<b>t Critical one-tail</b>	1.683851	
<b>P(T&lt;=t) two-tail</b>	0.027157	
<b>t Critical two-tail</b>	<b>2.021075</b>	

**Decision:** calculated  $|t| >$  tabulated (t), so we reject the hypothesis at 5% LOS.

**Conclusion:** Therefore, it means that there is a significant difference in Monthly salary of employees before and after covid.

## Conclusion

Firstly, the negative impact of Covid-19 on the restaurant industry is not surprising, considering the extreme hardships for the industry caused by the pandemic. In Mumbai, the dine-in service was severely restricted or even prohibited for certain periods. Even when such restrictions or prohibitions were not in place, people became very cautious of dining out at restaurants, which damaged restaurant sales.

Through this study we can conclude that covid-19 pandemic has caused a decrease in the number of employees working in a restaurant, average monthly salary of an employee and

the number of people visiting the restaurant, which has resulted in the increase of the average consumption cost for two people in a restaurant in order to mitigate their losses.

Although the number of people visiting the restaurants have decreased, the number of online orders has increased due to which the restaurants did not face any significant change in the turnover. However, restaurants are still facing difficulties in keeping their business profitable as they have faced significant losses during the pandemic period.

During our primary data collection, the restaurant management also shared the difficulties they faced after the pandemic which included increase in the utility bills and prices of the raw materials which in turn meant a significant increase in the expenses. Thus, based on our research and analysis we can say that the restaurants are adversely affected by Covid-19 and restaurant owners are still struggling to get back on their feet post-pandemic

## ***Limitations***

Every research has its own set of limitations. For this particular topic our sample size was considerably small which may not be the most accurate representation of restaurants in India as a whole. We could only collect the data from restaurants in Mumbai region due to the lack of required resources in order to collect them from other regions within India. During our primary research for this topic the restaurant management was reluctant to provide financial data such as turnover, monthly salary of an employee, monthly expenditure etc, we were able to convince only few of them to give us the data by explaining that the data would be absolutely confidential and would be used only for academic purposes. Most of the restaurants were not comfortable in providing such information even if it was only for academic purposes. As this study focuses only on COVID-19, thus its findings may not be generalizable to other future crises.

## ***Future scope***

The current study explores the impact of Covid-19 on the restaurant industry in Mumbai. Using similar statistical methods, a study can be done to compare the impact of covid-19 of other states all over India. This would significantly increase the sample size which would give us an accurate depiction of the impact of covid-19 on the restaurant industry in India. The data collected here mostly includes SME's ,and further we can expand it by taking data from high end restaurants so as to get a better analysis of the restaurant industry in India.

## ***References***

### **Research papers:**

1.Seoki Lee,Hyoungju Song,Michael S. Lin,Amit Sharma(2021),  
*Journal of Hospitality Financial Management*,29(1).

2.Sazu Sardar,Rudrendu Ray,Md. Kamrul Hasan,Shital Sohani Chitra,A. T. M. Shahed Parvez,Md. Ashikur Rahman Avi(2022),  
Assessing the Effects of COVID-19 on Restaurant Business From Restaurant Owners' Perspective,  
*Frontiers in psychology*.

3.Prof. Anil Kothari, Taranjeet Kaur Matharu(2020)  
Impact of Covid-19 on Restaurant Industry,  
*International Journal of Trend in Scientific Research and Development (IJTSRD)*.

4.Sumita Banik Saha(2021)  
*Impact of COVID 19 on Restaurant Business in Dimapur*.

5.Michael G. Brizek, Robert E. Frash, Brumby M. McLeod, Melinda O. Patience(2021),  
Independent restaurant operator perspectives in the wake of the COVID-19 pandemic,  
*International Journal of Hospitality Management*,(93).

## **Articles:**

1.Danny klein (2020),  
Restaurant Industry Has Already Lost \$120 Billion,Fast food.

2.Kashish Khurana (2020),  
Impact of covid -19 on the hospitality sector:A study into the plight of restaurant in Delhi-  
ner

3.Ritwik Sharma (2021)  
Indian restaurant industry shrank 53% in pandemic year: NRAI report,  
Business Standard