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Logistic regression analysis for studying the impact of home quarantine on psychological health during COVID-19 in Saudi Arabia

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Abstract During the Coronavirus disease (COVID-19) period, the world witnessed a complete closure of all aspects of social life, and people must go for home quarantine to limit the spread of Coronavirus disease. This study aims to use multiple logistic regression model (MLR) to identify the impact of home quarantine on psychological stability of individuals and its relationship to various factors. Maximum likelihood is used to estimate the parameters of MLR. Hosmer-Lemeshow method and Wald statistic are calculated to assess the significance of MLR. Cross sectional study was carried out and MLR was fitted to the collected data. This study applied to 846 residents of Makkah region during the COVID-19 period. High percentage of respondents felt psychological stability during the period of home quarantine. Logistic regression model showed that education level and psychological disorders during home quarantine were the significant risk factors for psychological stability during COVID-19. In addition, the positive impact of the home quarantine that people became more attention to their health, more interested to self-development and the families become close to each other. On the other hand, people on private employee or unemployed had psychological disorders more than others due to home quarantine and decrease their income.

1. Introduction

Various statistical methods had been used recently to study COVID-19 pandemic. One of these methods is machine learning techniques. Artificial neural network (ANN) was used to analyse the temporal dynamics of the COVID-19 spread [1]. In addition, machine learning was utilized to study the impact of COVID-19 pandemic on psychological health for university students [2]. The transmission of COVID-19 disease was analysed by using machine learning techniques and other methods.
Furthermore, nonlinear neural network time series model was adapted to forecast COVID-19 cases [4]. Different statistical models were used to study the COVID-19. In instance, Ehab M. Almetwally and others studied COVID-19 in different countries using Marshall-Okin inverse Toppe–Leone distribution which depends on two parameters [5]. Furthermore, new discrete distribution with three parameters called discrete extended odd Weibull exponential (DEOWE) distribution was introduced to model the mortality numbers in Latvia and Saudi Arabia due to the COVID-19 pandemic [6]. In addition, principal component analysis was used to study the number of morbidity and mortality rates due to COVID-19 pandemic in vary countries [7]. A simple exponential growth model was adapted to estimate the number of COVID-19 and the basic reproduction number at the early stage of pandemic in Nigeria [8]. Also, exponential number of COVID-19 were considered with several independent variables to predict the mortality due to COVID-19 in China and Europe [9].

Logistic regression model was used recently in different research. Logistic regression model and artificial neural network were considered with several independent variables to predict mortality due to COVID-19 pandemic in 32 European countries [10]. Logistic regression analysis was utilized to identify COVID-19 lockdown measures related risk factors in various studies [11,12,13,14]. Binary logistic regression was used to investigate customer impression towards online delivery [15]. Multiple logistic regression model was used to evaluate the association between anxiety and various factors during COVID-19 [16,17,18,19]. Models’ coefficients were estimated by utilizing different methods such as maximum likelihood method, Bayesian method and least square method [9,20,21,22,23].

Coronavirus disease 2019 (COVID-19) appeared in Wuhan, China in December 2019 [24]. It was announced as a public health emergency in China on January 30th, 2020, and a global pandemic by the World Health Organization (WHO) on March 11th, 2020 [25]. By June 2021, 15 months after COVID-19 was declared a global pandemic, more than 482,000 confirmed cases and 7,760 deaths were reported in Saudi Arabia [26]. In the absence of effective treatments and vaccines during the early stages of the COVID-19 pandemic, infection prevention and control health interventions were implemented in Saudi Arabia to prevent transmission of the COVID-19. Some of these interventions included closure of some social life aspects such as schools and universities and travel bans, impose social distances, required wearing masks and gloves and home quarantines. Moreover, curfew and home confinement had showed differences in controlling the spread of the COVID-19 around Saudi Arabia [27].

However, these interventions alongside with fear and anxiety of the pandemic have significant psychological health implications [28,29]. Some recent studies discussed the psychological impacts of COVID-19 in China, India, and the UK. They reported moderate to severe stress, anxiety, depression and worries from becoming infected with COVID-19 and fear of dying. These psychological disorders associated with social isolation, lockdowns, changes in daily habits and home quarantine [30,31,32]. The psychological disorders of COVID-19 have been also reported in Saudi Arabia. Different stages of psychological disorders were reported among 40% of Saudi population due to COVID-19 [33]. In addition, moderate to severe psychological effects were observed among 23.6% of Saudi residents [34]. Several factors impacted the psychosocial health in Saudi Arabia population during the COVID-19 have been discussed. 37% of contributors had anxiety where nursing students’ psychosocial health associated with fear from disease and closure to someone infected with COVID-19 [35]. Also, healthcare providers in Saudi Arabia who are directly dealing with patients who infected with COVID-19, were at high risk of severe depression and anxiety [36]. Furthermore, it was found that people whose colleagues or families were infected with the COVID-19 were more likely to observe severe symptoms of anxiety or depression [37]. Moreover, 51% of Saudi population had economic effects due to lockdown and curfew during COVID-19 [38].

On the other hand, some positive aspects were observed during home confinement. A study in Saudi Arabia was assessed lifestyle changes during home confinement. Interestingly, there is no weight increased during home quarantines at the COVID-19 pandemic [39]. Moreover, designing educational interventions for children and teenagers was recommended by Moustafa and others [40] to protect them from negative aspects such as low physical activity, and social and psychological disorders during home confinement.

The motivation of this study is to investigate the impact of home quarantine during COVID-19 pandemic on psychological stability for people live in Makkah region in Saudi Arabia - the most crowded region in Saudi Arabia- which have not discussed before, by using multiple logistic regression model. Moreover, the association between psychological stability and educational levels, current job and other factors is identified. Finally, the advantages and disadvantages of home quarantine during COVID-19 pandemic are investigated using some statistical methods.

2. Statistical methods

2.1. Logistic regression model

Logistic regression model is one of the generalized linear models (GLM). It is a model for binary variable where the response records either success or failure for a given event. The logistic regression model is given by [41]:

\[
 p_i = f(y|x) = \frac{1}{1 + \exp\left(-\left(b_0 + b_1 x_i\right)\right)} \tag{1}
\]

where \( p_i \) is the probability of success and \( P(y_i = 1) = p_i \) and \( P(y_i = 0) = q_i = 1 - p_i, 0 \leq p_i \leq 1 \).

Also, \( b_0 \) and \( b_1 \) are the parameters of the model, \( x_i \) is an independent variable, \( \exp \) is the mathematical constant called Euler’s number which approximately equal to 2.78.

Logistic regression can be extended to combine more than one independent variable, which can be continuous or categorical variables. The multiple logistic regression model can be then written as:

\[
 p_i = \frac{1}{1 + \exp\left(-z_i\right)} = \frac{\exp\left(z_i\right)}{1 + \exp\left(z_i\right)} \tag{2}
\]

where, \( z_i = b_0 + b_1 x_1 + b_2 x_2 + \cdots + b_n x_n \) and \( \frac{\exp\left(z_i\right)}{1 + \exp\left(z_i\right)} = \exp\left(z_i\right) \).where, \( \frac{\exp\left(z_i\right)}{1 + \exp\left(z_i\right)} \) is the odd ratio defined as the probability of occurrence the event divided by the probability of not occurrence the event. The odd ratio is a solution
of the upper and lower limits for the probability where, \( 0 < \text{odd ratio} < \infty \).

\[
p_i = \frac{\text{odds}}{1 + \text{odds}} = \frac{\exp\{\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n\}}{1 + \exp\{\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n\}}
\] (3)

\[
\logit = \ln (\text{odds}) = \ln \left( \frac{p_i}{1 - p_i} \right) = z_i
\] (4)

\[
\logit = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n, -\infty < \logit < \infty
\] (5)

Therefore, \( \logit \) is a linear function in independent variables \( x_j, 1 \leq j \leq n \) [42].

2.2. Maximum likelihood estimation

The maximum likelihood (ML) is considered the most widely method used to estimate the parameters in linear regression models. Maximum likelihood estimation is used to estimate the parameters of the logistic regression models. The maximum likelihood method selects the values of parameters of the model that maximize the likelihood function.

The likelihood function of the proposed model is given by:

\[
L(\beta, y | x) = p_i^y (1 - p_i)^{1-y}
\] (6)

Therefore, the log-likelihood function is obtained as:

\[
l(\beta, y | x) = \ln L(\beta, y | x) = \sum_{y=1} \ln p_i + \sum_{y=0} \ln (1 - p_i)
\] (7)

The MLE is the value of parameter \( \beta \) that maximizes the log-likelihood function (7) which is given by solving the following equation using the Newton-Raphson technique [42]:

\[
\frac{\partial l(\beta_j | x)}{\partial \beta_j} = 0
\] (8)

2.3. Evaluation of the fitted model

Several tests are involved to assess the usefulness, convenience, and sufficiency of the fitted model. The importance of each of independent variables is evaluated by testing the significance of the coefficients. Then, the goodness of fit of the model is investigated.

2.3.1. Statistical tests for the parameters

2.3.1.1. Wald statistic. The Wald statistic is used to test the significance of individual coefficients in the logistic regression model. The Wald test is given as follows [42]:

\[
\text{Waldstatistic} = \left( \frac{b}{se(b)} \right)^2
\] (9)

where \( b \) is the estimated parameter of \( \beta \) for the independent variable, \( se \) is the standard error of \( b \). The null hypothesis \( H_0 \): the effect of logit parameter is equal to 0 is tested against the alternative hypothesis \( H_1 \): the effect of logit parameter is not equal to 0.

2.3.1.2. Likelihood ratio test. The likelihood ratio test for a particular parameter compares the likelihood function (6) when the parameter is zero \( (L_0) \) with the likelihood function \( (L_1) \) when the parameter is estimated by MLE. The test statistic is obtained as follows:

\[
-2 \times \ln(\text{likelihood ratio}) = -2 \times \ln \left( \frac{L_0}{L_1} \right) = -2 \times \left( \ln(L_0) - \ln(L_1) \right)
\] (10)

Likelihood ratio statistic follows Chi-square \( \chi^2 \) distribution with one degree of freedom [42].

2.3.2. Goodness of fit of the model:

The goodness of fit of a statistical model describes how well the model fits the observed data and describes the dependent variable. Evaluating the goodness of fit involves inspecting how close predicted values are to the observed values.

2.3.2.1. Hosmer–Lemeshow statistic. The Hosmer–Lemeshow statistic is used to assess the goodness of fit of logistic regression model and allows for any number of independent variables; either quantitative or qualitative. It determines whether the differences between observed and expected proportions are significant. The Hosmer–Lemeshow test is like a \( \chi^2 \) goodness of fit test but it has the advantage of dividing the observations into various groups and approximately equal size, and therefore there are less likely to have groups with very low frequency of observed and expected values. The observations are grouped into deciles based on the expected probabilities. The Hosmer–Lemeshow statistic follows \( \chi^2 \) distribution with degree of freedom \( D-2 \) and it is given by the following equation [41]:

\[
\chi^2 = \sum_{d=1}^{D} \frac{(O_{id} - E_{id})^2}{N_d \tau_d (1 - \tau_d)}
\] (11)

where, \( D \) is the number of groups, \( O_{id} \) is the number of observed \( Y = 1 \) events, \( E_{id} \) is the number of expected \( Y = 1 \) events, \( N_d \) is the total number of observations, and \( \tau_d \) is the estimated risk for the \( d^{th} \) groups.

3. Case study

The impact of home quarantine- which was compulsory in Saudi Arabia from March 23 to June 21, 2020- on mental health during COVID-19 pandemic and its positive and negative aspects are studied. A cross-sectional study including a survey was conducted among people in three cities: Taif, Makkah and Jeddah and their corresponding villages in March- April 2021. Data were gathered using google forms. Survey was distributed randomly to the population of the study by several social media such as WhatsApp, Telegram and Emails. The data were collected in two months, March, and April 2021. The data were revised in preparation for analysis and the Statistical Package for Social Science (SPSS) was utilized to investigate and analyse the data. The sample size calculation for the minimum responses was done prior to the study conducted, where the minimum sample size is needed 784 at the 95% confidence level and 3.5 margin of error (confidence interval). The survey includes various variables and Table 1 explains these variables.

To identify the factors that impact the psychological stability during COVID-19 (feeling well most of the time during home quarantine), multiple logistic regression model is obtained as:

\[
\logit = \ln \left( \frac{y_i}{1 - y_i} \right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_{13} x_{13}
\] (12)
where $y_i$ and $x_j, 1 \leq j \leq 13$ are explained in Table 1. Maximum likelihood method is used to estimate the parameters $\beta_j$ of the model and Wald statistic is used to test the significance of the coefficients. The goodness of fit of the model is evaluated using Hosmer-Lemeshow statistic.

Furthermore, opinions of individuals towards pros and cons of home quarantine during COVID-19 pandemic are evaluated. The survey was divided into five main sections (statements) including 24 questions with five-dimensional Likert scale which was utilized for scoring as follow: 5. Strongly Agree, 4. Agree, 3. Not Sure, 2. Disagree and 1. Strongly Disagree. These questions are about impacting of home quarantine during COVID-19 pandemic on the psychological health, self-development, spiritualistic aspects, general health aspects and social aspects. Inference statistics are investigated to look for statistically significant results from the survey.

4. Analysis of the data

The data was analysed using SPSS and logistic regression model was fitted to the data.

4.1. Descriptive analysis

The total of respondents to this study was 846 (21% male, 79% female) from three cities and related villages in Makkah region. 67.7% are participated from Taif city and its villages. 58.5% of participants have undergraduate university level
and 22.6% of respondents have government job. Fig. 1 and Tables 2 and 3 observe some descriptive statistics of demographic data.

4.2. Likert scale analysis

Likert scale is used to describe the main statements in the survey. The mean of each question in the survey was calculated to find the overall score for that question. Then, in each statement, the weighted mean of all questions is calculated to find the overall score for the statement. Fig. 2 observes box plots for each statement and shows measures of central tendency.

Table 4 explains that people were able to coexistence with home quarantine, and they take the advantage of the time inside their home to improve many aspects in their life such as self-development, spiritualistic, health and social aspects.

4.3. Inference analysis

Some inference statistics are investigated to examine the dependency, differences, and association among different variables in the data. Chi-square test is used to investigate the dependency of current job and location and found that there was correlation between them where p-value < 0.05. There is 66.5% government employee from Taif while there is 37.5% who has free work from Taif and Jeddah. Moreover, there is association between current job and education level where 48.2% of government employee have postgraduate education level while 62.5% of people who have free work, they have undergraduate education level. However, Pearson correlation is used to investigate the relation between five statements of survey. This study showed statistically significant correlation between the impact of home quarantine on health, social, spiritual and self-development aspects. Whenever self-development increased during home quarantine, the attention towards health, social, spiritual aspects increased where the significant moderate correlation coefficients are 0.41, 0.40 and 0.49, respectively.

On the other hand, independent samples t-test is used to examine the difference of attention towards health aspects between male and female and showed that women have higher attention towards their health than men during home quarantine (p-value < 0.05). Moreover, the average of psychological disorder for those living with people who infected with the COVID-19 is significantly higher (p-value < 0.05) than the average of psychological disorder for those who do not live with people who infected with the COVID-19. This explains the high rate of anxiety and fear for those who live with people were infected with the virus from possible complications.

Furthermore, analysis of variance (ANOVA) is used to compare means of the impact of home quarantine during the COVID-19 among people based on their current job. Means are statistically significant different between students and government employees (p-value = 0.017). In addition, there are significant difference of impacting home quarantine during the COVID-19 between retirements and students, special

Fig. 1 Descriptive statistics plots for some demographic variables.
employees and unemployed as p-value = 0.007,0.007 and 0.013, respectively, see Fig. 3. Moreover, married people are more attention to their health during home quarantine than single people (p-value = 0.033). However, the impact of home quarantine during the COVID-19 on mental health are similar among people who live in Taif, Makkah and Jeddah where p-value greater than 0.05.

4.4. Multiple logistic regression analysis

Multiple logistic regression model is used to detect the related risk factors which impact the dependent variable; psychological stability (feeling well most of the time during home quarantine). Table 1 observed 13 independent variables which have used to fit multiple logistic regression model (equation (12)). Table 5 observes the estimated parameters from the fitted model and their Wald test. There are only three factors had significant effect on psychological stability as shown in Table 5.

Extracting all non-significant factors and fit the multiple logistic regression model with only three significant independent variables is obtained, see Table 6. As a result, there are three significant factors impacted the psychological stability and are given in Eq. (13) (see Table 7).

\[
\log \left( \frac{\hat{p}}{1 - \hat{p}} \right) = 2.278 + 0.767x_{31} + 1.099x_{9} + 0.628x_{12} \quad (13)
\]

The Wald test for the coefficient of variable \(x_3\) indicates that the education level contributes significantly of predicting the psychological stability during home quarantine (p-value < 0.05). The odd ratio (OR) of feeling psychological stability during home quarantine in the group of people have education level before university is 2.154 with 95% CI (1.188, 3.903) times comparing with the group of people have postgraduate studies, when controlling for all other variables.

Moreover, the variable \(x_9\) indicates the weighted mean of psychological disorder. Feeling psychological stability during home quarantine happens when psychological disorder decreases for individuals (OR = 0.333 with 95% CI (0.262, 0.424)). In addition, the variable \(x_{12}\) indicates the weighted mean of changing habits and improving general health during COVID-19. Psychological stability increases when people take care on their general health (OR = 1.874 with 95% CI (1.557, 2.255)). Table 7 shows the likelihood ratio test which indicates that the independent variables contribute significantly to predict the psychological stability during home quarantine. The constant has no practical interpretation in the model however, it is generally kept in the model regardless of its significance.

Table 8 observes contingency table for Hosmer-Lemeshow test. While Table 9 shows the result of the Hosmer–Lemeshow test where p-value = 0.829 indicates that the numbers of psychological stability are not significantly different from those predicted by the model therefore, the overall model fit is good.

5. Discussion

Coronavirus disease (COVID-19) began in late 2019 in China then spread off to all the world. Governments are imposed home quarantine to prevent it. Home quarantine is a strategy that isolate individuals in the event of an outbreak of communicable and contagious diseases. This research aims to apply logistic regression analysis and some statistical methods to investigate the impact of the home quarantine during COVID-19 pandemic on the psychological stability of individuals, and its relationship to the social status, educational level, career status and other factors.

Although the percentage of women participated in this study is higher than men, there is no significant difference between them for impacting home quarantine on their psychological health. The percentage of those who felt psychological

| Table 2 | Descriptive of categorical variables. |
|-----------------|-----------------|-----------------|
| Variable        | Category        | Percentage  |
| Gender          | Male            | 21.04         |
|                 | Female          | 78.98         |
| Location        | Taif            | 67.7          |
|                 | Makkah          | 15.7          |
|                 | Jeddah          | 16.5          |
| Education level | Before university| 26.48         |
|                 | University level (undergraduate) | 58.51 |
|                 | University level (postgraduate) | 15.01 |
| Current Job     | Student         | 48.5          |
|                 | Government employee | 22.6 |
|                 | Special employee | 3.8           |
|                 | Free worker     | 0.9           |
|                 | Retired         | 2.2           |
|                 | Unemployment    | 22            |
| Social level    | Single          | 55            |
|                 | Marid           | 41            |
|                 | Divorce         | 3.2           |
| Feeling well most of the time during home quarantine (psychological stability) | Yes | 78.6 |
|                 | No              | 21.4          |
| Do any person of the family has infected by COVID-19 during home quarantine? | Yes | 17.1 |
|                 | No              | 82.9          |

| Table 3 | Descriptive of continuous variables. |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| Variable        | Min  | Max  | Mean | Standard deviation |
| Age             | 13   | 77   | 29   | 11.23           |
| Family numbers are living together | 2   | 23   | 6.21 | 2.60            |
stability during the home quarantine period was higher (78.6%) than those who felt psychological instability.

The logistic regression model showed that psychological stability during the period of home quarantine due to COVID-19.
COVID-19 is affected by several factors. It observed that people who have higher education are suffering from psychological disorder due to COVID-19 more than others therefore, they were less psychological stability. However, people who have taken care and be more attention to their general health, they were more psychological stability than others.

Fear and anxiety to lose the job are the main psychological disorders that people had due to home quarantine because COVID-19 [43]. The government employee and retired are feeling more psychological stability than students and others due to career and financial security. This is confirmed by the ANOVA test, which showed that there was a significant difference in the level of the impact of home quarantine on mental health among people based on their career status. Specifically, when people were asked whether finance difficulties are a cause of mental disorders, we found a statistically significant difference between the government employee and the retired than the rest of the groups. The retired and then the government employee are the least psychologically disturbed because of the financial difficulties, where they have the financial and job security. In addition, this study agreed with [44] where that psychological disorder rises among people who are confirmed that one or more family members were infected with the COVID-19 during home quarantine, and this explains the high rate of anxiety, fear, and turmoil. People are afraid of transmitting the virus to them or to the rest of the family, especially the elderly or they are worried about those infected with the virus from subsequent complications such as death.

One of the most important points that the research focused on are pros and cons of home quarantine during the COVID-19. The most prominent advantages of the home quarantine are the closeness of family members and sitting together for long time and practicing various activities (religious, educational, sports and others). On the other hand, the most prominent negatives faced by society in general are the stopping of some jobs and private companies, anxiety, stress, and fear of the effects of the Coronavirus, the difficulty of adapting with the home confinement and social distancing from family and friends.

6. Conclusions

Although the Saudi government have imposed home quarantine and curfew in the period between March 23 - June 21, 2020, to prevent the spread of the COVID-19, high percentage of respondents felt psychological stability during the period of home quarantine.

Logistic regression analysis was used to study the impact of various variables on psychological stability during the period of home quarantine at COVID-19 time. By using different social media, survey was distributed randomly to individuals in Makkah region, which includes the most crowded cities in Saudi Arabia. This study is applied to 846 residents of Makkah region during the COVID-19 period (compulsory home quarantine period in Saudi Arabia was from March 23 to June 21, 2020). The main finding of this study is that the multiple logistic regression model showed that education level, psychological disorder and attention to general health had impacted the psychological stability during the period of home quarantine due to COVID-19. Though, most of the participants felt psychological stability during the period of home quarantine due to COVID-19. According to the results of the statistical tests obtained above, multiple logistic regression model had worked efficiently.

In addition, the positive impact of the home quarantine that people became more attention to their health, more interested to self-development and the families became closer to each other. On the other hand, people on private employee or unemployed have lack of psychological well-being more than others due to home quarantine and decrease an economic and income.

This study recommends community contribution which is important to limit the spread of the COVID-19. People should adhere to preventive policies, staying away from crowding, not leaving their home except in extreme necessity and keep social distancing. Moreover, they should get all doses of the vaccine as soon as possible to go back to the normal life.

As most of the participants were relatively educated; this study could be improved by including non-educated people to increase awareness and psychological health care in future. Furthermore, studying the extent of society awareness and commitment to the precautionary measures recommended by the Ministry of Health to limit the spread of the Coronavirus.
Table 5 Coefficients of multiple logistic regression model (12) with all possible independent variables.

| Variable | Coefficient“B” | SE | Wald | df | p-value | OR“Exp(B)” | 95% CI for OR |
|----------|----------------|----|------|----|---------|------------|---------------|
| Constant | 1.088          | 1.022 | 1.134 | 1  | 0.287       | 2.969       |               |
| Gender(1) | 0.223          | 0.247 | 0.818 | 1  | 0.366       | 1.250       | 0.770 - 2.029 |
| Age      | -0.005         | 0.017 | 0.091 | 1  | 0.762       | 0.995       | 0.963 - 1.028 |
| Location(1) | 2.387          | 2     | 0.303 | 1  | 0.171       | 0.700       | 0.420 - 1.166 |
| Location(2) | -0.357         | 0.261 | 1.878 | 1  | 0.071       | 0.917       |               |
| Location(3) | -0.260         | 0.260 | 1.003 | 1  | 0.317       | 0.771       | 0.464 - 1.283 |
| Social statues(1) | 1.009      | 3     | 0.799 | 1  | 0.366       | 1.250       | 0.770 - 2.029 |
| Social statues(2) | 0.211        | 0.304 | 0.480 | 1  | 0.488       | 1.235       | 0.680 - 2.243 |
| Social statues(3) | -0.240       | 0.168 | 0.682 | 1  | 0.786       | 0.250       | 0.250 - 2.477 |
| Social statues(4) | -0.058        | 0.002 | 1.964 | 1  | 0.944       | 0.060       | 0.060 - 14.782 |
| Education level(3) | 1.404        | 2.015 | 3.015 | 1  | 0.078       | 1.333       | 0.968 - 1.834 |
| Education level(1) | 1.000        | 0.385 | 6.751 | 1  | 0.009       | 2.718       | 1.278 - 5.779 |
| Education level(2) | 0.353        | 0.313 | 1.267 | 1  | 0.260       | 1.423       | 0.770 - 2.629 |
| Current Job(6) | 3.990         | 5     | 0.551 | 1  | 0.219       | 1.382       | 0.825 - 2.314 |
| Current Job(1) | 0.001         | 0.324 | 0.000 | 1  | 1.001       | 1.001       | 0.531 - 1.890 |
| Current Job(2) | 0.470         | 0.170 | 1.705 | 1  | 1.601       | 1.601       | 0.790 - 3.244 |
| Current Job(3) | 0.690         | 0.575 | 1.440 | 1  | 0.230       | 1.994       | 0.646 - 6.158 |
| Current Job(4) | 1.196         | 0.467 | 2.055 | 1  | 0.145       | 3.306       | 0.187 - 58.585 |
| Current Job(5) | 1.391         | 1.137 | 4.962 | 1  | 0.221       | 4.020       | 0.433 - 37.365 |
| Family No. are living together | -0.030 | 0.039 | 0.605 | 1  | 0.436       | 0.970       | 0.899 - 1.047 |
| Infected by COVID-19 during home quarantine(1) | 0.323         | 0.263 | 1.512 | 1  | 0.219       | 1.382       | 0.825 - 2.314 |
| Statment1 | -1.161         | 0.131 | 78.550 | 1  | 0.000       | 0.313       | 0.242 - 0.405 |
| Statment2 | 0.287         | 0.163 | 3.105 | 1  | 0.078       | 1.333       | 0.968 - 1.834 |
| Statment3 | 0.189         | 0.143 | 1.762 | 1  | 0.184       | 1.208       | 0.914 - 1.598 |
| Statment4 | 0.426         | 0.120 | 12.571 | 1  | 0.000       | 1.531       | 1.210 - 1.937 |
| Statment5 | -0.003       | 0.146 | 0.001 | 1  | 0.981       | 0.997       | 0.748 - 1.327 |

Dependent variable is psychological stability (Binary; Yes = 1 and No = 0)

Table 6 Coefficients of multiple logistic regression model (13) with significant factors only.

| Variable | Coefficient“B” | SE | Wald | df | p-value | OR“Exp(B)” | 95% CI for OR |
|----------|----------------|----|------|----|---------|------------|---------------|
| Constant | 2.278          | 0.509 | 20.049 | 1  | 0.000       | 9.754       |               |
| Education level(3) | 0.767        | 0.303 | 6.396 | 1  | 0.011       | 2.154       | 1.188 - 3.903 |
| Education level(1) | 0.109        | 0.252 | 0.186 | 1  | 0.666       | 1.115       | 0.680 - 1.828 |
| Education level(2) | -1.099       | 0.123 | 79.320 | 1  | 0.000       | 0.333       | 0.262 - 0.424 |
| Statment1 | 0.628         | 0.094 | 44.197 | 1  | 0.000       | 1.874       | 1.557 - 2.255 |

Dependent variable is psychological stability (Binary; Yes = 1 and No = 0)

Table 7 Tests of model effects.

| Likelihood ratio chi-square test | df | p-value |
|----------------------------------|----|---------|
| (Intercept)                      | 30.340 | 1 | 0.000 |
| Education level                  | 9.600   | 2 | 0.008 |
| Statment1                        | 96.249  | 1 | 0.000 |
| Statment4                        | 47.463  | 1 | 0.000 |

$-2 \text{ Log likelihood} = 727.250$
is of interest. In addition, studying the society acceptance of taking the Coronavirus vaccine and the impact of rumors for having the vaccination is interested.

7. Declaration

- Ethics approval and consent to participate: The data was collected after the approval had received from the Scientific Research Ethics Committee, Deanship of Scientific Research at Taif University (Approval number: 42–90).
- Consent for publication: Not applicable.
- Availability of data and materials: The datasets used and analysed during the current study are available from the corresponding author on reasonable request.
- Competing interests: The author declare that they have no competing interests.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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