

Task 2: Statistics Assignment

Statistically prove the impact of Covid-19 on Healthcare industry

Project Name: Prevalence of anxiety and depressive symptoms among 1124 healthcare workers during the coronavirus disease 2019 pandemic across XYZ Hospital

20 Oct 2020



Group Members:

1. Vineet Menon
2. Sandeep Vaishya
3. Abhijeet Suman
4. Bobby Kawade
5. Suman Lata
6. Laxmi Goswami

Project Abstract

Background

This project aims to do statistical study on the healthcare workers dataset of XYZ hospital for understanding the impact of coronavirus disease 2019 (COVID-19) pandemic in XYZ country. Statistical evaluation is done to assess the prevalence of anxiety and depressive symptoms among the healthcare workers (HCWs).

Method

The dataset comprises of responses to survey questionnaire that was completed by 1124 HCWs during the COVID-19 pandemic. Demographic data, questions on COVID-19 and scores of the Hospital Anxiety and Depression Scale are analysed using the chi-square test.

Results

The study consists of 1124 HCWs, including 749 doctors, 207 nurses, 135 paramedics, 23 administrators and ten supporting staff members. The prevalence of anxiety and depressive symptoms were reported as 37.2% and 31.4%, respectively.

Conclusion

Approximately one-third of the HCWs reported anxiety and depressive symptoms. The risk factors for anxiety symptoms were female gender, younger age and job profile (nurse) and for depressive symptoms were younger age and working at a primary care hospital. Providing a safer and supportive work environment for HCWs to face epidemics/pandemics should be identified and strategized.

Introduction

The world is presently scuffling with the coronavirus disease 2019 (COVID-19) pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS CoV-2). Cases and death are progressively increasing as the days are passing by. With the attack rate of 1.4–4.0 and no treatment or vaccine available in the near future, the COVID-19 pandemic has caused a substantial degree of panic, worry, fear and apprehension.

Most of the companies have encouraged their employees to “work from home”; however, no such provisions are offered to healthcare workers (HCWs). As a result, HCWs are encountering occupational hazards owing to high risk of exposure to coronavirus infection. It requires a lot of courage to work in potentially infectious environments that can impact the psychological health of HCWs. Among physicians, the primary risk factors of work-related conditions, lifestyles and physical health account for their anxiety and depressive symptoms.

Studies on mental health outcomes among HCWs involved in the SARS crisis showed the importance of specialised preparedness, working in “high-risk” environment, job-related stress and being quarantined as a staff member, all of which appeared to have a negative psychological impact. Almost everyone experiences health-related anxiety to some degree during epidemics, and high levels of health anxiety can be detrimental.

This is a study dealing with the emotional health of HCWs as XYZ country faces other phases of the COVID-19 pandemic. The study aims to investigate the prevalence of anxiety and depressive symptoms among HCWs during the COVID-19 pandemic across XYZ country.

Method

Sample

A self-administered questionnaire link was sent to all personnel to their WhatsApp accounts or email, who were involved in health care and were known to the investigators or their contacts (quota sampling). They were followed up for responses. It was a multisite study. Data collection means by the hospital was Google Forms. One thousand one hundred fifty-two responses were received. Twenty-eight responses were rejected because of duplicity: 8 filled in the questionnaire twice and submitted the same and 20 responses were incomplete, hence were not amenable to analysis.

Data Set used for Analysis



Impact_of_COVID19_o
n_healthcare.xlsx

Instruments of measurement

Demographic details

The demographic details of the respondents included age, gender, education level, job profile, duration of service and working place.

Questions pertaining to the COVID-19 pandemic

These questions were pertaining to feeling concerned regarding hospital-acquired infection, receiving adequate guidance on COVID-19, dealing with patients with suspected/confirmed COVID-19, the sufficiency of existing healthcare facilities to cope with COVID-19 and information on several media platforms regarding COVID-19.

Statistical analysis

The data analysis is done using Python code. The chi-square test was used to analyse the descriptive statistics. The chi-square test was used to compare characteristics between the group with and without psychological abnormality. A p-value of less than 0.05 was considered to be statistically significant.

Result

Of 1450 Google Forms sent, responses were received from 1152 HCWs, making the response rate 79.44%. Of these, 28 responses were discarded owing to duplicity or incomplete responses. The final sample for the study consisted of 1124 respondents, comprising of 749 (66.6%) doctors, 206 (18.3%) nurses, 135 (12.0%) paramedics, 24 (2.1%) administrators and 10 (0.9%) supporting staff members. The respondents were divided into two groups: non-anxiety (total score <8) and anxiety group (total score ≥8) (Table 1).

Table 1 - Comparison of non-anxiety and anxiety symptoms with demographic data using the chi-square test.

	Non-Anxiety 706 (63%)	Anxiety 418 (37%)	
Do you feel concerned regarding hospital-acquired infection?			
	Non-Anxiety Group	Anxiety Group	Total
Yes	345	328	673
Maybe	181	61	242
No	180	29	209
Total	706	418	1124
Did you receive adequate guidance regarding COVID-19?			
	Non-Anxiety Group	Anxiety Group	Total
Yes	419	195	614
Maybe	105	66	171
No	182	157	339
Total	706	418	1124
Are you dealing with suspected/confirmed COVID-19 patients?			
	Non-Anxiety Group	Anxiety Group	Total
Yes	396	275	671
Maybe	183	76	259
No	127	67	194
Total	706	418	1124
Have you been following information regarding COVID-19 on several media platforms?			
	Non-Anxiety Group	Anxiety Group	Total
Yes	635	393	1028
Maybe	32	7	39
No	39	18	57
Total	706	418	1124

Python Code Snippet

Question 1 : Do you feel concerned regarding hospital-acquired infection?

OBSERVED VALUE

```
In [4]: 1 Observed_Value=health_data.groupby(['Do you feel concerned regarding hospital-acquired infection?', "GROUP"]).COUNT.  
2 Observed_Value
```

Out[4]:

	GROUP	Anxiety	Non Anxiety
Do you feel concerned regarding hospital-acquired infection?			
	Maybe	61	181
	No	29	180
	Yes	328	345

Expected Value

```
In [5]: 1 EXPECTED_VALUE=chi2_contingency(Observed_Value)[3]  
2 EXPECTED_VALUE  
3  
4 pd.DataFrame(data=EXPECTED_VALUE[:,:], index=["Maybe", "No", "Yes"],  
5 columns=["Anxiety", "Non-Anxiety"]).round(2)
```

Out[5]:

	Anxiety	Non-Anxiety
Maybe	90.00	152.00
No	77.72	131.28
Yes	250.28	422.72

```

1 chi,pval,dof,exp=chi2_contingency(Observed_Value)
2 significance=0.05
3 p=1-significance
4 critical_value=chi2.ppf(p,dof)
5 critical_value.round(2)
6 print("Degree of freedom :",dof)
7 print("Chi-Square :",chi).round(2))
8 print("Critical_Value :",critical_value.round(2))
9 print("Pvalue :%.2f ,significance :%.2f\n"%(pval),significance))
10
11 if chi>=critical_value:
12     print("Critical Value Approach :")
13     print("we reject H0 at 5% L.O.S,There is a relationship between 2 categorical variables")
14 else:
15     print("we Accept H0 at 5% L.O.S,There is no relationship between 2 categorical variables")
16
17 if pval <= significance:
18     print("P-value Value Approach :")
19     print("we reject H0 at 5% L.O.S and we accept H1," "There is a relationship between 2 categorical variables")
20 else:
21     print("we accept H0 at 5% L.O.S and we reject H1," "There is no relationship between 2 categorical variables")

```

Degree of freedom : 2
 Chi-Square : 101.93
 Critical_Value : 5.99
 Pvalue :0.00 ,significance :0.05

Critical Value Approach :
 we reject H0 at 5% L.O.S,There is a relationship between 2 categorical variables
 P-value Value Approach :
 we reject H0 at 5% L.O.S and we accept H1,There is a relationship between 2 categorical variables

Results

```

In [27]: 1 TOTAL=health_data['COUNT'].sum()
2 print("TOTAL :",TOTAL)
3 percent_group = health_data.groupby(['GROUP', "COUNT"]).COUNT.sum().unstack(level = 0)
4 percent_group
5
6 percent_find_total = ((percent_group/TOTAL).round(3))*100
7 percent_find_total

```

TOTAL : 1124

Out[27]:

GROUP	Anxiety	Non Anxiety
COUNT		
1	37.2	62.8

The prevalence of anxiety and non-anxiety symptoms were reported as 37.2% and 62.8%, respectively.

Table 2 - Comparison of non-depression and depression symptoms with demographic data using the chi-square test.

	Non-Depression 770 (69%)	Depression 354 (31%)	
Do you feel concerned regarding hospital-acquired infection?			
	Non-Depression	Depression	Total
Yes	431	242	673
Maybe	169	73	242
No	170	39	209
Total	770	354	1124
Did you receive adequate guidance regarding COVID-19?			
	Non-Depression	Depression	Total
Yes	447	167	614
Maybe	108	63	171
No	215	124	339
Total	770	354	1124
Are you dealing with suspected/confirmed COVID-19 patients?			
	Non-Depression	Depression	Total
Yes	458	213	671
Maybe	182	77	259
No	130	64	194
Total	770	354	1124
Have you been following information regarding COVID-19 on several media platforms?			
	Non-Anxiety Group	Anxiety Group	Total
Yes	699	329	1028
Maybe	29	10	39
No	42	15	57
Total	770	354	1124

Python Code Snippet

Question 1: Do you feel concerned regarding hospital-acquired infection?

OBSERVED VALUE

```
In [3]: 1 Observed_Value=health_data.groupby(['Do you feel concerned regarding hospital-acquired infection?', "GROUP"]).COUNT()
        2 Observed_Value
```

```
Out[3]:
```

	GROUP	Depression	Non-Depression
Do you feel concerned regarding hospital-acquired infection?			
	Maybe	73	169
	No	39	170
	Yes	242	431

Expected Value

```
In [4]: 1 EXPECTED_VALUE=chi2_contingency(Observed_Value)[3]
        2 EXPECTED_VALUE
        3
        4 pd.DataFrame(data=EXPECTED_VALUE[:, :], index=["Maybe", "No", "Yes"],
        5               columns=["Depression", "Non-Depression"]).round(2)
```

```
Out[4]:
```

	Depression	Non-Depression
Maybe	76.22	165.78
No	65.82	143.18
Yes	211.96	461.04


```

1 chi,pval,dof,exp=chi2_contingency(Observed_Value)
2 significance=0.05
3 p=1-significance
4 critical_value=chi2.ppf(p,dof)
5 critical_value.round(2)
6 print("Degree of freedom :",dof)
7 print("Chi-Square :", (chi).round(2))
8 print("Critical_Value :",critical_value.round(2))
9 print("Pvalue :%.2f ,significance :%.2f\n" %((pval),significance))
10
11 if chi>=critical_value:
12     print("Critical Value Approach :")
13     print("we reject H0 at 5% L.O.S,There is a relationship between 2 categorical variables")
14 else:
15     print("we Accept H0 at 5% L.O.S,There is no relationship between 2 categorical variables")
16
17 if pval <= significance:
18     print("P-value Value Approach :")
19     print("we reject H0 at 5% L.O.S and we accept H1," "There is a relationship between 2 categorical variables")
20 else:
21     print("we accept H0 at 5% L.O.S and we reject H1," "There is no relationship between 2 categorical variables")

```

Degree of freedom : 2
 Chi-Square : 22.37
 Critical_Value : 5.99
 Pvalue :0.00 ,significance :0.05

Critical Value Approach :
 we reject H0 at 5% L.O.S,There is a relationship between 2 categorical variables
 P-value Value Approach :
 we reject H0 at 5% L.O.S and we accept H1,There is a relationship between 2 categorical variables

Results

```

In [30]: 1 TOTAL=health_data['COUNT'].sum()
2 print("TOTAL :",TOTAL)
3 percent_group = health_data.groupby(['GROUP', "COUNT"]).COUNT.sum().unstack(level = 0)
4 percent_group
5
6 percent_find_total = ((percent_group/TOTAL).round(3))*100
7 percent_find_total

```

TOTAL : 1124

```

Out[30]:
GROUP  Depression  Non-Depression
COUNT
1      31.5        68.5

```

The prevalence of depressive and non-depressive symptoms were reported as 31.5% and 68.5%, respectively.

***Refer Python Code placed in the folder Task 2**

- As per the analysis, 418 (37.2%) respondents were having anxiety symptoms and 354 (31.5%) respondents were having depression symptoms.
- The results of the chi-square test showed that more percentage of individuals in the anxiety group were concerned regarding hospital-acquired infection (48.9% vs 78.5%), were dealing with patients with suspected/confirmed COVID-19 (56.1% vs 68.5%), felt existing healthcare facilities have insufficient medical arrangements to cope with COVID-19 (43.2% vs 58.9%). More percentage of individuals in the non-anxiety group received adequate guidance on COVID-19 (59.3% vs 46.7%).

Conclusion

The present study denotes approximately one-third of HCWs have symptoms of anxiety and depression. Higher levels of anxiety and depressive symptoms were found in HCWs with concern regarding acquiring COVID-19 infection, thinking healthcare facilities are inadequate to cope with COVID-19 or thinking it is difficult to manage the spread of COVID-19. Healthcare facilities should provide a structured and safer work environment to HCWs to cope with future bio disasters. It is required to identify and strategize required supporting for the emotional health of HCWs in the face of epidemics or pandemics.

References

1. Coronavirus Disease (COVID-19) - Events as They Happen [Internet]. [cited 2020 Jul 30]. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen>.
2. Coronavirus Disease (COVID-19) Situation Reports [Internet]. World Health Organization; [cited 2020 Jul 30]. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>.
3. Statement on the Meeting of the International Health Regulations (2005) Emergency Committee Regarding the Outbreak of Novel Coronavirus 2019 (n-CoV) on 23 January 2020 [Internet]. World Health Organization; [cited 2020 Jul 30]. Available from: [https://www.who.int/news-room/detail/23-01-2020-statement-on-the-meeting-of-the-international-health-regulations-\(2005\)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-\(2019-ncov\)](https://www.who.int/news-room/detail/23-01-2020-statement-on-the-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)).
4. Circulars for Covid-19: Ministry of Home Affairs [Internet]. Ministry of Home Affairs | GoI. [cited 2020 Jul 30]. Available from: <https://www.mha.gov.in/notifications/circulars-covid-19>.