

Reviewing the Underlying Factors of COVID-19 Induced Depression from Environmental, Nutritional, and Emotional Aspects

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ABSTRACT

Corona Corona Virus Disease-19 (COVID-19) virus has constituted one of the most influential global health concerns in human history. It has significantly altered people's life both physically and mentally. Meanwhile, depression, a common mental disorder and one of the main causes of suicidal death around the world, has been founded to have an increased prevalence since the outbreak of COVID-19. In consideration of the public mental wellbeing, this positive relationship between COVID-19 and depression has been internationally highly studied. However, few studies have comprehensively investigated and summarized the underlying factors contributing to this relationship. The current study will examine this relationship in terms of environmental, nutritional, and emotional aspects by reviewing previous relevant studies. Findings would hopefully help to draw people's attention to the contributors and in this way preserve their mental health. Further studies are needed to give a more comprehensive summary about the contributors as only the main ones were examined in the present paper.

Keywords: COVID-19, depression, environmental, nutritional, emotional

1. INTRODUCTION

Corona Virus Disease-19 (COVID-19) virus has been widely spread around the world since December 2019, which has been regarded as one of the most severe global health concerns in human history [1]. Due to the magnitude and speed of transmission and unpredictable variants of the virus, as well as the serious outcomes of being affected, it is rational to have increasing fear and anxious feelings among the public. In addition, methods implemented to control the pandemic, such as restriction of lockdown, also have induced negative feelings as well as mental issues for the public. Therefore, researchers around the world have conducted series studies to investigate the mental health problems induced by the pandemic [2].

Depression, also known as major depressive disorder, is a common mental disorder and one of the main causes of suicidal death around the world [3]. According to DSM-5 [4], two core diagnostic symptoms for depression are persistent feelings of low mood and loss of interest in things one previously enjoyed. There are seven other diagnostic symptoms includes but not limited to low energy, decreased concentration, feelings of guilty and

hopelessness, as well as suicidal thoughts. These diagnostic symptoms imply that individuals suffering from depression would become incapacitated, and that their life quality could be devastated as a result. Furthermore, in severe cases where suicidal attempts occur, it then becomes a potential threat to life. Thus, concerns about risk factors that may increase the develop rate of depression are indicated to be significantly needed.

Unfortunately, the COVID-19 and various kinds of local polices related to the pandemic have caused the increase of depression disorders. For example, in the study of Nandy and Kumar [5], they investigated the effect of the COVID-19 pandemic on individuals' mental health using a deep learning model. This model is more advanced in classification than standard machine learning approaches to analyze and classify their tweets collected at two different time points – before and after the onset of pandemic. The dataset was formed by collecting tweets with hashtags of mental health conditions (i.e., #depression), among which 4428 tweets were collected before the onset of pandemic and 8789 were collected after the onset and during the pandemic. The model analyzing results showed that the percentage of tweets marked as depressed increased from 10.25% to

12.31% with an increase in depression relating terms such as depressed and depression used in tweets collected after the onset of pandemic compared to those collected before the onset. Thus, they draw a conclusion that the onset of the pandemic was significantly correlated with the increase in depression level among tweeters according to the model detection.

The positive relationship between COVID-19 and depression has been highly studied among the psychological field globally given concerns for the public mental wellbeing. However, most studies focused on the effects among specific populations, such as college students [6], or the effects of specific factors such as increased exposure to social media [7, 8]. Few studies have comprehensively investigated the underlying factors that contributed to the positive relationship. Thus, the present study will examine several underlying factors which possibly lead to the increase in depression under COVID-19 in the manner of literature review. Factors included in this paper were reviewed in terms of three aspects – environmental, nutritional, and emotional aspects.

2. UNDERLYING FACTORS

Based on the review on relevant studies, several factors under the situation of COVID-19 might attribute to the increasing depression rate. Firstly, in terms of environmental factors, due to the lockdown restriction, people mostly stayed at home with families, especially for adolescents, and most activities moved online. Thus, factors such as family circumstances [9] and exposure to social media [7, 8] play important roles on individuals' mental health. Secondly, lockdown restriction leads to limited grocery shopping, which further lead to alternative in diet system and even food insufficiency. According to nutritional psychiatry theories, nutrition gained from food intake is associated with mental wellbeing [10, 11]. Finally, the pandemic also has direct emotional impacts on individuals, such as anxious feelings about losing loved ones [9] and feelings of loneliness due to social isolation, both of which are highly related to the development of depression [12].

2.1. Environmental Factors

Family circumstances is a significant environmental factors under COVID-19 pandemic as most people were forced to stay at home with their families, especially for adolescents. Türk et al. [9] conducted a study to investigate the level of depression and copying strategies among adolescents during the pandemic period in terms of certain factors, which include parental status and parental education level. Participants sample included 3058 high school students (2080 females and 978 males). Measuring scales included Personal Information Form, The Revised Child Anxiety and Depression Scale – Child

Version and Coping Scale for Children and Adolescents. Data were analysed using Independent Samples t-Test and One-Way ANOVA. The results showed that depression level of participants with both parents were significantly much lower than those with separated parents [$F(2-3055)= 13.776, p< .001$]. Additionally, participants with university graduate parents were found to have a lower depression rate [$(F(5-3052)= 7.766, p< .001)$; $(F(5-3052)= 6.068, p< .001)$] and lower avoidant coping levels [$(F(5-3052)= 4.893, p< .001)$; $(F(5-3052)= 2.816, p< .05)$] than those whose parents with lower education levels. These results indicated that parental status and educational level have impact on adolescents' depression level as well as their coping strategies towards depression. Specifically, higher education levels of parents were associated with lower depression levels and more use of active coping strategies of adolescents. In addition, separation of parents negatively affects adolescents in terms of higher depression levels and more use of negative or avoidant coping skills.

Another main environmental factor is the exposure to social media as most activities moved from offline to online during lockdown periods. While intensive use of social media during the pandemic was argued to be a negative factor impacting on individuals' mental health [7, 8], the study of Sourav et al. [13] illustrated a contrary effect that effective information support from social media would help to reduce depression level during COVID-19. In addition, self-efficacy was found to be a mediator on the relationship between information support from social media and depression during the pandemic. They designed an online questionnaire-based survey to measure the information support obtained from social media, the COVID-19 derived depression, and self-efficacy level of each participant. Results showed that depression will increase by 0.48 units along with 1 unit increase in self-efficacy. It was coherent with previous studies that a high level of self-efficacy was not certainly associated with a low level of depression, as self-efficacy may be influenced by certain internal and external factors [14]. Results also showed that with 1 unit increase in information support from social media, depression level will decrease by 0.33 units, while self-efficacy will increase by 0.11 units. Therefore, they draw the conclusion that self-efficacy might increase with information support, while the direction of mediating effects of self-efficacy on depression is uncertain. Many other factors such as individuals' mindset works as determinant roles. However, the study illustrated that social media was not always a risk factor for depression during COVID-19, as information support from social media could help to reduce depression when individual has a high level of self-efficacy in appropriate manner,

which could help to distinguish fake information from the truth, and to deal with emotions properly.

Thus, parental conditions in terms of higher education levels and parents living together tend to prevent the development of depression of adolescents during the pandemic. Furthermore, in spite that excessive exposure to social media is likely to result in several mental health problems, proper use of social media in terms of obtaining supportive information also help to reduce depression rate for individuals.

2.2. Nutritional Factors

Nutrition gained from food intake is vital for both physical and psychological wellbeing, which, however, it is hard to be secured during the pandemic due to restrictions on grocery shopping. Shabbir et al. [11] conducted a literature review research to investigate nutrition as a mediator on COVID-19 induced mental health problems such as depression. Their paper comprehensively evaluated the eating habits during the pandemic and lockdown periods among different countries and found that people tended to develop unhealthy food system that was likely to increase depression level during COVID-19. For example, consumptions of fast food were generally increased among reviewed countries, while consumptions of fresh fruits and vegetables, as well as meat decreased in all countries based on their results. Reasons were demonstrated to be both internal and external. To be specific, in terms of internal reasons, fast food might be highly consumed to reduce the anxious mood during pandemic. While external reasons might include that restriction of lockdown limited grocery shopping, leading to preference of highly processed meals rich in salts and fats, which were risk factors for depression. Thus, it can be seen that under COVID-19, certain factors such as anxiety mood and lockdown result in unhealthy eating habits, which, in turn, tends to increase depression rate.

During tough periods when the pandemic was extremely severe, situation of food insufficiency did exist, which also led to negative impacts on individuals' mental health. In order to investigate the relationship between depression, anxiety, and sleep disorders with food insecurity in US adults, Arenas et al. [10] conducted a meta-analysis using sufficient databases searched for relevant research up to 15 December 2018. Articles were selected using filters such as "journal articles", "USA", "depression", and "food insecurity", and were critically analyzed using cross-sectional method. Among the articles, depression was measured using several different validated scales. Data were analyzed in terms of measures of effect size such as standardized mean differences (specifically Hedges' g) and Pearson correlation coefficients (r). Results showed a

significantly positive association between depression and food insufficiency, which indicates that suffering food insufficiency will tend to increase the depression level of individuals compared to those without experience of food insufficiency. Such positive associations were also found between anxiety and sleep disorder with food insufficiency, while the association between depression and food insufficiency appeared to be the strongest, as shown by 57 studies with 169,433 participants. Thus, it proposed a significant relationship between nutrition and mental well-being, especially regarding to depression.

In conclusion, nutrition plays a significant role in maintaining mental wellbeing. However, sufficient nutrition is hard to be ensured during the pandemic, which tends to increase the depression rate of the public.

2.3. Emotional Factors

In addition to the external factors discussed previously in this paper, COVID-19 pandemic also has direct negative impacts on individuals' emotions and feelings. Anxiety is one of the main feelings induced by the pandemic, which is highly correlated with depression. Another study based on Tweeter activities done by Zhou et al. [15] draw the same conclusion that the depression rate increased after the outbreak of the pandemic in New North Wales. The depression classification model used is built basing on multimodal features such as emotions and topics from tweets and term frequency-inverse document frequency (TF-IDF), which is different from the deep learning model used in the study of Nandy and Kumar [5]. While deep learning model relies on large data sets to be reliable, TF-IDF helps to form a reliable model basing on both large and small data sets, which takes the short texts into account and form a more comprehensive data base. Data were analysed in details of certain dates of events such as the outbreak of pandemic, significant increase in confirmed cases, and the lockdown restriction. Results showed that the depression level was significantly increased as the confirmed cases of COVID-19 significantly increased. However, although the depression rate significantly increased when the discussion of the lockdown restriction started, and it further slightly increased when the restriction is formally carried out, it continued increasing after the relaxation of lockdown restriction. This might be in the case that people still worried about being infected even after the relaxation of lockdown restriction.

In addition to anxiety, loneliness is another main feelings perceived by the populations due to social isolation, and it is also highly associated with depression. In the study of Wu et al. [12], a repeated measures design was used to examine whether and how loneliness, anxiety, and depression were temporally associated during the COVID-19 pandemic, and the potential mediating factors. Online surveys containing self-reported scales to measure loneliness, anxiety, and depression levels were

administered at three different time points during pandemic, with different numbers of participants from the same Chinese university each time. Analysis was conducted based on the data of 458 students (240 males, 218 females) with a mean age of 20.35 years who completed all three surveys. No differences were found in the temporal levels of loneliness, anxiety, and depression between the participating and non-participating students by a series of independent sample t-tests. Furthermore, in order to investigate the potential reciprocal relationship among the studied variables, cross-lagged panel analysis was performed. Results showed a bidirectional association between loneliness and depression overtime, which indicates that a higher level of loneliness will predict a higher level of depression, which, in turn, will then predict a higher level of loneliness. Same relationship was also found between depression and anxiety. Thus, it can be concluded that both anxiety and loneliness tend to increase the level of depression.

Therefore, direct emotional factors such as anxiety and loneliness derived from the pandemic are likely to result in an increased prevalence of depression globally.

3. CONCLUSION

In conclusion, the current paper examined the effect of COVID-19 pandemic on public depression rate around the world in terms of environmental, nutritional, and emotional aspects. Based on the findings of the current review, attention should be drawn to the following dimensions in consideration of the public mental wellbeing. First, parents should be aware of their significant role in mediating the mental status of their children [9], and thus it is responsible for them to provide a healthy family circumstance for their children. Second, methods such as lockdown will induce loneliness feelings to individuals [12], which tend to increase their use of social media to avoid the sense of being isolated. However, it is noteworthy that while proper use of social media could help people to feel better [13], excessive exposure to social media is likely to further do harm to individuals' mental health [7, 8]. Third, the pandemic is such a tough period that increased anxious feelings are reasonable and common among the public [2, 15]. Thus, support is needed and vital to maintain mental health during the COVID-19. Finally, a healthy diet could also help to preserve mental wellbeing from depression given that nutrition is also vital for mental health [10, 11]. Other potential underlying factors that might impact on mental health during the pandemic need further investigation in the future in consideration of the public wellbeing.

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