RAYAT SHIKSHAN SANSTHA'S,

SADGURU GADAGE MAHARAJ COLLEGE, KARAD.

(An Autonomous college)

Department of Statistics

Case study report on

"A Statistical Study on Impact of COVID-19 Pandemic on mental health."

Submitted by,

Miss. Ghorpade Nikita Balasaheb.
&
Miss. Kadam Sayali Sunil.

M.Sc. II (Statistics)

Under the Guidance of

Dr. Mrs. S. P. Patil

(2020-2021)

Teacher in-charge **P.G. Coordinator** **Head of department**

CERTIFICATE

This is to certify that the Case study report entitled **"A Statistical Study on Impact of COVID-19 Pandemic on Mental Health"** being submitted by Miss. Ghorpade Nikita Balasaheb & Miss. Kadam Sayali Sunil as partial fulfillment for the M.Sc. in Statistics of Sadguru Gadage Maharaj College, Karad record of bonafide work carried out by them under supervision and guidance.

To the best of our knowledge and belief, the matter presented in this project report is original and has not been submitted elsewhere for any other purpose.

Place: Karad

Date:

(Head, Department of Statistics) **(P.G. Co-ordinator)**

ACKNOWLEDGEMENT

While conducting the Impact of COVID-19 on mental health oriented case study, innumerable people have give me various suggestions and opinions. We have tried to incorporate all those suggestions which are really relevant in preparing my final report. I think it is essential to thank all those who have contributed and helped me throughout the duration of the case study.

We pay our immense gratitude to “Dr. Mrs. S. P. Patil”, Faculty of “S. G. M. College, Karad” for this continuous and deliberate on the topic and indeterminable burden taken by him in helping me throughout conducting the case study.

We would like to also like to thank my friends who rendered their wholehearted co-operation in the successful completion of the case study work.

Finally, We thankful to all the people who willingly responded to the questionnaire and their contribution has been invaluable. This case study not have been completed without their participation.

We pleased to state the whole report is just the presentation of the fact that have been found during the case study through different sources and its each sentence is an exact representation of the information of the information obtained and the analysis. We hope that we have manifested my sincere attempts to represent all the information and other things to the best of our ability.

CONTENT

INTRODUCTION

COVID-19 had a great impact on every aspect of our nation. Similar to many other countries worldwide, nationwide measures such as quarantine lockdown and social distancing were launched in the March 2020, in responsive to rising number of cases and deaths attributed to COVID-19. Although these measures might have mitigated the spread of the severe acute respiratory syndrome corornavirus2 (SARS-COV-2) that causes COVID-19 they might also have negatively affected the economy, employment and public health with worries about future uncertainty. Concern has been growing about the mental health sequelae of the COVID-19 crisis.

The mandated lockdowns abruptly and dramatically altered people's daily routines, work, travel and leisure activities to a degree unexperienced by most people living outside of war zone. Simultaneously, the highly contagious, yet invisible virus transformed previously neutral situations to perceived potentially dangerous ones. Social interactions, touching one's face, going to concert and shaking someone's hand. Given these changes and looming threat, increase in anxiety and depression can be expected.

Some people, the mental distress in the form of stress, depression and negative affect are likely reactions to the lockdown. Therefore people wellbeing is likely to suffer. Some people lost income as a result of the lockdown and this is a known risk factor for poor mental health.

Thus the aim of this study was to determine has COVID-19 been affected by mental health and if so, to what extent.

OBJECTIVES

- To find out if COVID-19 has affected on mental health.
- To find out which type of mental problem they faced in COVID-19 pandemic.
- To check out some feelings they have experienced throughout this time of pandemic.
- To check relation between occupation and affect of COVID-19 on mental health of peoples.
- To check the proportion of effect of COVID-19 on mental health of male and female.

METHODOLOGY

Data is collected on primary sources. It is collected through the questionnaire (Google Form). A sample of size 384 is selected from the infinite population. We prepared 39 questions in the questionnaire related to mental health. With the help of this questionnaire, We collect the data and analyse it by using some statistical methods.

Sample Size Determination:

The sample size is determined by using "Cochran formula".

$S = Z^2*p*(1-p)/M^2$

S = Sample size for infinite population.

Z = Z score

P = Population proportion (assumed to be 50%=0.5)

M = margin of error

Z score is determined based on confidence level. The probability that the value of a parameter falls within a specified range of values. If we consider 95% confidence level then the Z score is 1.96

Margin of error is a small amount that is allowed for in case of miscalculation or change of circumstances.

Generally, we take margin of error as 5%.

M = 0.05

Z-score = 1.96

p = 0.5, M = 0.05

$S = Z^2*p*(1-p)/M^2$

$S = 1.96^2*0.5*(1-0.5)/0.05^2$

$S = 3.8416*0.25/0.0025$

$S = 384.16 \sim 384$

S = 384

Data Collection Method:

The main objective of our case study is statistical study on impact of COVID-19 on mental health. So, for case study we have collected data from 384 peoples from infinite population.

In this case study we have used simple random sampling without replication.

For this process we prepared a questionnaire satisfying some characteristics of good questionnaire. This questionnaire is filled by 384 peoples from different area of different age group and occupation.

Statistical Analysis:

Statistical tools:

- Cronbach's Alpha
- Exploratory Data Analysis.
- Chi-square independent test.
- Kruskal Wallis H test.

Statistical Software:

- R-Studio
- Ms-Excel

RELIABILITY TEST: Cronbach's Alpha

Measures of Internal consistency

Cronbach's alpha tests to see if multiple question Likert scale surveys are reliable. It will tell you if the test you have designed is accurately measuring the variable of interest.

Cronbach's Alpha Formula:

$$\alpha = K/K\text{-}1[1-(\Sigma S^2y/S^2x)]$$

Where,

K is the number of test item

ΣS^2y is sum of the item variance

S^2x is the variance of total score

Cronbach's alpha	**Internal Consistency**
0.90 and above	Excellent
0.80 to 0.89	Good
0.70 to 0.79	Acceptable
0.60 to 0.69	Questionable
0.50 to 0.59	Poor
Below 0.50	Unacceptable

To calculate the Cronbach's Alpha.

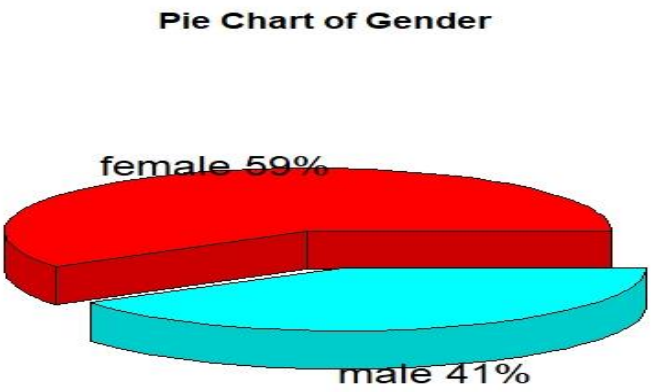
VARIABLES	**DESCRIPTION**	**VALUES**	**INTERNAL CONCISTENCY**
K	# of items	39	
ΣS^2y	sum of the item variance	12.20813	ACCEPTABLE
S^2x	variance of total score	40.2644789	
α	Cronbach's Alpha	0.715138371	

Therefore, the internal consistency of our data is acceptable.

Exploratory Data Analysis by Using R-Studio

1] To check how data distributed within Male and Female By Using Pie Chart:

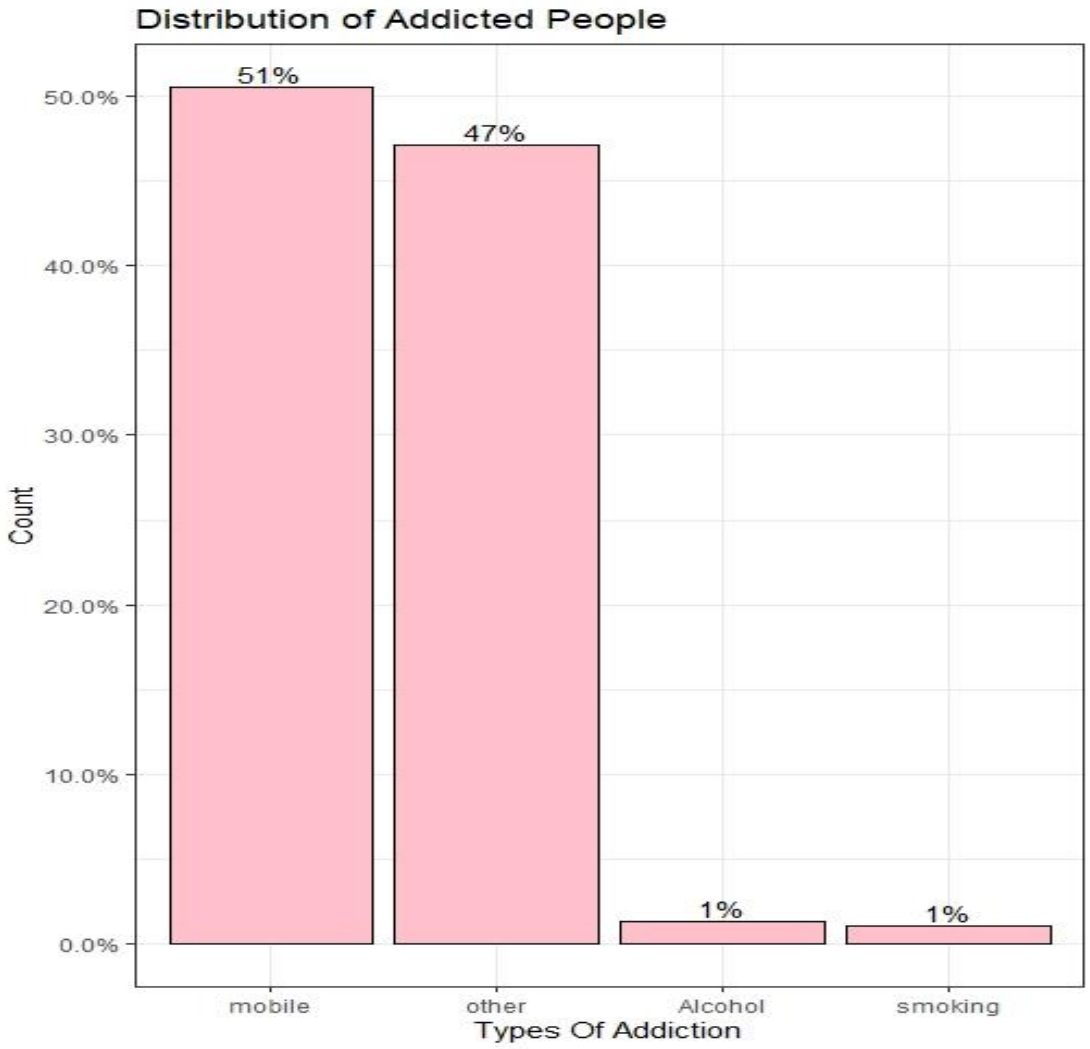
Pie Chart for Distribution of Male and Female



Conclusion :

In above graph we conclude that data distributed with 59% female and 41 % male.

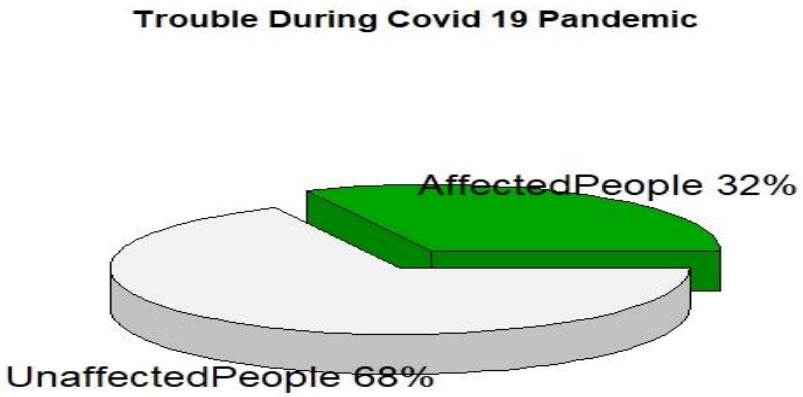
2] To check Addiction of People By Using Simple Bar Diagram:



Conclusion:

Comparison to all addiction the people who addicted mostly 51% by mobile, less people are addicted by alcohol and smoking with only 1% while people also have 47% other addictions.

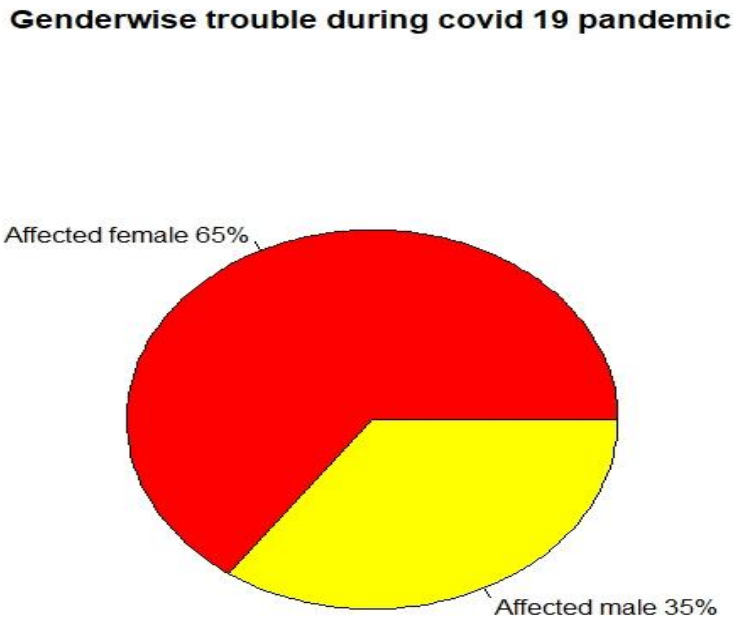
3] To check how many people Face Trouble During COVID-19 Pandemic By Using Pie Chart



Conclusion:

In above graph we conclude that 32% people are affected by COVID-19 pandemic while 68% people are unaffected i.e., 32% people face trouble during COVID-19 pandemic.

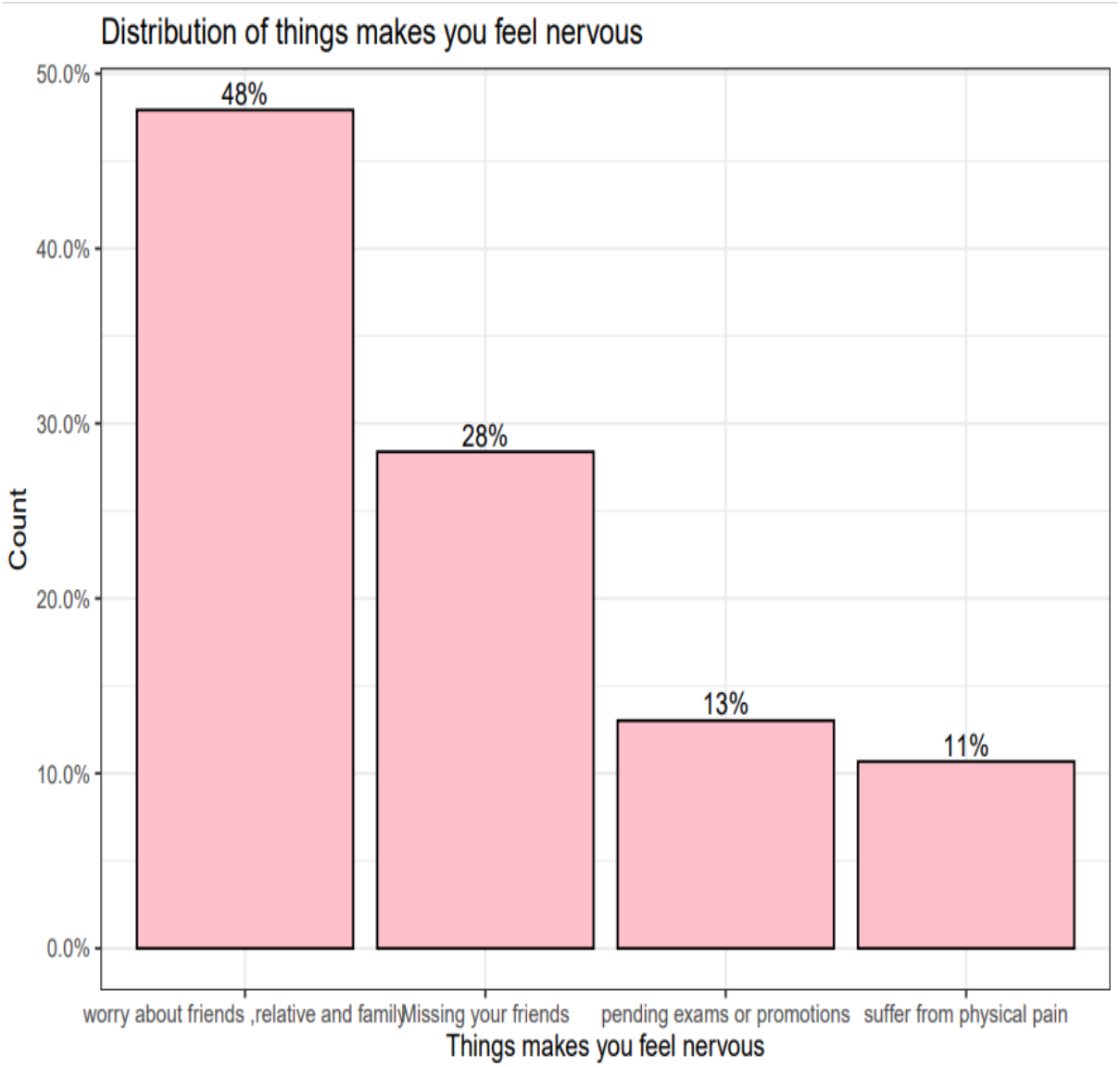
4] To check Gender wise Trouble During COVID-19 Pandemic By Using Pie Chart



Conclusion:

According to above graph we conclude that 35% males affected by COVID-19 pandemic & 65% females affected by COVID-19 pandemic i.e., mostly female have faced trouble during COVID-19 pandemic.

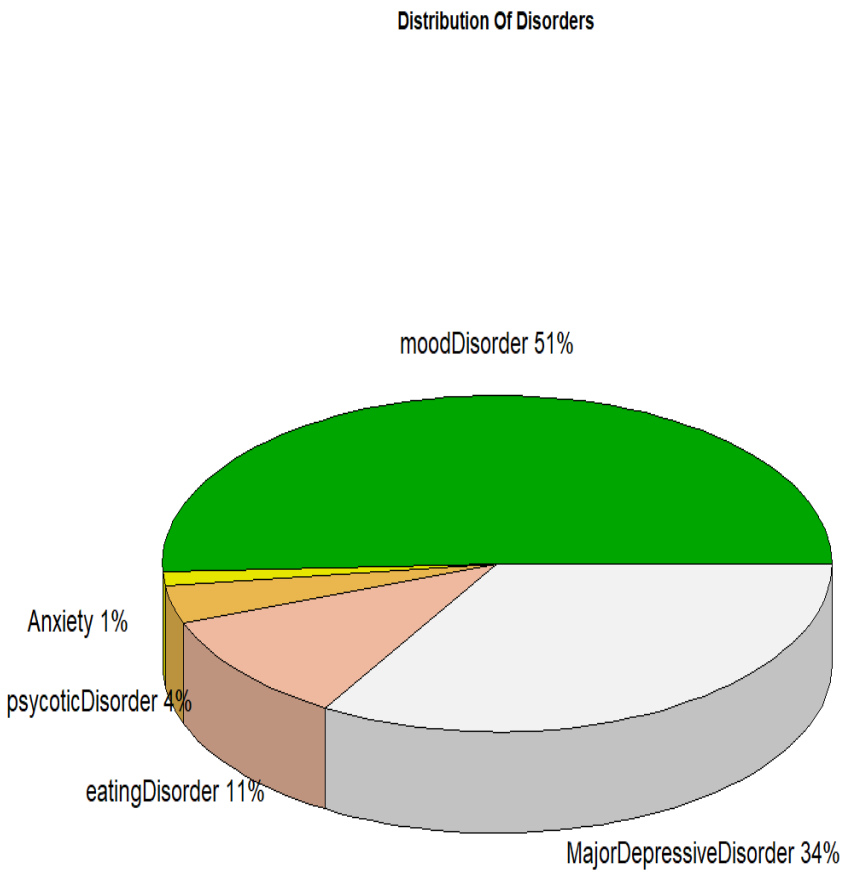
5] To check which Things Makes People Nervous By Using Simple Bar Diagram



Conclusion:

From above bar diagram we conclude that people feel nervous in which maximum people worry about their friends relative family are 48%, people who miss their friends are 28% and 13% people feel nervous for pending exams or promotion while minimum people i.e., 11% suffer from physical pain.

6] To check People suffer from which type of Disorders By Using Pie Chart



Conclusion:

In above pie chart we conclude that most of the people i.e., 51% people suffer from mood disorder, 34% people suffer from major depressive disorder, 11% people suffer from eating disorder and 4% people suffer from psychotic disorder while less people i.e., 1% people suffer from anxiety.

Statistical Analysis By Using Ms-Excel

1] chi-Square test for independence of COVID-19 pandemic and mental health of human being. (By using Ms-Excel)

Hypothesis: H0: The COVID-19 pandemic and mental health are independent.

H1: The COVID-19 pandemic and mental health are dependent.

Observed value table

Effect of COVID-19 / Under mental disorder	affected	unaffected	total
yes	77	82	159
no	46	179	225
total	123	261	384

Expected value table

Effect of COVID-19 / Under mental disorder	affected	unaffected	total
yes	50.9296875	108.0703125	159
no	72.0703125	152.9296875	225
total	123	261	384

Chi square table

Effect of COVID-19 / Under mental disorder	affected	unaffected	total
yes	13.34508864	6.289064759	19.63415339
no	9.430529302	4.44427243	13.87480173
total	22.77561794	10.73333719	**33.50895513**

Degrees of Freedom

m= (r-1) * (c-1)

m= 1

Critical Value = **3.8414 (By using CHISQ.INV function)**

P-value **= 7.09366E-09 (By using CHISQ.TEST function)**

Conclusion : Here the level of significance value α=0.05 is greater than P-value and Chi square tabulated is greater than the critical value, hence H0 is rejected at 5% level of significance. Hence, the COVID-19 pandemic and mental health are dependent.

2] To check relation between Occupation and Effect of COVID-19 on Mental Health By Using Kruskal Wallis H Test.

Hypothesis:

H0: There is no relation between Occupation and effect of COVID-19 on mental health or occupation and effect of COVID-19 on mental health are independent.

H1: There is relation between Occupation and Effect of COVID-19 on mental health occupation and effect of COVID-19 on mental health are not independent(dependent).

Observation Table:

Count of Effect of COVID-19	**Column Labels**		
Row Labels	**0**	**1**	**Grand Total**
3	11	47	58
1	13	17	30
2	27	35	62
4	2	5	7
0	70	157	227
Grand Total	**123**	**261**	**384**

Step 1: Determine the ranks.

Step 2: Determine Overall average rank.

r avg = 192.5

Step 3: Determine average of number in each category.

Determine average rank per category & quare the difference with the overall average rank and multiply by the cases in the category.

category	**ni**	**riavg**	**ni(riavg - ravg)^2**
0	123	191.1991	208.1300
1	261	195.2567	1983.4492
Total	384	386.4558	**2191.5793**

Step 4:

$\sum ni(riavg - ravg)^2$ = **2191.579315**

Step 5: For each rank substract the overall rank average and square the result.

Step 6: Sum up results of step 5.
$\sum\sum(ri-ravg)^2$ =**3705436.5**

Step 7: Determine H value Statistic.

Hadj =(N-1) $\frac{\sum(ni(\bar{r}i-\bar{r})\text{^}2}{\sum\sum(ri-\bar{r})\text{^}2}$

H = **0.226525236**

Step 8: Determine the degrees of freedom.

df (c-1)	1

Step 9: Determine chi square and p value.

p – Value = **0.63411237 (by using fun CHIDIST)**

critical value(tab) = **3.841458821(by using fun. CHIINV)**

Here, H(cal) < critical value then we accept Ho.

Hence, there is no relation between occupation and effect on mental Health i.e., occupation and effect on mental health are independent.

Conclusion :

Here the level of significance value α=0.05 is less than P-value and Critical value is greater than the p-value, hence Ho is accepted at 5% level of significance. Hence, there is no relation between occupation and effect on mental Health i.e., occupation and effect on mental health are independent.

Overall Conclusion:

Exploratory Data Analysis :

1] There is most of data i.e., 59 % in female and less i.e., 41% in male.

2] Maximum people i.e., 51% people addicted through mobile and minimum people i.e., 1% people addicted by alcohol and smoking.

3]There is 32% people face trouble during COVID-19 pandemic.

4] On comparing male and female data maximum female i.e., 65% female affected by COVID-19 pandemic with compare to male.

5] Maximum people i.e., 48% people feel nervous by worry about their friends, family and relatives.

6] On comparing disorders 51% people suffer from mood disorder and 28% people suffer from major depressive disorder and minimum i.e., 1% female suffer from anxiety.

Statistical Analysis :

1] The COVID-19 Pandemic and mental health are dependent.

2] There is no relation between occupation and effect on mental Health i.e., occupation and effect on mental health are independent.

QUESTIONNAIRE

1. **Gender**

   a) Male

   b) Female

2. **Age**

   a) 0-12 b) 13-18 c)19-59 d)60 & above

3. **Occupation**

   a) student b) farmer c) housewife
   d) employee or other

4. **Family**

   a) joint family b) nuclear family

5. **Are you away from your family?**

   a) yes b) no

6. **Do you suffer from insomnia?**

   a) yes b) no

7. **Do you have such feelings like fear, anger and sadness?**

   a) yes b) no

8. **Have the following changes occur in your behaviour?**

   a) risk taking b) refusing order
   c)Addiction d) failures to use tools

9. **Are you addicted?**

   a) yes b) no

10. **If you are addicted then what kind of addiction are you addicted to?**

    a) mobile b) smoking c) alcohol d) other

11. **Do you ever feel guilty or lonely?**

    a) yes b) no

12. **Which of the following did you fear or worry about in the COVID-19?**

    a) falling ill and dying fear of being infected mistaken of COVID-19.

    b) powerlessness, helplessness, random loneliness

    c) loss of pay, no job, dismissed from work

    d) avoiding to seek health facilities.

13. Which of the following makes you feel nervous?

a) missing your friends b) suffer from physical pain

c) pending exams or promotions d) worry about friends, relatives & family

14. Do you have any of the following disease?

a) Blood pressure b) thyroid c) heart problem d) other

If you have any of the following problem say yes or no.

Que		yes	no
15	Fit of terror or panic attack		
16	Any type of pain		
17	Nausea		
18	Headaches		
19	Horror dreams		
20	Repeated thoughts		
21	Fear of leaving the house		

22. Did you start above trouble during the COVID-19 era? That means from 6 months.

a) yes b) no

If you have any of the following problem say yes or no.

Que		yes	no
23	Hearing voices		
24	Hallucination		
25	Delusions		
26	Social withdrawal		
27	Abnormal reasoning		
28	Memory loss problem		

29. Were you suddenly sad and suddenly happy?

a) yes b) no

30. Do you get irritated without reason that means unwarranted resentment?

a) yes b) no

31. Do you suddenly feel nervous?

a) yes b) no

If you have any of the following problem say yes or no.

Que		yes	no
32	Reduction of food intake.		
33	Overeating		
34	Feeling of depression		
35	Concern of weight and self-image		
36	Self-starvation		

37. Do you feel of extreme sadness?

a) yes b) no

38. Do you feel of hopeless?

a) yes b) no

39. Has the above trouble started during the COVID-19 pandemic?

a) yes b) no

APPENDIX

Exploratory Data Analysis By Using R-Studio

1] To check how data distributed within Male and Female By Using Pie Chart : Pie Chart for Distribution of Male and Female

```
> installed.packages("MASS")
> library("MASS")
> rm(list=ls())
> data=read.csv("MentalHealth.csv")
> View(data)
> gender=table(data$Q1);gender
> ###Pie Chart with Percentage
> gender=c(228,156)
> lbls=c("female","male")
> #pct as %
> pct=round(gender/sum(gender)*100)
> lbls=paste(lbls,pct) #ad percent to lables
> lbls=paste(lbls,"%",sep="") #ad % to lables
> #3D Exploded Pie Chart
> install.packages("plotrix")
> library("plotrix")
> gender=c(228,156)
> lbls=c("female","male")
> pct=round(gender/sum(gender)*100)
> lbls=paste(lbls,pct)
> lbls=paste(lbls,"%",sep="")
> pie3D(gender,labels=lbls,explode = 0.2,main="Pie Chart of Gender")
```

2] To check Addiction of People By Using Simple Bar Diagram:

```
> rm(list=ls())
> data=read.csv("Addiction.csv")
> View(data)
> library(ggplot2)
> library(breakDown)
> ggplot(data,mapping=aes(x=Types.Of.Addiction,fill="genre"))+
  +   geom_bar()
> library(dplyr)
> per_data = data %>%
  +   count(Types.Of.Addiction) %>%
  +   mutate(per = n / sum(n),
               +          per_label = paste0(round(per*100),"%"))
> per_data
> ggplot(per_data, aes(x = reorder(Types.Of.Addiction, -per), y = per))+
  +   geom_bar(stat = "Identity" , fill = "Pink", color = "black")+
  +   geom_text(aes(label = per_label), vjust = -0.25)+
  +   labs(x = "Types Of Addiction",
          +  y="Count",
          +  title = "Distribution of Addicted People")+
  +   scale_y_continuous(labels = scales::percent)+
  +   theme_bw()
```

3] To check how many people Face Trouble During COVID-19 Pandemic By Using Pie Chart

```
> rm(list=ls())
> my_data=read.csv("MentalHealth.csv")
> View(my_data)
> gender=head(my_data$Q1)
> ## Pie chart of total affected People
> Affected=table(my_data$Q1[my_data$Q39=="0"])
> Unaffected=table(my_data$Q1[my_data$Q39=="1"])
> AffectedPeople=sum(Affected)
> UnaffectedPeople=sum(Unaffected)
> TroubleDuringCovid=c(123,261)
> lbls=c("AffectedPeople","UnaffectedPeople")
> #pct as%
> pct=round(TroubleDuringCovid/sum(TroubleDuringCovid)*100)
> lbls=paste(lbls,pct)
> lbls=paste(lbls,"%",sep="")
> library("plotrix")
>pie3D(TroubleDuringCovid,labels=lbls,explode=0.1,main="Trouble During Covid 19 Pandemic",col=terrain.colors(2))
```

4] To check Gender wise Trouble During COVID-19 Pandemic By Using Pie Chart

```
> rm(list=ls())
> my_data=read.csv("MentalHealth.csv")
> View(my_data)
> data=data.frame(gender,occupation)
> print(data)
> library(readxl)
> MentalHealth <- read_excel("D:/Statistics CaseStudy/MentalHealth.xlsx")
> View(MentalHealth)
> rm(list=ls())
> my_data=read.csv("MentalHealth.csv")
> View(my_data)
> table(my_data$Q1)
> ### Pie chart of Genderwise trouble during covid 19 pandemic
> female=table(my_data$Q39[my_data$Q1=="0"])
> male=table(my_data$Q39[my_data$Q1=="1"])
> affected=c(80,43)
> lbls=c("Affected female","Affected male")
> #pct as%
> pct=round(affected/sum(affected)*100)
> lbls=paste(lbls,pct)
> lbls=paste(lbls,"%",sep="")
>pie(affected,lbls,main="Genderwise trouble during covid 19 pandemic",col=c("red","yellow"))
```

5] To check which Things Makes People Nervous By Using Simple Bar Diagram

```
> rm(list=ls())
> data=read.csv("table_data.csv")
> View(data)
> library(ggplot2)
> library(breakDown)
> ggplot(data,mapping=aes(x=FeelNervous,fill="genre"))+
+   geom_bar()
> library(dplyr)
> count_data=data %>%
+   count(FeelNervous)
> count_data
> ggplot(count_data, aes(x = reorder(FeelNervous, n), y = n)) +
+   geom_bar(stat = "Identity", fill = "pink",color = "black") +
+   geom_text(aes(label = n), vjust = -0.25) +
+   labs(x = "Things makes you feel nervous",
+        y = "Count",
+        title = "Things makes you feel nervous")
> per_data = data %>%
+   count(FeelNervous) %>%
+   mutate(per = n / sum(n),
+          per_label = paste0(round(per*100),"%"))
> per_data
> ggplot(per_data, aes(x = reorder(FeelNervous, -per), y = per))+
+   geom_bar(stat = "Identity" , fill = "Pink", color = "black")+
+   geom_text(aes(label = per_label), vjust = -0.25)+
+   labs(x = "Things makes you feel nervous",
```

```
+       y="Count",
+       title = "Distribution of things makes you feel nervous")+
+   scale_y_continuous(labels = scales::percent)+
+   theme_bw()
```

6] To check People suffer from which type of Disorders By Using Pie Chart

```
> library("MASS")
> rm(list=ls())
> data=read.csv("Disorders.csv")
> View(data)
> #1
>moodDisorder=table(data$MOOD.DISORDER[data$MOOD.DISORDER=="YES"])
> moodDisorder
>Anxiety=table(data$ANXIETY.DISORDER[data$ANXIETY.DISORDER=="YES"])
> Anxiety
>
psycoticDisorder=table(data$PSYCHOTIC.DISORDER[data$PSYCHOTIC.DISORDER=="YES"])
> psycoticDisorder
>eatingDisorder=table(data$EATING.DISORDER[data$EATING.DISORDER=="YES"])
> eatingDisorder
>MajorDepressiveDisorder=table(data$MAJOR.DEPRESSIVE.DISORDER[data$MAJOR.DEPRESSIVE.DISORDER=="YES"])
> MajorDepressiveDisorder
> Disorders=c(142,4,10,30,94)
> ### 3D Exploided Pie Chart
>
> library("plotrix")
> Disorders=c(142,4,10,30,94)
> library("MASS")
> rm(list=ls())
```

```
> data=read.csv("Disorders.csv")

> View(data)

> #1

>moodDisorder=table(data$MOOD.DISORDER[data$MOOD.DISORDER=="
YES"])

>moodDisorder
Anxiety=table(data$ANXIETY.DISORDER[data$ANXIETY.DISORDER=="
YES"])

> Anxiety

>psycoticDisorder=table(data$PSYCHOTIC.DISORDER[data$PSYCHOTIC.
DISORDER=="YES"])

> psycoticDisorder

 >
eatingDisorder=table(data$EATING.DISORDER[data$EATING.DISORDER=
="YES"])

> eatingDisorder

>MajorDepressiveDisorder=table(data$MAJOR.DEPRESSIVE.DISORDER[da
ta$MAJOR.DEPRESSIVE.DISORDER=="YES"])

> MajorDepressiveDisorder

> ### 3D Exploided Pie Chart

> library("plotrix")

> Disorders=c(142,4,10,30,94)

> Disorders

>lbls=c("moodDisorder","Anxiety","psycoticDisorder","eatingDisorder","Majo
rDepressiveDisorder")

> pct=round(Disorders/sum(Disorders)*100) #%

> lbls=paste(lbls,pct) # % & lbls

> lbls=paste(lbls,"%",sep="")

>pie3D(Disorders,labels=lbls,explode=0.0,main="DistributionOfDisorders",col
=terrain.colors(5))
```

Reference :

1] For Sample Size Determination :
https://www.statisticshowto.com/probability-and-statistics/find-sample-size/

2] Cronbach's-Alpha for Reliability :
https://www.real-statistics.com/reliability/internal-consistancy-reliability/cronbach's-alpha/

3] For Chi Square Test :

Basic Statistics by B.L. Agarwal

4] For Kruskal Wallis H test :
https://peterstatistics.com

5] https://spoken-tutorial.org/ (R-Studio)