

Depression Levels of Undergraduate and Clerkship Medical Students during the COVID-19 Pandemic

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ABSTRACT

The COVID-19 pandemic brought complex challenges for global public health, research and medical communities. Medical students face unique challenges during the pandemic, including disruption of pre-clinical and clinical training. Many students had distance learning as their main course delivery mode, in-person activities were especially retained, clerkship students undergo new protocols to increased safety measures. This study aims to identify the depression levels of undergraduate and clerkship medical students to create proper and effective strategies to build good mental status among medical students during the COVID-19 pandemic. It is a cross-sectional study. The survey was conducted using an online questionnaire to assess respondents' identity, demographic data, family history, perceptions about online/offline learning, and the researchers used the Beck Depression Inventory-II (BDI-II) test to measure the depression levels of the subjects. The subjects of this study were 164 medical students, divided into two groups, 94 final year undergraduate students and 70 final year clerkship students who were still doing their clinical rotations at the hospital. The findings of this study informed that the average depression levels was 5.88 for undergraduate students and 7.03 for clerkship students. The BDI-II score was higher among clerkship students than undergraduate students. However, the statistical analysis showed no difference ($p=0.435$) in BDI-II scores between clerkship and undergraduate students. A close approach and continuous observation are needed because the higher the BDI-II score indicates the higher the depression levels.

Keywords: COVID-19, depression, undergraduate, clerkship, medical students.

1. INTRODUCTION

Depression is a common mental health problem that affects someone's feel. Feeling of sadness and/or loss of interest, loss of energy, and sleep disorder can caused by depression [1]. Depression is a negative interpretation that experienced by someone. Someone who suffering from depression don't see any hope for life and feel the misfortune of future [2]. World Health Organization (WHO) reported that depression is a common mental health problem in worldwide. More than 322 million people in the world have experienced depression, and almost half of it comes from South-East Asia [3]. In December 2019, a series of acute, atypical respiratory diseases was identified in Wuhan, China. and the subsequent disease it causes was named the coronavirus disease 2019 (COVID-19) [4]. The

emergence and rapid increase in the number of cases of Coronavirus Disease 2019 (COVID-19), an COVID-19, pose complex challenges for global public health, research and medical communities. Currently, COVID-19 is a public health emergency of international concern, as declared by the World Health Organization [5]. As of 20 September 2021, 454.499 new and 228.226.384 cumulative cases were reported nationwide. Whereas, In Indonesia, As of 15 September, the Government of Indonesia reported 4 178 164 (3948 new) confirmed cases of COVID-19, 139 682 (267 new) deaths and 3 953 519 recovered cases from 510 districts across 34 provinces [6].

The Indonesian Government provided a Large-Scale Social Restrictions or *Pembatasan Sosial Berskala Besar* (PSBB) as a new national policy on April 2020. Non-essential business is closed, social contact is restricted, peoples are

asked to remain at home, including working, learning, and teaching activities [7]. Not only physical health that needs to be considered during the COVID-19 pandemic, but also mental health has a potential to be affected during a pandemic [8]. Since the declaration of this pandemic, more aggressive measures against COVID-19 have been taken, including shutting down schools and other public places to reduce the transmission of COVID-19 [9]. Decreased physical activity, changes of eating habit during PSBB can affect mental well-being including stress, anxiety, and depression [10]. The impact of new policy are felt across populations, included undergraduate and clerkship medical students [11]. As for other healthcare workers, medical students, are in close contact with changes in health care systems when they occur, including those brought about by the COVID-19 pandemic. Medical students face unique challenges during the pandemic, including disruption of pre-clinical and clinical training. Many students had distance learning as their main course delivery mode, but in person activities were especially retained, clerkship students under go new protocols to increased safety measures [12].

Undergraduate medical students are usually in the age group of late teens to mid-twenties, and hence the current COVID-19 outbreak is the first exposure to them as adults on a pandemic levels. They are sudden changes in their training routine, including teaching and assessment via online sessions, also decreased interactions with peers. These changes result in increased screen time, possible hinderance to their training and increased worries about contracting the infection [13]. In clerkships, many medical schools during that time successfully transitioned to videotaped vignettes, audiotaped recordings, or online chat rooms and webcasting to replace clinical experiences. While simulation may provide alternate clinically related opportunities for medical schools facing the current COVID-19 pandemic, there is a lack of fidelity and realism with such learning methods. As a result, these medical students will have reduced clinical opportunities [14].

Medical student, both Undergraduate and Clerkship already report high levels of psychological distress, anxiety and depression at the end of their first year during pandemic. There is no doubt that many students are ready to accept this challenge [15]. Isolation, boredom, frustrations, worries about contracting the infection, lack of freedom, concerns for family/friends are some of the factors that could affect mental well-being. Poor sleep quality and increased psychological distress were also well-documented during earlier pandemics. In particular, poor sleep

was associated with negative emotions, depressive symptoms and increased risk of mental illness and social isolation was found to be strongly associated too with anxiety, depression, self-harm, and suicidal tendencies [13]

Studies previously reported that both of undergraduates and clerkship medical college students in China have experienced depressive symptoms because of COVID-19 pandemic [16]. Increased levels of depression on undergraduates students were associated with online learning difficulties [17]. Undergraduates students experience far less psychological response than clerkship. Clerkship students on medical college are considered as a part of the health workes. Higher depression on them can be occurred during COVID-19 pandemic because they feel worried about being infected of COVID-19 due to close contact with infectious patients which cause a psychological response, such as depression, and anxiety [16]. Other studies have demonstrated evidence of depressive symptoms in medical students during the pandemic. In a study of 530 medical students, 234 (44.1%) students had a sense of being emotionally detached from family and friends and 202 (38.1%) students reported feeling hopeless, exhausted, or emotionally unresponsive during the quarantine period [18]. So, This study aims to identify the levels of depression among clerkship and undergraduate medical students to create proper and effective strategies to build good mental status among medical students.

2. METHOD

This is a cross-sectional study. It involved 164 medical students of the Faculty of Medicine Universitas Muhammadiyah Surakarta. The sampling method is universal sampling. The students were divided into two levels of medical education, the final year of clerkship students who were still on their clinical rotation at the hospital and the final year of undergraduate students who were ready to start their clinical clerkship. The researchers used an online platform to assess identity, demographic data, family history, and depression levels using the Beck's Depression Inventory II (BDI-II) questionnaire that was translated to Bahasa Indonesia. The data was collected from August 31st 2020 until September 9th 2020.

This Questionnaire contains a depression scale that describes 21 categories, each of the 21 items corresponding to a

symptom of depression is summed to give a single score for the Beck Depression Inventory-II (BDI-II). There is a four-point scale for each item ranging from 0 to 3. On two items (16 and 18) there are seven options to indicate either an increase or decrease of appetite and sleep. Cut-off score guidelines for the BDI-II are given with the recommendation that thresholds be adjusted based on the characteristics of the sample, and the purpose for use of the BDI-II. Total score of 0–13 is considered minimal range, 14–19 is mild, 20–28 is moderate, and 29–63 is severe.

The data was presented in the form of mean, standard deviation, proportion, and analysed with SPSS. This study had obtained an ethical clearance provision from the Ethical Clearance Committee of Faculty of Medicine Universitas Muhammadiyah Surakarta No.3044/B.2/KEPK-FKUMS/IX/2020.

3. RESULTS

The subjects of this study were 164 medical students, consist of 113 female, and 51 men whose mean of age was 23 years old. Ninety-four of them were undergraduate students, and 70 of them were clerkship. The mean of BDI-II Score of all subjects was 6.37 ± 7.61 . (Table 1.)

Table 1. Sample characteristics and univariate analysis data of variables related to depression level.

Number of Subjects	Mean age \pm SD*(years.old)		Mean BDI-II Score \pm SD	
164	23.15 \pm 1.174		6.37 \pm 7.61	
Variables	Number	Percentage	Depression levels	<i>P</i> **
			Mean BDI-II Score \pm SD	
Gender (n=164)				
Male	51	31.10%	6.33 \pm 8.5	0.477***
Female	113	68.90%	6.39 \pm 7.2	
Level of medical education (n=164)				
Undergraduate	94	57.30%	5.88 \pm 7.0	0.435***
Clerkship	70	42.70%	7.03 \pm 8.5	
Gender of undergraduate students (n=94)				
Male	33	35.10%	6.36 \pm 8.1	0.952***
Female	61	64.90%	5.62 \pm 6.3	
Gender of clerkship students (n=70)				
Male	18	25.70%	6.28 \pm 9.5	0.282***
Female	52	74.30%	7.29 \pm 8.1	
Marital status (n=164)				
Single	160	97.60%	6.41 \pm 7.7	0.859***
Married	4	2.40%	4.75 \pm 4.9	
Having children (n=164)				
Yes	2	1.20%	9.00 \pm 1.4	0.235***
No	162	98.80%	6.34 \pm 7.6	
Parents' job (n=164)				
Healthcare workers	60	36.60%	5.78 \pm 7.2	0.297***
Non-healthcare workers	104	63.40%	6.71 \pm 7.9	
Isolation experience (n=164)				
Yes	9	5.50%	5.90 \pm 5.90	0.873***
No	155	94.50%	6.40 \pm 7.71	
Financial problem (n=164)				
Yes	54	32.90%	7.93 \pm 8.46	0.028****
No	110	67.10%	5.61 \pm 7.07	
Blood type (n=164)				
A	36	22.00%	8.00 \pm 9.31	0.533***
B	42	25.60%	6.83 \pm 7.28	
AB	18	11.00%	5.56 \pm 7.33	
O	68	41.50%	5.44 \pm 6.85	
Perception of learning method during pandemic (n=164)				
Prefer offline learning	75	45.70%	6.24 \pm 7.58	0.920***
Prefer online learning	89	54.30%	6.48 \pm 7.67	

*Standard Deviation

**Man Whitney Test for variables 2 groups and Crusal Wallis for Variable with more than 2 groups.

***Nonsignificant difference

****Significant difference

4. DISCUSSION

COVID-19 pandemic affects all aspects of life. The pandemic has introduced of new method of delivering education at all levels from preschool – postgraduate. It delivered by online such as webinar, and zoom [19]. Those new method has contributed toward increasing levels of mental health crisis all around the world, especially for medical students. Its able to effect on mental health crisis, such as anxiety, fear, and depression [20]. Prevalence of depression, anxiety, and sleep disorder is higher significantly in the COVID-19 pandemic [21]. It can happen because of an unpleasant experience during the pandemic such as home quarantine and isolation [22].

Depression levels of medical students can be affected by COVID-19 pandemic. Mental health crisis can occur during pandemic because the government makes a new policy, such as long period of lockdown, and educational disruptions to prevent distributing COVID-19 [23]. The pandemic altered medical students' learning experience as the undergraduate, and also the clerkship.

Clerkship students showed higher BDI-II Score than undergraduate students, although the difference isn't significant. Clerkship students have different from any another academic programs, because they may miss the opportunity for a rotation completely. In the other hands, the extended period of suspended clerkships can disrupt the ability essential decision making skill that necessary for them in the future [14]. Even more, clerkship students who follow clinical rotation will meet patients directly and they can meet covid 19 patients. The issues may lead clerkship students to fall prey for mental crisis and being vulnerable to have depression [22]. The study of Perisotto (2021) are found that high levels of mental crisis in medical students especially depression because they have fewer resources to deal with depression.

Generally, female medical students have higher BDI-II Score than male in this study, although the difference wasn't significant. The score is 6.39 for female medical students, and 6.33 for male medical students. From BDI-II Score data reveals from gender and levels of subject's education, female clerkship students have a higher BDI-II score than male clerkship students. From the BDI-II score data viewed from gender and levels of education, male undergraduate students have a higher score than female undergraduate students. It's different with clerkship, female clerkship students show higher BDI-II score compared to male clerkship students.

Other study confirmed the result that female might have used different coping and adaptation

stress that haven't helped them to control their mental issues [24].

Another reported in the study of Eweida (2020) that female are more emotionally responsive and they can do the unpleasant experience negatively than man. The triggers for depression appear to differ, with women more often presenting with internalizing symptoms and men presenting with externalizing symptoms. The fact that increased prevalence of depression correlates with hormonal changes in women, particularly during puberty, prior to menstruation, following pregnancy and at perimenopause, suggests that female hormonal fluctuations may be a trigger for depression he male brain testosterone is converted into estrogen by endogenous aromatase (CYP19). Estrogen could mediate protective actions through estrogen receptors expressed throughout the male brain (especially estrogen receptor β). In addition, the presence of androgen receptors in men may confer protection, for example in hippocampal neurons. Since testosterone does not cycle in men as estrogen does in women, there may be a more consistent protection in men. However, men also have sexually dimorphic brain nuclei, particularly in the hypothalamus, so the lower prevalence of depression in men is probably more complex owing not only to hormonal differences, but also to developmental differences in brain circuitry [25].

Marital status in our study showed that single status have higher BDI-II Score than marriage. The score of BDI-II is 6.41 for single status, and 4.75 for marriage status. There wasn't difference significant of our study result. Other study confirmed the result that single status has a higher BDI-II score than marriage status [26]. The condition considered at risk for mental health crisis such as depression because has low social experience, and emotional support. In the other hand, marriage status has emotional support enough and makes individual mature [27]. The possession of children did not significantly influence depression levels in this study because the number of medical students who are married and having children are few.

Characteristics of our study showed that medical students whose parents are non-healthcare workers have higher BDI-II Score than medical student whose parents are healthcare workers. The score are 6.71 for non-healthcare workers and 5.78 for healthcare workers, those are not significant differences. Other study showed that healthcare workers are protective factor for mental health issues. Medical students whose parents' job being a health workers were at lower risk of developing mental health crisis because they had clear communication and family support as coping ability [28]. So that, it can be reducing the levels

of depression or another mental health crisis in their families because if medical students whose health workers parent are adapt to the pandemic easily [28].

Isolation experience during the pandemic has lower BDI-II Score that someone whose not isolation experience. The result reveals 5.90 for there was an isolation experience, and 6.40 whose not isolation experience, although the difference isn't significant. During the pandemic, the government implementing a new policy such as school closures, social distancing, and isolation whose positive COVID-19. Those new policy are likely to result in increased loneliness. Loneliness is the painful emotional that established links strongest between depression [29]. Those findings were consistent across children, adolescents, and young adult. People who had experienced of isolation have 5 times risk to require mental health [29].

Medical students whose Financial problem or financial concerns have higher DBI Score than medical students whose not financial problem, significantly. The score are 7.93 for subject whose financial problem, and 5.61 for subject whose not financial problem. There is a study reported that financial problem is isgnificantly being a predictors of mental well-being. Lockdown and COVID-19 pandemic affect financial instability that increased the risk of depression Over 48% of study participants reported the impact of the pandemic on their finances concerns [30].

The blood group difference factor does not appear to have a significant contribution to the levels of depression, although the survey results showed that medical students with blood type A had the highest mean of BDI-II score of 8.00. The study by Iqbal (2017) Blood group A in medical studens have significant corelation to depression, it because blood group A mostly represent with high levels of cortisol and the cortisol is a stress hormone, so the person is more prone to develop hypertension, hyper cholesterol, Alzheimer etc so they are more predisposed to develop absessional neurosis, dep ression and stress in personality, In the findings another study, people with blood type A had the most emotional sensitivity and stable emotions [31].

Students who preferred online learning during the pandemic had higher depression than those who preferred offline learning (6.48 compared to 6.24) although the difference was not significant. The study by Bolatov (2021), during Online learning in COVID-19 pandemic, most often medical students complained about the following symptoms: fatigue, headaches, menstrual pain, or other problems with the menstrual cycle in women, backache, and trouble sleeping (in more than 43% of cases). In one cross-sectional

study that was conducted in China among college students, it was found that the frequency of somatic symptoms is 35% [32].

This study has several limitations. First, since the data and relevant analyses presented were derived from a cross-sectional design, it is difficult to make causal inferences. Second, the study was limited to the COVID-19 outbreak, and we used a web-based survey method to avoid possible infections, causing the sampling of the study was voluntary and conducted by an online system. Therefore, the possibility of selection bias should be considered. Third, this study cannot explain the heterogeneity between other studies, and caution should be taken when interpreting the results. Another limitation is due to the sudden occurrence of the disaster, we do not have baseline data about depression levels of medical students of Universitas Muhammadiyah Surakarta before the COVID-19 pandemic, as a comparison.

5. CONCLUSION

There is no difference in BDI-II score between clerkship students and undergraduate students during this pandemic. It seemed that the medical students had a good coping ability during the COVID-19 pandemic indicated by the overall BDI-II score that is overall under 13, that is considered minimal range of depression levels. Although overall BDI-II score is overall under 13, those who had financial problems should receive more attention because there are significant P value. Further evaluation and observation are needed to make sure their psychological conditions.

AUTHORS' CONTRIBUTIONS

I.N.N.M, S, and A.H conceived of the presented idea. I.N.N.M, N.A, and R.K.L developed the theory and performed the computations. I.N.N.M, and S. verified the analytical methods. N.A and R.K.L wrote the manuscript with support from I.N.N.M, S. and A.H. All authors discussed the results and contributed the final manuscript.

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REFERENCES

- [1] American Psychiatric Association, "Depression," 22 September 2020. [Online]. Available: <https://www.psychiatry.org/patients-families/depression/what-is-depression>.
- [2] J. Asshiddiqie and N. J. Triastuti, "The Relation Between Stress Level, Sleep Quality, Depression Level, And Use Of Gadget With Learning Achievement Of Medical Student," in *Thalamus*, Surakarta, 2020.
- [3] WHO, "Depression and Other Common Mental Disorder," 2017. [Online]. Available: <https://apps.who.int/iris/bitstream/handle/10665/254610/WHO-MSD-MER-2017.2-eng.pdf>.
- [4] J. Deng, F. Zhou, W. Hou, Z. Silver, C. Y. Wong, O. Chang, E. Huang and Q. K. Zuo, "The prevalence of depression, anxiety, and sleep disturbances in COVID-19 patients: a meta-analysis," *Psychiatric disorders in COVID-19 patients*, pp. 1-22, 2020. E. P. H.
- [5] Choi, B. P. H. Hui and E. Y. F. Wan, "Depression and Anxiety in Hong Kong during COVID-19," *International Jurnal of Environmental Research and Public Health*, pp. 1-11, 2020.
- [6] WHO, "Coronavirus Disease 2019 (COVID-19) Situation Report," 15 September 2021. [Online]. Available: <https://www.who.int/indonesia>.
- [7] J. Rutland-Lawes, A.-S. Wallinheimo and S. L. Evans, "Risk Factors for Depression during The COVID-19 Pandemic: a Longitudinal Study in Middle-aged and Older Adults," *Bj Pysch Open*, vol. 7, no. 5, pp. 1-7, 2021.
- [8] Y. Xiao, B. Becerik-Gerber, G. Lucas and S. C. Roll, "Impacts of Working From Home During COVID-19 Pandemic on Physical and Mental Well-Being of Office Workstation Users," *American College of Occupational and Environmental Medicine*, pp. 181-190, 2021.
- [9] A. A. Nabila, I. N. N. Mahmuda, Sulistyani and A. Herdaetha, "Anxiety Levels of Undergraduate and Clerkship Medical Students during the COVID-19 Pandemic," *The Malaysian Journal of Islamic Sciences*, vol. 3, pp. 91-102, 2021.
- [10] S. Sankhi and N. R. Marasine, "Impact of COVID-19 Pandemic on Mental Health of the General Population, Students, and Health Care Workers: A Review," *Preprints*, pp. 1-17, 2020.
- [11] M. H. E. M. Browning, L. R. Larson, I. Sharaievska, A. Rigolon, O. McAnirlin, L. MullenbachI, S. Cloutier, T. M. Vu, J. Thomsen, N. Reigner, E. C. Metcalf, A. D'Antonio and M. Helbich, "Psychological Impacts from COVID-19 among University Students: Risk Factors Across Seven," *PLOS ONE*, pp. 1-27, 2021.
- [12] T. Perissotto, T. C. R. P. d. Silva, F. P. C. Miskulin, M. B. Pereira, B. A. Neves, B. C. Almeida, A. Victoria, S. R. I. Ribeiz and P. V. Nunes, "Mental health in medical students during COVID-19 quarantine: a comprehensive analysis across yearclasses Classes," *CLINICS*, pp. 1-8, 2021.
- [13] I. Saraswathi, J. Saikarthik, K. S. Kumar, K. M. Srinivasan, M. Ardhanaari and R. Gunapriya, "Impact of COVID-19 outbreak on the mental health status of undergraduate medical students in a COVID-19 treating medical college: a prospective longitudinal study," *PeerJ*, 2020.
- [14] A. Akers, C. Blough and M. S. Iyer, "COVID-19 Implications on Clinical Clerkships and the Residency Application Process for Medical Students," *Cureus*, vol. 12, no. 4, pp. 1-5, 2020.
- [15] L. O'Byrne, B. Gavin, D. Adamis, Y. X. Lim and F. McNicholas, "Levels of stress in medical students due to COVID-19," *J Med Ethics*, pp. 383-388, 2021.
- [16] L. Huang, H. Liu and F. Xu, "Emotional responses and coping strategies of nurses and nursing college students during COVID-19 outbreak," *medRxiv*, pp. 1-17, 2020.
- [17] A. Kecojevic, C. H. Basch, M. Sullivan and N. K. Davi, "The impact of the COVID-19 epidemic on mental health of undergraduate

- students in New Jersey, cross-sectional study," *Plos One*, pp. 1-16, 2020.
- [18] R. Mittal, L. Su and R. Jain, "COVID-19 mental health consequences on medical students worldwide," *Journal Community Hosp Intern Med Perspect*, vol. 11, no. 3, pp. 296-298, 2021.
- [19] P. Sandhu and M. d. Woif, "The impact of COVID-19 on the undergraduate medical curriculum," *Medical Education Online*, 2020.
- [20] A. J. Rodríguez-Hidalgo, Y. Pantaleón, I. Dios and D. Fall, "Fear of COVID-19, Stress, and Anxiety in University Undergraduate Students: A Predictive Model for Depression," *Frontiers in psychology*, pp. 1-9, 2020.
- [21] M. Jakovljevic, I. Jakovljevic, S. Bjedov and F. Mustac, "COVID-19 and blame games people play from public and global mental health perspective," *Psychiatria Danubina*, pp. 221-228, 2020.
- [22] R. S. Eweida, Z. I. Rashwan, G. M. Desoky and L. M. Khonji, "Mental strain and changes in psychological health hub among intern-nursing students at pediatric and medical-surgical units amid ambience of COVID-19 pandemic: A comprehensive survey," *Nurse Education in Practice*, 2020.
- [23] C. G. Sibley, L. M. Greaves, N. Satherley, M. S. Wilson, C. H. J. Lee, P. Milojev, J. Bulbulia, D. Osborne, T. L. Milfont, C. A. Houkamau and I. M. Duck, "Effects of the COVID-19 pandemic and nationwide lockdown on trust, attitudes toward government, and well-being," *Am Psychol*, pp. 618-630, 2020.
- [24] S. H. Hamaideh, H. Al-Modallal, M. Tanash and A. Hamdan-Mansour, "Depression, anxiety and stress among undergraduate students during COVID-19 outbreak and "home-quarantine"," *Nursing Open*, pp. 1-9, 2021.
- [25] P. R. Albert, "Why is depression more prevalent in women," *Psychiatry Neurosci*, vol. 40, no. 4, 2015.
- [26] M. L. Tee, C. A. Tee, J. P. Anlacan, K. J. G. Aligam, P. W. C. Reyes, V. Kuruchittham and R. C. Ho, "Psychological impact of COVID-19 pandemic in the Philippines," *J Affect Disord*, pp. 379-391, 2020.
- [27] A. A. Alkhamees, S. A. Alrashed, A. A. Alzunaydi, A. S. Almohimeed and M. S. Aljohani, "The psychological impact of COVID-19 pandemic on the general population of Saudi Arabia," *Compr Psychiatry*, p. 102, 2020.
- [28] N. D. Brier, S. Stroobants, P. Vandekerckhove and E. D. Buck, "Factors affecting mental health of health care workers during coronavirus disease outbreaks (SARS, MERS & COVID-19): A rapid systematic review," *PLoS One*, 2020.
- [29] M. E. Loades, E. Chatburn and N. R. S. S. R. B. A. L. C. M. M. N. B. C. & C. E. Higson-Sweeney, "Rapid Systematic Review: The Impact of Social Isolation and Loneliness on the Mental Health of Children and Adolescents in the Context of COVID-19," *Journal of the American Academy of Child and Adolescent Psychiatry*, pp. 1218-1239, 2020.
- [30] I. Solomou and F. Constantinidou, "Prevalence and Predictors of Anxiety and Depression Symptoms during the COVID-19 Pandemic and Compliance with Precautionary Measures: Age and Sex Matter," *Int J Environ Res Public Health*, 2020.
- [31] S. Iqbal, R. Akram, S. Akram, . M. Saif ullah, Q. u. I. Fatima and H. M. I. Afzal, "Association between ABO Blood Group Phenotype and Reaction to Academic Stress in Young Medical Students," *International Journal of Contemporary Medical Research*, vol. 6, no. 11, 2019.
- [32] A. K. Bolatov, T. Z. Seisembekov, A. Askarova, R. K. Baikanova, D. S. Smailova and E. Fabbro, "Online-Learning due to COVID-19 Improved Mental Health Among Medical Students," *Med.Sci.Educ.*, vol. 31, p. 183-192, 2021