



### DEPRESSION AMONG PHYSICIANS IN A GOVERNMENT DESIGNATED COVID-CENTER HOSPITAL DURING CORONAVIRUS DISEASE-19 PANDEMIC \*

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#### ABSTRACT

**OBJECTIVES:** This study aimed to determine the prevalence, most common symptoms and sociodemographic factors associated with depression among physicians in a government COVID-Center i.e. Southern Philippines Medical Center-Institute of Psychiatry & Behavioral Medicine in Bajada, Davao City.

**METHODOLOGY:** This cross-sectional, survey-based study collected socio-demographic data and PHQ-9 scores using Google Forms, from resident physicians from July 1 to August 31, 2020. Multinomial logistics regression analysis was used to identify risk factors of depression.

**RESULTS:** Two hundred fifty-one (251) out of 376 physicians responded (68.39% response rate). The average age was 30 years old, majority were female (58.57%, 147), single (78.88%, 198), frontliners (77.29%, 194), with average hospital experience of 2.0 years. Ninety six (38.26%) were assigned in surgical departments while 155 (61.75%) worked in nonsurgical departments. There were twelve respondents (4.78%) who had a history of psychiatric illness and 31 (12.35%) had previous psychiatric intervention, while 66 (26.29%) had a history of medical illness. Eighty-five (33.86%) had depression using PHQ-9; 57 (22.71%) as mild, 19 (7.57%) moderate, 7 (2.79%) moderately severe and 2 (0.8%) severe. Out of 85 residents who were depressed, the most common symptoms were: low energy (81, 95.29%); anhedonia (76, 89.41%); and feeling depressed (72, 84.70%). Medical illness was associated with higher levels of depression. Physicians with a history of psychiatric illness, psychiatric intervention and medical illness had significantly higher levels of depression.

**CONCLUSION:** More than a third (33.86%) of physicians screened positive for depression. Current mental health programs must be strengthened and made specific, to prevent and address depression especially among those who have a history of psychiatric and medical illness.

**KEYWORDS:** Depression, Medical Illness, Resident Physicians, PHQ-9, COVID-19 Pandemic

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## INTRODUCTION

Coronavirus Disease-19 is a global infectious disease that has been elevated to a pandemic status by the World Health Organization on March 12, 2020, with a case-fatality ratio reported to be about 3.4-5.8%. (1)

The Philippines had its first confirmed case on January 30, 2020 and reported its first local transmission on March 7, 2020. (1) The city of interest had its first case on March 15, 2020. By March 31, the tertiary hospital wherein the study was conducted became a Government-Designated COVID-19 Center Hospital. (2)

A review of psychological impact of epidemic outbreaks showed that depression rates could be as high as 27.5% to 50.7% (3) among health care workers (HCW), with much higher rates during the current pandemic at 50.4 to 50.7%. (4,5) Depressive symptoms in HCWs can be sustained (6,7), and rates may vary when screening is done at different time points - during and after outbreaks. (5,8) Furthermore, depression amongst physicians has been shown to increase the risk of medical errors (9) and can translate into poor quality of care, desired outcomes in terms of morbidity and mortality rates, and patient experience. (10)

The Patient Health Questionnaire-9 (PHQ-9) is a 9-item self-rating instrument and is based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM IV) criteria for Major Depressive Disorder. Aside from ease of completion, scoring and interpretation, publicly available; the questionnaire could be used among diverse populations. Respondents rated the items from 0-3 according to the frequency of their experience over the previous two weeks. The items were summed up to give a total score for depression severity. Theoretical score range was 0-27. The standardization of the total score was: 1-4 for Minimal Depression; 5-9 for Mild Depression; 10-14 for Moderate Depression; 15-19 for Moderately Severe Depression; and 20-27 for Severe Depression. A score of 10 or more had a sensitivity and specificity of more than 88% for Major Depressive Disorder. (11)

The unprecedented nature of the COVID-19 outbreak has caused psychological stresses for HCWs. (3)

Mental health measures should be available to identify and limit psychological morbidity among HCWs as a high-risk group. (4, 6,12) However, local data on the psychological impact of the COVID-19 pandemic was scarce. Information regarding the prevalence of depression, its common manifestations and risk factors would facilitate integration of psychosocial responses to administrative policies for the current outbreak and guide preparedness planning for future infectious disease outbreaks as well.

This study aimed to assess the prevalence of depression among physicians in a government-designated COVID-Center Hospital during COVID-19 Pandemic. Specifically, the study determined the 1) socio-demographic profile of resident physicians in terms of their age, sex, marital status, hospital experience in years, area of assignment, department of assignment, history of psychiatric illness, previous psychiatric intervention and history of medical illness; 2) prevalence of depression; 3) most common symptoms of depression; and 4) predictors of depression using multinomial logistic regression analysis.

## METHODOLOGY

This study was a descriptive-analytical, cross-sectional, hospital-based survey using the screening tool PHQ-9, conducted online using Google Forms, amongst all resident physicians in a tertiary hospital.

This research underwent evaluation from the Institutional Review Board and was approved for conduct in May 2020. Data was gathered from July 1 to August 31, 2020.

All resident physicians were invited to participate in the study. A written request to individual departments was sent to obtain mobile numbers and e-mail addresses of the residents. A text message and an e-mail with individually assigned codes were sent to the intended respondents, along with a link that would lead to an online survey. To ensure anonymity and confidentiality, respondents were required to input their identifying code when answering the online survey. Only the author of this research knew the names and codes of the respondents.



The online survey required the respondents' consent to proceed. The consent form included information on the study objectives, significance, risks, benefits and confidentiality measures. The respondents were also informed of their right to refuse or withdraw from the study and were given an option to receive feedback of their results as well as to consent to receive a referral form from the author should their PHQ-9 scores be  $\geq 10$ .

Sociodemographic data was reported by the participants themselves that included age, sex, marital status, hospital experience in years (defined as number of years spent working in a hospital setting from the time license was obtained to practice as a medical doctor), area of assignment (frontline vs second-line), department of assignment (surgical vs non-surgical), history of psychiatric illness, previous psychiatric intervention (interventions included any psychosocial or psychiatric intervention that included pharmacotherapy, psychotherapy and psychological first aid), and history of medical illness. Upon completion of the socio-demographic survey, the respondents then answered the PHQ-9 tool.

In this study, frontline physicians were physicians who were directly engaged in clinical activities of diagnosing, treating, or providing care to patients who were probable, possible or confirmed COVID-19 cases; while second-line physicians referred to physicians who were not directly engaged in clinical activities of diagnosing, treating, or providing care to patients who are probable, possible or confirmed COVID-19 cases.

Considering that this study was conducted at the height of the Corona Virus Pandemic, residents from all departments were required to rotate in the COVID Wards. It has also been noted in a study by Bianco et al, that health care providers assigned to surgical departments may have more stressful environments with increased risk of COVID-19 infection due to aerosol-generating medical procedures thus the department of assignment, was categorized as surgical or non-surgical. (13)

Data was processed using Statistical Package for Social Sciences SPSS statistical software version 19.0 (IBM Corp).

The significance level was set at  $\alpha = 0.05$ . The ranked data, which were derived from the count of each level for symptoms of depression were presented as frequencies and percentages. Means were used to determine individual average PHQ-9 scores.

The nonparametric Mann-Whitney U test and Kruskal-Wallis test was applied to compare the severity of each symptom between two or more groups, respectively.

Multinomial logistic regression analysis was performed to determine factors associated with symptoms of depression in participants.

## RESULTS

Two hundred fifty-one (251) out of 376 resident physicians responded (response rate of 68.39%). The average age of respondents was 30 years old.

The majority were female (58.57%, 147), single (78.88%, 198), with average hospital experience of 2.0 years. The majority were front liners (77.29%, 194), with 96 (38.26%) assigned in surgical departments and 155 (61.75%) assigned in nonsurgical departments.

There were 12 (5%) who had a history of psychiatric illness; while there were 31 (12%) who had undergone previous psychiatric intervention.

Of the twelve (12) respondents who had a history of psychiatric illness, only two (2/251, 0.80%) indicated that they had received psychiatric intervention and only three (3/125, 1.2%) of them had scores of ten or higher, who were subsequently referred for psychiatric evaluation and management. There were 66 (26%) who had a medical illness. (Table 1)

Eighty-five (33.9%) of the respondents had depression according to PHQ-9, with 57 (22.71%) classified as mild, 19 (7.57%) as moderate, 7 (2.79%) as moderately severe and 2 (0.8%) as severe. (Figure 1)

Among the 85 residents who were depressed, the most common symptoms were: low energy (81, 95.29%); anhedonia (76, 89.41%); and feeling depressed (72, 84.70%) (Figure 2)

TABLE 1. SOCIODEMOGRAPHIC CHARACTERISTICS & PHQ-9 SCORES OF RESIDENT PHYSICIANS

Sociodemographic Profile	Severity of Depression (PHQ-9 Scores)										Total (N=251)	
	1-4 (n=166)		5-9 (n=57)		10-14 (n=19)		15-19 (n=7)		20-27(n=2)			
Age in Years (Median)	30		29		30		31		31		30	
	#	%	#	%	#	%	#	%	#	%	#	%
<26	3	1.8	1	1.75	0	0	0	0	0	0	4	1.59
26-30	94	56.63	42	73.68	13	68.42	3	42.86	1	50	153	60.96
31-40	66	39.76	14	24.56	6	31.57	4	57.14	1	50	91	36.25
>40	3	1.8	0	0	0	0	0	0	0	0	3	1.2
Sex												
Female	98 59.04		36	63.16	8	42.11	4	57.14	1	50	147	58.57
Male	68	40.96	21	36.84	11	57.89	4	57.14	1	50	104	41.43
Civil Status												
Single	124	74.7	52	91.22	15	78.95	6	85.71	1	50	198	78.88
Married	40	24.1	5	8.77	4	21.05	1	14.29	1	50	51	20.32
Separated	2	1.2	0	0	0	0	0	0	0	0	2	0.8
Widowed	0	0	0	0	0	0	0	0	0	0	0	0
Divorced	0	0	0	0	0	0	0	0	0	0	0	0
Hospital Experience in Years (Median)	82		2		2		1		1.5		2	
1 year and below	52	31.33	27	47.37	8	42.11	4	57.14	1	50	92	36.65
2 years	35	21.08	12	21.05	4	21.05	2	28.57	1	50	54	21.51
3 years	48	28.92	12	21.05	2	10.53	1	14.29	0	0	63	25.1
4 years and above	31	18.67	6	10.53	5	26.32	0	0	0	0	42	16.73
Area of Assignment												
Frontline	128	77.11	45	78.95	14	73.68	6	85.71	1	50	194	77.29
Second line	38	22.89	12	21.05	5	26.32	1	14.29	1	50	57	22.71
Department of Assignment												
Surgical	63	37.95	20	35	11	58	2	28	0	0	96	38.26
Non-surgical	103	62.05	37	65	8	42	5	72	2	100	155	61.75
History of Psychiatric Illness												
Yes	4	2.41	5	8.77	1	5.26	1	14.29	1	50	12	4.78
No	162	97.59	52	91.23	18	94.74	6	85.71	1	50	239	95.23
Previous Psychiatric Intervention												
Yes	14	8.43	8	14.04	6	31.58	2	28.57	1	50	31	12.35
No	152	91.57	49	85.96	13	68.42	5	71.43	1	50	220	87.65
History of Medical Illness												
Yes	34	20.48	19	33.33	9	47.37	3	42.86	1	50	66	26.29
No	132	79.52	38	66.67	10	52.63	4	57.14	1	50	185	73.71

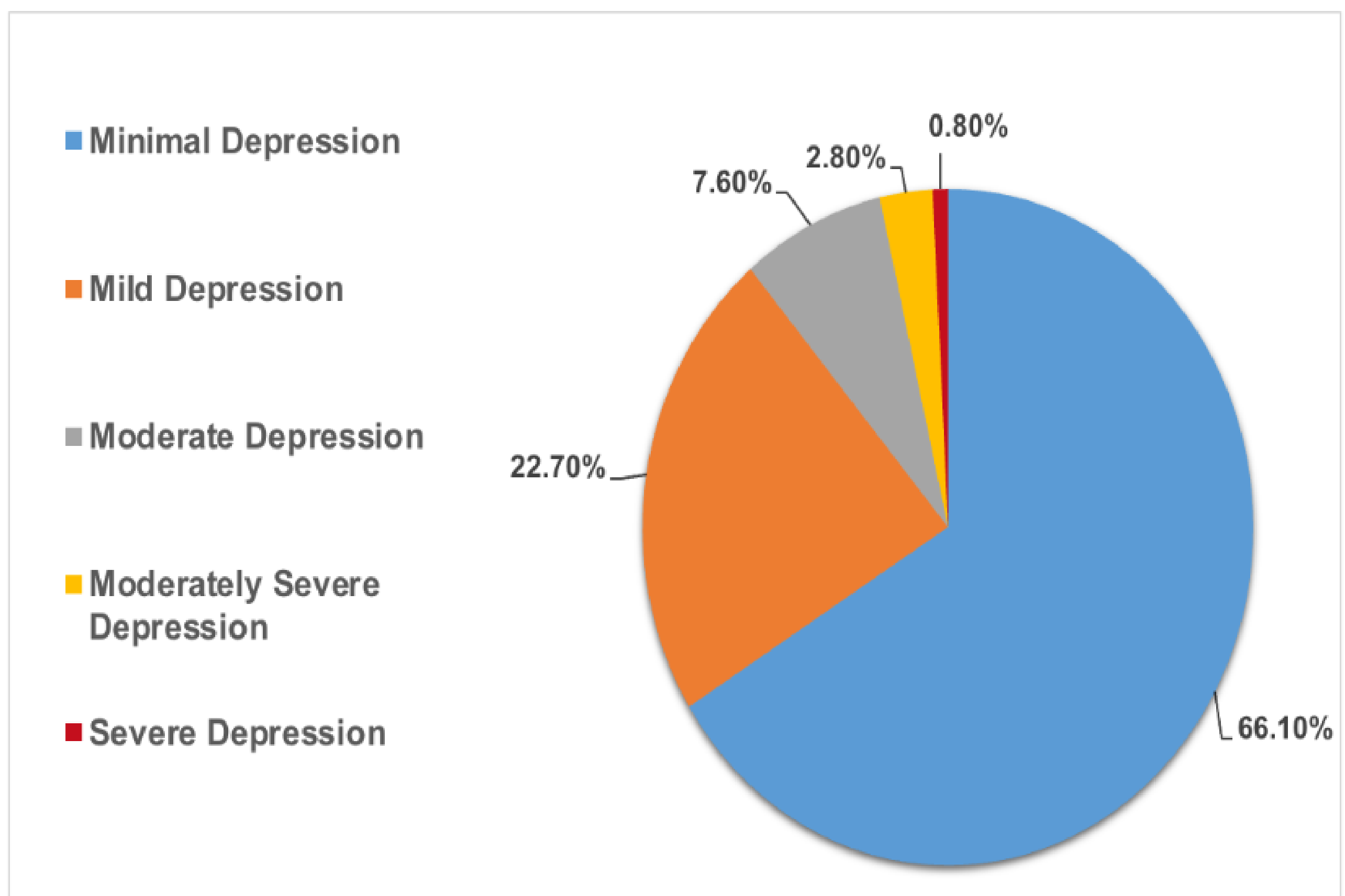


FIGURE 1. PREVALENCE AND SEVERITY OF DEPRESSION BASED ON PHQ-9 (N= 251)

Among the 85 residents who were depressed, the most common symptoms were: low energy (81, 95.29%); anhedonia (76, 89.41%); and feeling depressed (72, 84.70%) (Figure 2)

Significant results were found among physicians with a history of medical illness (p-value 0.006), history of psychiatric illness (p-value 0.00) and history of psychiatric intervention (p-value 0.00).

Specifically, physicians who had these histories had significantly higher levels of depression compared to their counterpart group (p<0.05). No significant results were found across other variables. (Table 2)

Furthermore, history of medical illness is associated with higher levels of depression

(OR=0.438 [CI: 0.230 - 0.834], p-value=.012, Wald=6.305). (Table 3)

## DISCUSSION

### Sociodemographic Characteristics

#### Age

Average age of the participants was 30 years old. In this study, age does not appear to be associated with depression. Of note, the majority of the respondents in this study (244/ 251 = 97.21%) belong to the age group of 26-40 years old. Findings agree with review of researches pre-pandemic by Joules et al. in 2014 wherein age of participants is not associated with rates and severity of depression. (14)

#### Sex

Of the 85 (33.86%) who screened positive for depression, 49 (57.65%) are females and 36



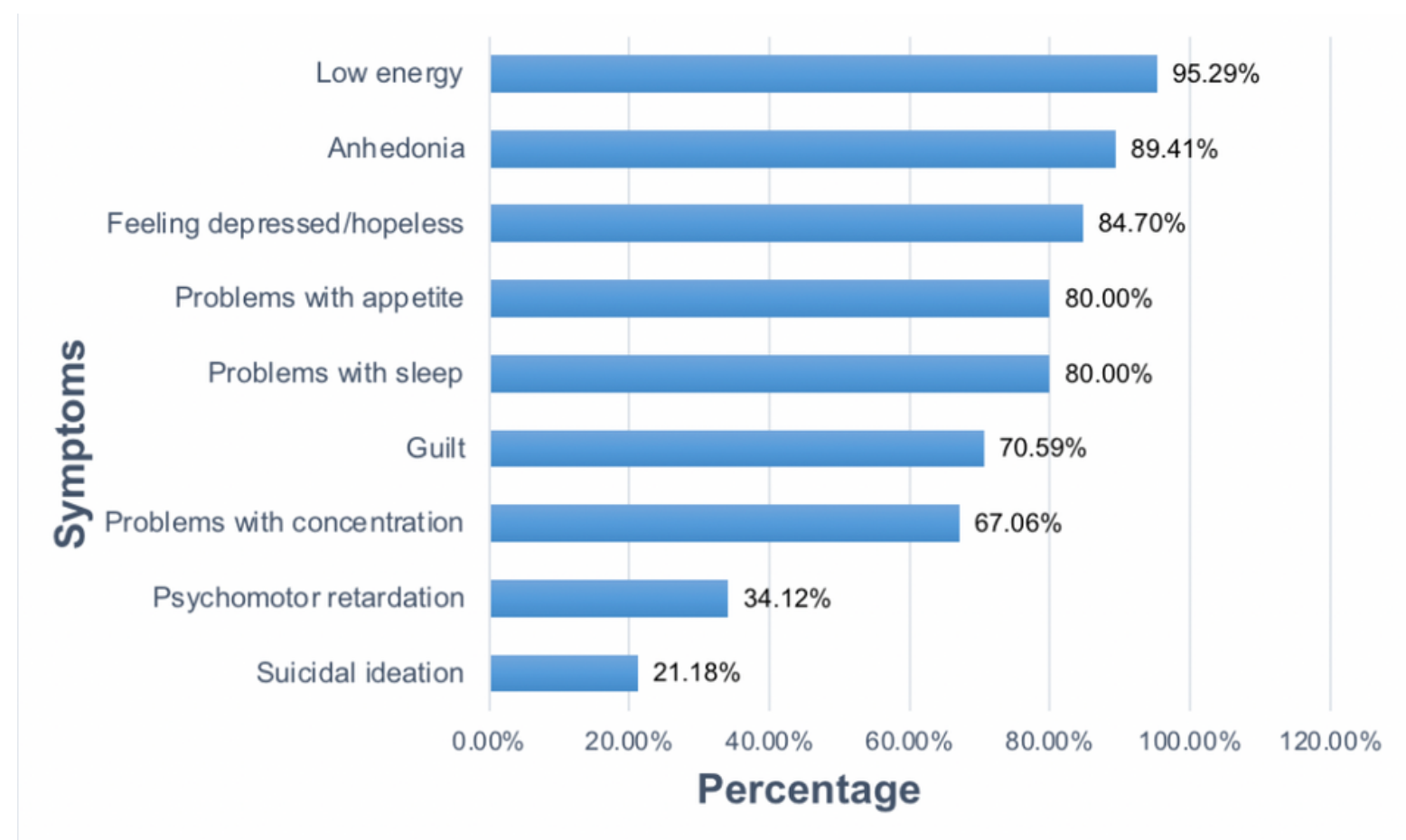


TABLE 3. RISK FACTORS FOR HIGHER LEVELS OF DEPRESSION IDENTIFIED BY MULTINOMIAL LOGISTIC REGRESSION ANALYSIS

Variables	Wald	p-value	Odds ratio	CI (95%)	
				LU	UB
Age					
30 years old and below	.175	.676	.863	.433	1.721
Above 30 years old	Reference group				
Sex					
Female	.005	.944	.980	.553	1.735
Male	Reference group				
Civil Status					
Single	2.751	.097	.494	.215	1.137
Married	Reference group				
Hospital Experience					
1 year and below	2.689	.101	.464	.185	1.162
2 years	.965	.326	.604	.221	1.652
3 years	.126	.723	1.194	.447	3.189
4 years and above	Reference group				
Area of Assignment					
Frontline	.027	.870	1.061	.524	2.146
Second-line	Reference group				
Department of Assignment					
Surgical	1.004	.316	.737	.405	1.340
Non-Surgical	Reference group				
History of Psychiatric Illness					
Yes	1.149	.284	.410	.080	2.093
No	Reference group				
Previous Psychiatric Intervention					
Yes	.585	.444	.668	.238	1.878
No	Reference group				
*History of Medical Illness					
Yes	6.305	.012*	.438	.230	.834
No	Reference group				

CMARRIED CATEGORY INCLUDED DIVORCED PARTICIPANTS. UB - UPPER BOUND LB - LOWER BOUND

(42.35%) are males. There was no gender-differences in terms of depression and gender was not associated with depressive symptoms in this study.

In other studies however, female gender has been shown to be associated with increased risk of depression in resident physicians (14) and with increased suicide rates compared to males. (15) During the current pandemic, females were found to have higher rates both in the general population (16, 17) and among HCWs. (4,18) Higher rates in women, as suggested by Hammerberg et al., may be due to the disproportionate burden of unpaid caregiving. (16)

#### Civil Status

In this study, there were no differences in the levels of depression across single and married resident physicians, and civil status was likewise not associated with depression. Findings coincide with a study from Joules et al. where marital status and social support was not predictive of screening positive for depression. (14)

#### Hospital Experience

Hospital experience was not associated with depressive symptoms in this study. Findings during the SARS outbreak however, found that HCW with less experience had new onset psychiatric disorders (8), while Joules et al. (14) reported higher rates of depression amongst resident physicians during the early years of training. Our findings may be due to perceived adequacy of training, and feelings of preparedness among resident physicians, that were purported to be protective of mental health. (19) These factors can be strengthened with training and education programs prior to outbreaks. (20)

#### Area of Assignment

There was no significant difference in PHQ-9 scores between frontline and second line physicians. Area of assignment in this study was not predictive of depressive symptoms.

This study finding may be attributed to resident physicians' strong sense of altruism (21) and hardiness (being able to adapt better in a crisis) that may have mitigated the psychological impact. (22)

A study among physicians and nurses in China, however, found that HCWs who were assigned in the frontlines were at higher risk of symptoms of depression. (4)

#### Assigned Department

This study found no significant associations between department assigned and rates of depression. Likewise, there was no significant difference in rates of depression between surgical and nonsurgical departments. These agree with a previous study by Mata et al. where there was no statistically significant difference observed between cross-sectional vs longitudinal studies in studies comparing surgical and nonsurgical residents. (23)

#### History of Psychiatric Illness

In this study, respondents with a history of psychiatric illness and psychiatric intervention showed significantly higher levels of depression compared to those who had none.

Studies, which examined prevalence of psychiatric morbidity among HCWs after the SARS outbreak (8, 24), as well as studies conducted during the COVID-19 pandemic (3, 25) showed that previous history of psychiatric illness was a predictor of developing depression. Moreover, a study among HCWs in a low resource setting in Nepal, found that history of taking medications for mental health problems were associated with higher likelihood of developing depression. (25)

Depression among physicians has been linked to occupational distress and stressful working conditions (26) and was more likely to develop among those with a history of the disorder. (14)

This finding underlines the importance of awareness of physicians of their personal risk in order to respond to emergent symptoms of depression (8), and caution in placing physicians with a history of psychiatric illness in highly stressful situations. (24)

#### History of Medical Illness

History of medical illness in this study was a risk factor for developing higher levels of depression. Likewise, those who had medical illness had significantly higher levels of depression compared to those who had none.



A study among at-risk groups in the United Kingdom (27) and among HCWs in China during the COVID-19 pandemic (28), identified existing physical illness as a factor for developing depression. Similarly, a hospital survey comparing rates of depression before and during COVID-19 pandemic (29), found increased rates of depression among those who were medically ill. This may be due to common comorbidities that have been associated with severity and increased mortality in COVID-19 infection such as hypertension, diabetes, cardiovascular diseases, chronic obstructive pulmonary disease, chronic kidney disease and cancer. (30, 31)

#### Rates of Depression

Among the 251 resident physicians who participated in the study, 33.86% screened positive for depression rates using PHQ-9 scale. This finding is lower than depression rates in studies found on HCWs by Lai et al. and Liu et al. in China with depression rates 50.4-50.7%, using PHQ-9 score of equal and greater than five. (4,5)

The city in study had a relatively lower number of cases compared to the regions where the studies in comparison were conducted. (32) Also, the data was gathered relatively early in the course of the outbreak i.e. four months after the start of the outbreak.

Although Psychological First Aid (PFA) was initiated by the Institute of Psychiatry and Behavioral Medicine among residents in the hospital of study, only 31 (12.35%) received any form of psychiatric intervention at the time data were gathered.

Studies have shown that psychological support to HCWs (33) along with training in novel tasks and personal protection (8) may improve adaptability and coping during pandemic even among HCWs who are at high risk of developing depression.

Chen et al. further advised that psychiatric interventions should be specific to the needs of the medical staff, otherwise, reluctance may be encountered. (34) In their study, provision of a place for rest, isolated from the staff's family; food and daily living supplies; detailed rules on the use and management of PPEs; leisure

activities and relaxation training; and regular psychological counsellors were instrumental in mitigating psychological impact.

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#### Symptoms of Depression

The most common depressive symptoms among the 85 residents who were depressed in this study were low energy low energy (81, 95.29%); anhedonia (76, 89.41%); and feeling depressed (72, 84.70%).

High percentages of low energy may be from physical exhaustion from high work demands in an outbreak. Dimitriu et al. explained that physical fatigue in the context of the pandemic could add to the mental stress among resident physicians. (35) Prolonged use of personal protective equipment and its physical effects (36), modification of shifts and work schedule and difficulty in interactions due to PPE use, could contribute to physical fatigue. (35)

Anhedonia was one of the most treatment-resistant symptoms in depression and could be related to severity of depressive psychopathology, dysfunctional impulsivity and recurrent suicidal ideation. (37)

Concurrent with this study's findings, Hacimusalar et al., in 2020 found that hopelessness was increased among HCWs compared to non-HCWs during the COVID pandemic. (38) Hopelessness has also been shown to increase suicidal ideation. (39,40)

#### LIMITATIONS & RECOMMENDATIONS

Only resident physicians in one tertiary hospital were the respondents of the study and therefore this study cannot make generalizations to other resident physicians from other hospitals. Data was gathered during the early phase of the



outbreak and lacked longitudinal follow up. The cross-sectional nature of the study did not allow for determination of temporality.

This study was unable to distinguish if the symptoms of depression were associated with being a physician or with living in a city with a viral outbreak since there was no comparator group. This study was unable to differentiate if the depressive symptoms were from a pre-existing psychiatric illness or were new-onset symptoms. Collection of data from multiple centers, longitudinal follow-up and having a comparator group are recommended for future studies.

Although the study asked for participants' history of psychiatric intervention, the study did not specify which psychiatric interventions (pharmacologic or nonpharmacologic) the participants availed. Specifying the treatment received will provide a clearer data.

Despite the response rate being 68%, response bias was still present if the non-responders were either not interested in the survey or too stressed to participate. Extending the sampling period may have provided ample time for participants to answer the online questionnaire.

Although the absence of face-to-face interviews would have allowed respondents to feel more comfortable in reporting their symptoms, it also prevented the tracing and investigation of nonresponders and follow-up of staff members who needed help.

Longitudinal studies on the same population may be conducted to investigate depressive symptoms during the different phases of the pandemic.

Furthermore, this study did not investigate on other mental health issues that could arise in a pandemic such as anxiety, stress, resilience, etc. Studies investigating these responses are suggested.

## CONCLUSION

Four months after the outbreak of the COVID-19 pandemic, more than a third (33.86%) of

resident physicians in a tertiary hospital screened positive for mild to severe depression using PHQ-9.

Measures to reduce work related physical exhaustion and to promptly identify significant depressive symptoms, particularly those that increase risk of suicide, was necessary. Current mental health support programs must be strengthened and made specific, to prevent and address depression especially among those who have a history of psychiatric and medical illness.

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## REFERENCES

1. World Health Organization. Coronavirus in the Philippines. World Health Organization. 2020 October 7. [cited 2020 December 11]; Available from: <https://www.who.int/philippines/emergencies/covid-19-in-the-philippines>
2. Caro K. Resources poured into SPMC to reduce infection in private hospitals. Philippine Information Agency. 2020 April 8. [cited 2020 March 19]; Available from: <https://pia.gov.ph/news/articles/1038374>.
3. Preti E, Di Mattei V, Perego G, Ferrari F, Mazzetti M, Taranto P, et al. The Psychological Impact of Epidemic and Pandemic Outbreaks on Healthcare Workers: Rapid Review of the Evidence. *Curr Psychiatry Rep.* 2020 Jul; 22(8): 43. doi:10.1007/s11920-020-01166-z.
4. Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, et al. Factors Associated with Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. *JAMA Network Open.* 2020; 3(3): e203976. doi:10.1001/jamanetworkopen.2020.3976.
5. Liu S, Yang L, Zhang C, Xiang YT, Liu Z, Hu S, et al., Online mental health services in China during the COVID-19 outbreak. *Lancet Psychiatry.* 2020; 7(4): 17-18. doi: 10.1016/S2215-0366(20)30077-8.
6. Lee SH, Shin HS, Park HY, Kim JL, Lee JJ, Won SD et al. Depression as a Mediator of Chronic Fatigue and Post-Traumatic Stress Symptoms in Middle East Respiratory Syndrome Survivors. *Psychiatry Investig.* 2019;16(1): 59-64. doi: 10.30773/pi.2018.10.22.3.
7. McAlonan G, Lee A, Cheung V, Cheung C, Tsang K, Sham P, et al. Immediate and sustained psychological impact of an emerging infectious disease outbreak on health care workers. *Can J Psychiatry.* 2007; 52(4): 241-7. doi:10.1177/070674370705200406.
8. Lancee W, Maunder R, Goldbloom D. Prevalence of Psychiatric Disorders Among Toronto Hospital Workers One to Two Years After the SARS Outbreak. *Psychiatr Serv.* 2008; 59(1): 91-95. doi:10.1176/ps.2008.59.1.91.
9. Pereira-Lima K, Mata D, Loureiro S, Crippa J, Bolsoni L, Sen S. Association Between Physician Depressive Symptoms and Medical Errors A Systematic Review and Meta-analysis. *JAMA Netw Open.* 2019; 2(11):e1916097. doi: 10.1001/jamanetworkopen.2019.16097.
10. Kim Y, Seo E, Seo Y, Dee V, Hong E. Effects of Middle East Respiratory Syndrome Coronavirus on post-traumatic stress disorder and burnout among registered nurses in South Korea. *International Journal of Healthcare.* 2018; 4(2): 27. doi: 10.5430/ijh.v4n2p27.
11. Rancans E, Trapencieris M, Ivanovs R, Vrublevska J. Validity of the PHQ-9 and PHQ-2 to screen for depression in nationwide primary care population in Latvia. *Ann Gen Psychiatry.* 2018; 2(17): 33. doi:10.1186/s12991-018-0203-5.
12. Tan B, Chew N, Lee G, Jing M, Goh Y, Yeo L et al. Psychological Impact of the COVID-19 Pandemic on Health Care Workers in Singapore. *Annals Internal Medicine.* 2020; 173(4): 317-320. doi:10.7326/M20-1083.
13. Bianco F, Incollingo P, Grossi U, Gallo G. Preventing Transmission Among Operating Room Staff During COVID-19 Pandemic: the Role of the Aerosol Box and other Personal Protective Equipment. *Updates in Surgery.* 2020 May 24; 72(3): 907-910. doi:10.1007/s13304-020-00818-7.
14. Joules N, Williams D, Thompson A. Depression in Resident Physicians: A Systematic Review. *Open Journal of Depression.* 2014 Aug;3(3): 89-100. doi: 10.4236/ojd.2014.33013.
15. Duteil F, Aubert C, Pereira B, Dambrun M, Moustafa F, Trousselard M, et al. Suicide among physicians and health-care workers: A systematic review and meta-analysis. *PLoS One.* 2019; 12(14): 12. doi:10.1371/journal.pone.0226361.
16. Hammerberg K, Tran T, Kirkman M, Fisher J. Sex and age differences in clinically significant symptoms of depression and anxiety among people in Australia in the first month of COVID-19 restrictions: a national survey. *BMJ Open.* 2020; 10(11):e042696. doi:10.1136/bmjopen-2020-042696.
17. Tee M, Tee C, Anlacan J, Aligam KJ, Reyes PW, Kuruchittham V, et al Psychological impact of COVID-19 pandemic in the Philippines. *J Affect Disord.* 2020; 1(277): 379-391. doi: 10.1016/j.jad.2020.08.043.
18. Pappa S, Ntella V, Giannakas T, Giannakoulis V, Papoutsis E, Katsaounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. *Brain Behav Immun.* 2020 Aug; 88: 901-907. doi: 10.1016/j.bbi.2020.05.026.
19. Brooks SK, Dunn R, Amlôt R, Rubin GJ, Greenberg N. A Systematic, Thematic Review of Social and Occupational Factors Associated with Psychological Outcomes in Healthcare Employees During an Infectious Disease Outbreak. *J Occup Environ Med.* 2018; 60(3): 248-257. doi: 10.1097/JOM.0000000000001235.
20. Matsuishi K, Kawazoe A, Imei H, Ito A, Mouri K, Kitamura N, et al. Psychological impact of the pandemic (H1N1) 2009 on general hospital workers in Kobe. *Psychiatry Clin Neurosci.* 2012;66(4): 353-60. doi: 10.1111/j.1440-1819.2012.02336.x.
21. Wang H, Liu Y, Hu K, Zhang M, Du M, Huang H, et al. Healthcare workers' stress when caring for COVID-19 patients: An altruistic perspective. *Nurs Ethics.* 2020; 27(7): 1490-1500. doi:10.1177/0969733020934146.
22. Park JS, Lee EH, Park NR, Choi, Y. H. Mental Health of Nurses Working at a Government-designated Hospital During a MERS-CoV Outbreak: A Cross-sectional Study. *Arch Psychiatr Nurs.* 2018; 32(1): 2-6. doi:10.1016/j.apnu.2017.09.006.
23. Mata D, Ramos M, Bansal N, Khan R, Guille C, Di Angelantonio E, et al. Prevalence of Depression and Depressive Symptoms Among Resident Physicians: A Systematic Review and Meta-analysis. *JAMA.* 2015; 314(22): 2373-83. doi: 10.1001/jama.2015.15845.
24. Su TP, Lien TC, Yang CY, Su YL, Wang JH, Tsai SL, et al. Prevalence of psychiatric morbidity and psychological adaptation of the nurses in a structured SARS caring unit during outbreak: a prospective and periodic assessment study in Taiwan. *J Psychiatr Res.* 2007; ;1(1-2):119-30. doi:10.1016/j.jpsychires.2005.12.006.
25. Khanal P, Devkota N, Dahal M, Paudel K, Joshi, D. Mental health impacts among health workers during COVID-19 in a low resource setting: a cross-sectional survey from Nepal. *Global Health.* 2020;16,89 (2020). <https://doi.org/10.1186/s12992-020-00621-z>.
26. Bernburg M, Vitzthum K, Groneberg D, Mache S. Physicians' occupational stress, depressive symptoms and work ability in relation to their working environment: a cross-sectional study of differences among medical residents with various specialties working in German hospitals. *BMJ Open.* 2016; 6(6):e011369. doi: 10.1136/bmjopen-2016-011369.
27. Iob E, Frank P, Steptoe A, Fancourt D. Levels of Severity of Depressive Symptoms Among At-Risk Groups in the UK During the COVID-19 Pandemic. *JAMA Netw Open.* 2020 Oct 26; 3(10): e2026064. doi:10.1001/jamanetworkopen.2020.26064.
28. Zhang WR, Wang K, Yin L, Zhao WF, Xue Q, Peng M, et al. Mental Health and Psychosocial Problems of Medical Health Workers during the COVID-19 Epidemic in China. *Psychother Psychosom.* 2020; 89(4): 242-250. doi: 10.1159/000507639.2-020-00299-5.



#### REFERENCES (Continued)

29. Hajure M, Tariku M, Mohammedhusein M, Dule A. Depression, Anxiety and Associated Factors Among Chronic Medical Patients Amid COVID-19 Pandemic in Mettu Karl Referral Hospital, Mettu, Ethiopia, 2020. *Neuropsychiatric Disease and Treatment*. 2020 Oct 28; 6: 2511-2518. doi:10.2147/NDT.S-281995.
30. Luo L, Fu M, Li Y, Hu S, Luo J, Chen Z, et al. The potential association between common comorbidities and severity and mortality of coronavirus disease 2019: A pooled analysis. *Clinical Cardiology*. 2020 Dec; 43(12): 1478-1493. doi:10.1002/clc.23465
31. Ejaz H, Alsrhani A, Zafar A, Javed H, Junaid K, Abdalla A, et al. COVID-19 and comorbidities: Deleterious impact on infected patients. *J Infect Public Health*. 2020; 13(12): 1833-39. doi: 10.1016/j.jiph.2020.07.014.
32. World Health Organization. WHO Coronavirus Disease (COVID-19) Dashboard. World Health Organization. 2020, Dec 17. <https://covid19.who.int>.
33. Kang L, Ma S, Chen M, Yang J, Wang Y, Li R, et al. Impact on mental health and perceptions of psychological care among medical and nursing staff in Wuhan during the 2019 novel coronavirus disease outbreak: A cross-sectional study. *Brain, Behavior, and Immunity*. 2020 Jul ; 87: 11-17. doi: 10.1016/j.bbi.2020.03.028.
34. Chen Q, Lian M, Li Y, Guo J, Fei D, Wang L, et al. Mental health care for medical staff in China during the COVID-19 outbreak. *Lancet Psychiatry*. 2020 Apr; 7(4): e15-16. doi:10.1016/S2215-0366(20)30078-X.
35. Dimitriu M, Pantea-Stoian A, Smaranda A, Nica A, Carap A, Constantin V, et al. Burnout syndrome in Romanian medical residents in time of the COVID-19 pandemic. *Med Hypotheses*. 2020 Nov; 144:109972. doi: 10.1016/j.mehy.2020.109972.
36. Shaukat N, Ali DM, Razzak J. Physical and mental health impacts of COVID-19 on healthcare workers: a scoping review. *International Journal of Emergency Medicine*. 2020 Jul 20; 3(40). <https://doi.org/10.1186/s12245-020-00299-5>.
37. Gago B, Garcia-Blanco AC. Anhedonia: Psychological predictors, neural mechanisms and clinical treatment options. In: Columbus AM, editor. *Advances in Psychology Research*. 1st ed. Valencia, Spain: Nova Science Publishers; 2015. Volume 107.p. 37-51.
38. Hacimusalar Y, Kahve AC, Yasar AB, Aydin MS. Anxiety and hopelessness levels in COVID-19 pandemic: A comparative study of healthcare professionals and other community sample in Turkey. *Journal of Psychiatric Research*. 2020 Oct; 129: 181-188. doi:10.1016/j.jpsychires.2020.07.024.
39. Wang Y, Jiang N, Cheung E, Sun H, Chan R. Role of depression severity and impulsivity in the relationship between hopelessness and suicidal ideation in patients with major depressive disorder. *J Affect Disord*. 2015; 1(183): 83-9. doi:10.1016/j.jad.2015.05.001.
40. Hawton K, Comabella CC, Haw C, Saunders K. Risk factors for suicide in individuals with depression: a systematic review. *J Affect Disord*. 2013; 14(1): 17-28. doi:10.1016/j.jad.2013.01.004.