Jordan Journal of Nursing Research

www.jjnr.just.edu.jo

The Effect of COVID-19 on Tawjeihi Students' Anxiety and Depression in Jordan: A Cross-sectional Study

Nihaya Al Sheyab RN, PhD [1]; Azhar Omar Alshami, MSc [1]*

1 Society Health Division, Jordan University of Science and Technology, Irbid, Jordan.
 * Correspondent Author. Email: azharalshami@yahoo.com

ARTICLE INFO

ABSTRACT

Background: The COVID-19 pandemic has had a significant negative impact on the mental health of students. Students have reported feelings of boredom, relaxation, and complications during remote learning, as well as missing social interactions and experiencing fear, sadness, and anxiety when hearing news about COVID-19. **Purpose**: The objective of this study is to investigate the level of anxiety and depression among the students who practiced online learning through COVID-19. **Methods**: A quantitative study was used. The study used a convenience sampling method to collect data. The total number of the sample reached 390 students. The students were selected from the University of Jordan and Applied Science University in Amman. The other part of the sample was collected from the governmental and private schools in Amman governorate. The questionnaire was used as a tool for data collection. **Results**: The results showed a wide variation of the conditions inside households that left a deep impact on the students in Tawjihi. The previous conditions and the difficulties that the families faced to save the internet with high criteria left high pressure on Tawjihi students. The results showed that the complete lockdown due to COVID-19 caused different levels of depression and anxiety. The results showed that the students were depressed from online learning due to the difficulties that they faced in reaching the online sessions and the difficulty in managing the online platforms. **Conclusion**: Online learning left different levels of depression and anxiety among the Tawjihi students as a result of the low experience of online learning. **Implications for Nursing**: By addressing anxiety and depression among students, nursing science can contribute to the development of effective interventions and support systems that enhance students' mental well-being and overall educational experience.

Keywords: Online learning, High-school students, Depression, Anxiety.

What does this paper add?

1. This paper addresses the consequences that may result of shifting from long run educational style to a sudden new style on the mental health of the students.
2. Continuous training on how to utilize online learning with the minimization of depression and anxiety is paramount.

Introduction

The coronavirus disease 2019 (COVID-19) distribution and the consequences of its effects left millions of people around the world living in an ambiguous stage in their lives. The health consequences of COVID-19 included thousands of infected people everywhere, and the high percentage of deaths resulting from the pandemic in different countries increased individuals' worries about their

lives worldwide (Paudel et al., 2021).

The lockdown in different countries was applied to educational systems. Most countries used online teaching to replace the physical attendance of students in schools. This conversion created depression and anxiety for students due to different factors including their inability to access the online teaching process and their low ability to react to online teaching similarly to their physical teaching process (Sundarasen et al., 2020). In Jordan, the students experienced different levels of anxiety and depression before the COVID-19 pandemic (Malak & Khalifeh, 2018). The complete lockdown left hundreds of students away from accessing online teaching, minimized the students' observation through their teaching, and decreased the level of care that should be provided for students according to their needs. These conditions created depression and anxiety among the students to cope with the teaching needs and to follow their teachers in getting the required educational needs (Basheti et al., 2021, 2023).

The COVID-19 pandemic has had a significant impact on student achievement. Studies have shown that the pandemic and the resulting shift to remote learning have led to challenges in students' adjustment to daily life and new learning methods (Suryatiningsih et al., 2021). However, there is evidence to suggest that COVID-19 confinement has improved students' learning performance and efficiency (Gonzalez et al., 2020). On the other hand, school closures during the pandemic had a negative effect on student achievement, particularly among younger students and those from low socio-economic backgrounds (Hammerstein et al., 2021). Additionally, the transition to remote learning has resulted in decreased motivation, engagement, and perceptions of success among university students (Daniels et al., 2021). Educators need to address these challenges and provide support to students to mitigate the negative effects of the pandemic on their achievement (Holderieath et al., 2021).

Online learning has been found to adversely affect students' mental health, specifically leading to increased levels of stress, anxiety, and depression (Noviati et al., 2020; Starkey et al., 2016). The isolation from peers and lecturers, difficulties in using online platforms, lack of guidance and counseling, and high levels of distraction

have been identified as major causes of stress among students (Akpınar, 2021). Additionally, the prolonged duration of playing online games has also been found to be associated with higher levels of depression among students (Jojoa et al., 2021). These findings highlight the need to address the mental health concerns of students in online learning environments and implement strategies to provide support and guidance to mitigate the negative effects on their well-being (Trifan et al., 2021). By addressing anxiety and depression among students, nursing science can contribute to the development of effective interventions and support systems that enhance students' mental well-being and overall educational experience. This study will introduce knowledge about the consequences of shifting from common educational tools to new ones on the students' depression and anxiety.

Theoretical Framework

The COVID-19 pandemic has had a significant negative impact on the mental health of students. Factors contributing to increased stress levels include lower overall life satisfaction, worsened health situation, lack of social support and interaction, worries about financial difficulties, stressful thoughts about the pandemic, feeling unable to positively influence the situation, and study-related effects, such as perceived study burden and likely delay in studies (Schröpfer et al., 2021). Students have reported feelings of boredom, relaxation, and complications during remote learning, as well as missing social interactions and experiencing fear, sadness, and anxiety when hearing news about COVID-19 (Fitriyana et al., 2021). University students evaluated during the pandemic have shown significantly higher levels of anxiety, depression, and stress compared to pre-pandemic times (Maia & Dias, 2020). The pandemic has also led to increased levels of stress, anxiety, and sadness among students in Mexico, with factors such as gender and income reduction playing a role (Fruehwirth et al., 2021). These findings highlight the need for proactive efforts to support the mental health and well-being of students during the pandemic.

Research Problem

Online teaching was practiced in Jordan to face the complete lockdown through COVID-19. The lack of knowledge about online teaching created different problems for the students leaving them experiencing

different levels of anxiety and depression. This study investigates the levels of anxiety and depression that students experienced.

Methods

Research Objective: Investigating the levels of anxiety and depression levels that the students experienced through online learning.

Research Questions: This study will answer the main question: "What is the effect of COVID-19 on students' anxiety and depression? This will be achieved through answering the following questions: What is the level of depression that the students lived through online teaching during the COVID-19 pandemic? What is the effect of online teaching on the life patterns of students through the COVID-19 pandemic? What are the consequences left on students' depression results of online teaching through the COVID-19 pandemic?

Research Design: The research used a descriptive quantitative study design, as this design facilitates the quantitative data collection for the students' depression and anxiety, as well as the application of such procedure in previous studies.

Research Setting: The study was conducted among Tawjihi students from 2020-2021 through the COVID-19 pandemic. The study will include the students who finished the Tawjihi schools and got complete online learning and the current students who practiced face-to-face learning process.

Research Population and Sample: The study population included all Tawjihi students in 2020 and 2021 studying years in Jordan. The total number of students of Tawjihi students in 2020-2021 was 95,451, while the number increased in 2021-2022 to reach 144,000 regular students distributed among the governmental and private schools (Ministry of Education, 2021). Due to the difficulty of reaching the population of the study, a simple random sample (SRS) was selected. Through the SRS equation, the total number of the random sample was 390 students. The sample was collected from governmental and private schools in Amman governorate, as well as one public university and another private university in Amman. The Tawjeihi students of 2020-2021 and 2021-2022 were included in this study.

Research Tools and Data Collection: A questionnaire was prepared for the collection of data. The study questionnaire preparation was based on the Beck Anxiety Inventory (BAI) to investigate the level of anxiety of the students experiencing online studying through the COVID-19 pandemic (Beck et al., 1988). The measure includes 10 items. Also, the study used depression measurement tools to measure depression. The depression statements were abstracted from the Depression Anxiety and Stress Scale (DASS) and modified to meet the requirements of this study (Lovibond & Lovibond, 1996). The measure included 20 anxiety criteria. The questionnaire was translated into Arabic and then into English to ensure rigorous translation. A five-point Likert scale was used for anxiety, while a 4-point Likert scale was used for depression. The questionnaire was distributed physically to the students in the schools and universities.

Validity and Reliability: The prepared questionnaire forms were sent to a group of specialists inside and outside the university to measure the validity. The validity was checked by an expert panel group of specialists inside and outside the university to measure the validity to evaluate the suitability of each dimension's questions to the desired dimension to be measured.

The questionnaire was distributed to a pilot study sample outside the original sample composed of 30 respondents to measure the internal consistency and the structure of the questionnaire. The results showed that the consistency coefficient was acceptable for such research. Table 1 shows Cronbach's alpha values for the reliability test. The results showed that the alpha values exceeded 0.6 which is the minimum acceptable limit for such studies (Hair et al., 2007).

Table 1. Cronbach's alpha values for the study tool

Variable	Alpha value
Depression	0.708
Anxiety	0.899
The whole tool	0.972

Ethical Approval: Ethical approval was obtained from the Jordan University of Science and Technology. Also, informed consent was obtained from each participant in the study through the agreement of

participation introduced in the introduction of the questionnaire. In addition, approval from the governmental bodies was taken.

Statistical Analysis: The collected data was entered into the SPSS (ver. 26). The data was cleaned through the exclusion of the questionnaire forms not eligible for analysis due to missing or contradicting answers. Two types of statistical analysis were used as follows: Descriptive statistics were used. Frequencies and percentages were used to describe the socio-demographic characteristics of the sample. Means and standard deviations were used to measure the levels of depression and anxiety.

Study Limitations: The study faced the difficulty of data collection due to the redistricted movement after the cancelation of the lockdown, which extended the period of data collection. Moreover, the move of students to join the universities doubled the required effort for data collection.

Results
The Socio-demographic Characteristics of Students

The results show that the percentage of females in the sample was higher (63.6%) forming nearly two-thirds of the sample. The ages of the sample represent the current Tawjihi students and ex-Tawjihi students who were forced to practice online learning to finish the higher school stage. (Table 2).

The highest percentage of the families have a low monthly income of less than 500 JD (34.5%), while the families with a monthly income of more than 1000 JD formed a good percentage (27.2%). (Table 2). The number of family members of the students who participated in this study showed that the highest number of families have 5-8 members, which reflects the higher number of members that join online learning in the family (40.0%). The percent of families with members less than 5 formed 38.2%. These results reflect the variety of difficulties that face students in practicing online education (Table 2).

The results showed that 56.7% of the families have 1 to 3 sons joining schools or universities. The rest of the families (43.3%) have more than 3 members joining schools and universities at the same time (Table 2). Also, about two-thirds of the sample are joining governmental schools or graduated from governmental schools at the time of the pandemic (62.3%). Only about one-third of the sample graduated from private schools, forming 37.7% of the sample.

The results show that 16.7% of the students suffered from providing internet to practice online learning during the time of COVID-19, while 83.3% of the students have internet access. The lack of internet at home forms the start of suffering with online learning. The other problem related to the internet is related to enough internet speed to practice online learning. The results show that 38.5% of the students were suffering from internet speed which facilitates their connection through online learning. The distribution of the internet for more than one set at the same time will affect the internet speed. The results showed that 16.7% of the sample are connecting more than three sets to the internet to practice online learning (Table 2).

There are other problems related to the internet's suitability to practice online learning. The results of this study revealed that about 18.5% of the students were suffering from unstable Wi-Fi connections, affecting their ability to follow up the online learning process and so affected their anxiety and depression. The connection of more than one set at the same time at home will affect the stability of the internet speed (Table 2).

The pressure on the internet at the time of COVID-19 was very high, as thousands of students were using the internet at the same time to access their online education. After the pandemic, the pressure on the internet was decreased due to the practice of physical education, which encouraged the students at the Tawjihi stage to keep using online learning through private educational platforms (63.6%) or practice online learning at the university (33.6%) as part of the hybrid educational system applied after the pandemic (Table 2).

Table 2. The socio-economic characteristics of the students

Characteristic	Frequency	Percentage (%)
Gender		
Male	142	36.4
Female	248	63.6

Age (Years)		
17	15	3.8
18	149	38.2
19	93	23.8
20	77	19.7
21	56	14.4
Family monthly income (JD)		
< 500	135	34.6
500-750	93	23.8
751-1000	56	14.4
> 1000	106	27.2
Number of family members		
<5	149	38.2
5-8	156	40.0
>8	85	21.8
Number of family members at schools or universities		
1-3	221	56.7
>3	169	43.3
Type of school		
Governmental	243	62.3
Private	147	37.7
Tawjeihi study stream		
Scientific	327	83.8
Literate	63	16.2
Internet availability		
Yes	325	83.3
No	65	16.7
Internet speed problems		
Yes	150	38.5
No	240	61.5
Number of sets connected at the same time		
1-3	325	83.3
>3	65	16.7
Reaching the online platform		
Yes	318	81.5
No	72	18.5
Unstable Wi-Fi		
Yes	318	81.5
No	72	18.5
Practicing online learning after the pandemic		
Yes	248	63.6
No	142	36.4
Practicing online learning at the university		
Yes	131	33.6
No	259	66.4

Depression Levels among Students Resulting from Online Learning

Figure 1 shows the results of the depression distribution among the students while practicing online learning. The results show that most of the students agreed that they deserve much more than online learning (3.99±0.93). This reflects the low satisfaction which the students have while practicing online learning. Another depression cause is related to the gap of supervision in online learning classes (3.81±1.11). Most of the students reported that they did not experience any positive feelings while practicing online learning (3.75±0.72).

The students reported that they had nothing to look forward to through online learning (3.63±1.08). They felt frustrated to access the online classes each time (3.63±0.98) and they did not receive emotional support through the online learning lessons (3.63±1.15). The students showed that they found that online learning was meaningless for them (3.57±1.05). Most of the students found it difficult to work up the initiative to do things (3.52±0.71). The students did not feel enthusiastic to practice online learning (2.71±1.13) (Figure 1).
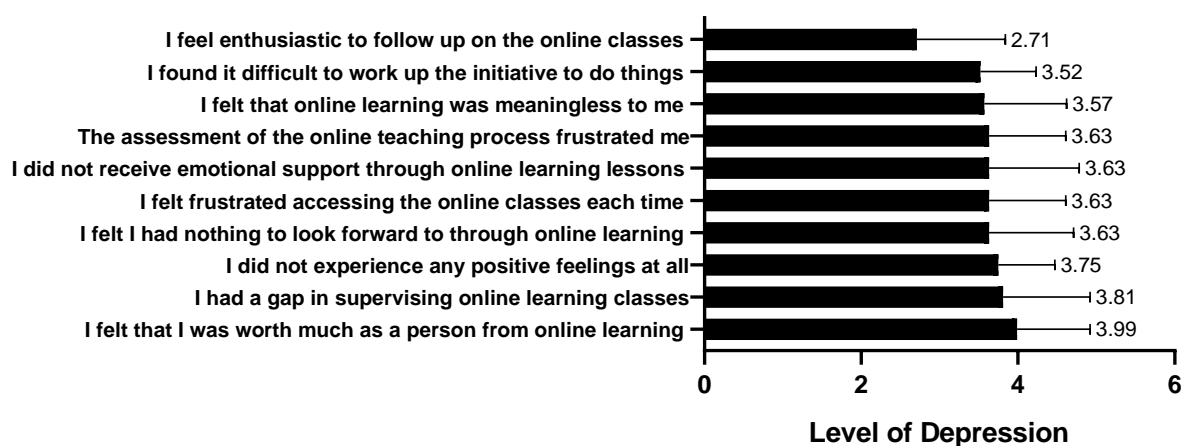

Figure 1. The levels of depression among Tawjihi students resulting from online learning

Anxiety Levels among Students Resulting from Online Learning

The anxiety level among students was measured according to four scales. The most anxious was dizzy or lightheaded (3.37±0.48). The same level of anxiety was given for the nervousness while practicing online learning (3.37±0.83). A high level among the students was recorded for feeling hot while practicing online learning (3.25±0.80). Another important anxiety aspect recorded among the students is related to the fear of the worst happening (3.23±0.78) (Figure 2).

The students showed that they were not able to relax while practicing online learning (3.20±0.52). Also, the students showed numbness or tingling (3.15±0.82). The students showed that they felt shock (3.06±1.13), while they also reported that their faces were flushed (2.98±1.15). The levels were a little bit lower, but the students also showed a high level of heart-pounding/racing (2.95±1.03). Other levels were shown related to being terrified or afraid (2.94±1.08). Moreover, the students showed difficulty in breathing (2.89±1.10). The students showed unsteady feelings (2.87±1.09) (Figure 2).

Some students through online learning experienced the feeling of fear of losing control (2.81±1.16). Students experienced wobbliness in their legs (2.78±1.19) and hands' trembling (2.72±1.15), hot and cold sweats (2.70±1.23). Other behaviors that appeared in the students represented being shaky/unsteady (2.66±1.16) and indigestion (2.66±1.06). The last two feelings were represented in being scared (2.64±1.14) and faint/lightheaded (2.61±1.17) (Figure 2).
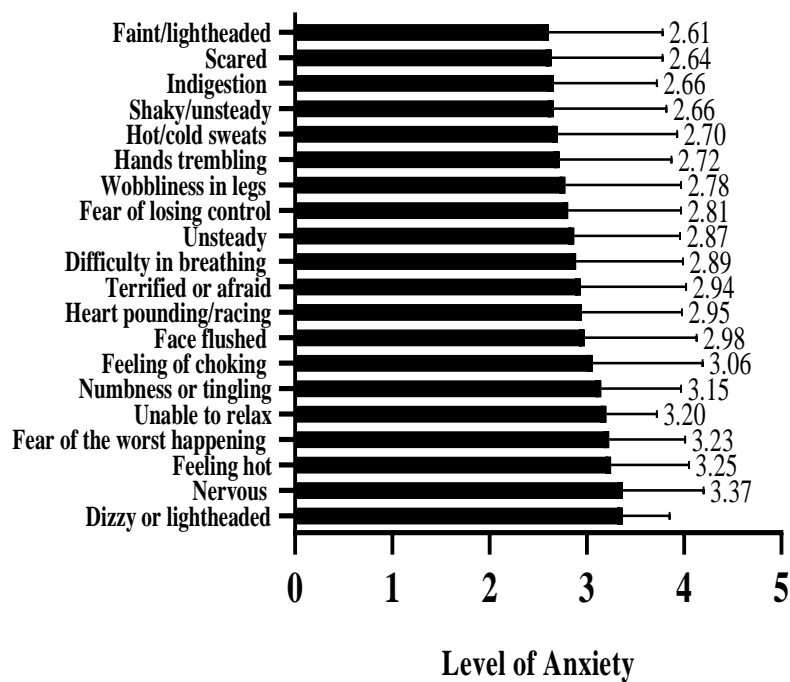
Figure 2. The levels of anxiety among students resulting from online learning

Discussion

The objective of this study is to investigate the effect of online learning on the anxiety and depression levels of Tawjihi students through and after the COVID-19 pandemic. The structure of the collected sample was varied, which facilitates the study of the levels of depression and anxiety under different conditions of the students. Online learning is connected to the availability of well-separated spaces that facilitate the students' contact with their supervisors. The results showed that the students suffered from the lack of space to practice online learning freely. The high density of members inside the home will affect the level of independence of the students to study online. Goa et al. (2021) have shown that the family structure and the number of family members affect the sons' behavior during the e-learning process. Moreover, Zhonggen (2021) has shown that gender and level of education affected the achievements of the E-learning process during the COVID-19 pandemic.

On the other hand, the structure of the family would affect online learning and the levels of depression and anxiety that the students live. The high number of school or university students within the family will affect the number of sets needed to connect to the internet, which will affect the quality of the internet. Also, the number of connected persons to online learning requires the availability of enough space to join such online learning without surrounding pressures. Moreover, the higher number of individuals in the home to be connected to online learning will be affected by the number of sets that should be available to join online learning. The joining of online learning through smartphones will be different from the same activity using laptops. These factors will affect the levels of depression and anxiety which will be experienced by the student, as they affect the effort needed to follow-up with the instructors. Fatema et al. (2020) found that the use of internet through online learning affected students psychologically. Also, the effect was associated with the availability of the internet and the purpose of accessing the internet.

The joining of online learning varied among governmental and private schools. The follow-up of private school students to join online learning was higher compared to government school students which will affect the levels of depression and anxiety that the students live through online learning. Moreover, access to educational platforms is different for private schools compared to governmental ones. Onyeaka et al. (2022) have shown that the difficulties to access online platforms can increase depression and anxiety for

individuals. This may produce a mix of feelings for the students who will join online learning. Easy access to platforms would increase the students' depression and anxiety compared to low access. Also, the studying stream produced different depression and anxiety feelings among the students due to the differences between the introduced courses and the effort needed to follow-up with instructors.

The results showed the negative effect of low-quality online learning tools on students. The availability and quality of online learning tools affected the levels of depression and anxiety experienced by the students through online learning. The results showed that the lack of pre-preparation for online learning increased the anxiety and depression experienced. The high quality of the internet would direct the students to care for other aspects related to the concern with the scientific material introduced by the instructors. The low quality of internet connection and internet availability will shift the students' concern to accessing the educational platforms and would increase the gaps to follow-up with the instructors. Rawashdeh et al. (2021) have shown that the side effects of online learning is dependent on the experience of using online tools and the availability of these tools for the students.

The results showed that the practice of online learning after the pandemic did not lead to deep anxiety and depression due to preparations already made. Also, the level of practicing online learning after the pandemic would provide a good indication of the experience that students gained practicing such type of learning. The continuity of joining such online education through commercial platforms continued in Jordan. The difference is that these platforms would provide the students with an extra opportunity to follow-up more clarifications for the material and attend physically. Accordingly, the acceptance of such online learning would depend on the students' tendency for practice and the preparations made by the students to follow-up on all of the introduced information by an instructor. Rawashdeh et al. (2021) have shown that the ability of the students to follow the instructor will affect their psychological aspects of online learning. Also, the type of reaction required by the students determines the type of depression effects and the students' reactions.

The level of depression that the students experienced through online learning was different according to the type of depression. The first and deepest depression was related to the students feeling that they deserve other types of learning processes than online learning. The conversion to online learning for the first time without any pre-preparations forms high depression for the students. The transformation to online learning without psychological preparation for both students and teachers formed high depression for the students who lack the knowledge of how to handle and benefit from such type of learning.

The interference of the different factors that affect the students' ability to follow-up online learning formed a gap in the ability of the students to follow all the activities introduced through online learning. The missing high-quality tools to join online learning may cause high depression for the students and lead to different gaps in following teachers through online learning. These accidents through online learning led the students to feel that online learning does not cause any positive feelings. The lack of preparation of students before starting online learning and the lack of students' knowledge to deal with technology form a deep source of frustration for the students, which leads them to carry negative feelings about online learning and deepens the negative psychological effects of online learning.

Most students experienced deep depression concerning reaching the targeted goals and objectives. This forms a feeling of loss for the students, as they do not have alternative tools to compensate for what is lost through online learning. Under all these conditions, frustration is expected to be one of the outputs of online learning. This frustration was enriched by the lack of emotional support for the students. At the end, the students will find it meaningless to follow-up online learning if the targets of the students are not reached or if the problems are associated with a lack of complete follow-up of the process. Most students lack the enthusiastic emotions for online learning. They consider this process as a negative experience and they will try to avoid it continuously. Pelucio et al. (2022) have shown that a large number of students experienced depression and anxiety symptoms in all their forms while practicing the online learning process.

The online learning anxiety feelings that the students experienced were high.

The anxiety levels that the students lived exceeded the common ones. The anxiety feelings expanded to experiencing difficulty in breathing and feeling terrified and unsteady through the online learning process. These

feelings also will lead to more complicated feelings related to the hands' troubles, passing different hot and cold sweating conditions, especially if the teacher includes the student in any activity in online learning. The mix of anxiety feelings may be produced by the different pressures that the students live through online learning resulting from the lack of availability of the tools that facilitate this process, the lack of support and leaving them behind by teachers, thus making them unable to follow-up with the other students.

Implications for Nursing

Studying anxiety and depression among students in online learning is important, because it can help identify the common features and symptoms associated with these mental health issues. By addressing anxiety and depression among students, nursing science can contribute to the development of effective interventions and support systems that enhance students' mental well-being and overall educational experience. By addressing these mental health issues, universities can improve students' online learning satisfaction and their overall well-being.

Conclusions and Recommendations

The objective of this research is to investigate the levels of anxiety and depression of the students left by the online learning process. All the students included in the study experienced different levels of anxiety and depression problems resulting from online learning. The students' anxiety and depression were affected by the socio-economic characteristics of the families. The low IT infrastructure at home increased the level of psychological and mental effects of online learning on students. The structure of the families affected the level of online learning's effect on anxiety and depression through its effect on the availability of a suitable environment to practice this type of learning. The depression of students was connected to the number of family members connected to the internet at the same time, which affected the quality of the internet and the ability of the students to follow-up with the teachers. The emotions of students toward online learning were negative due to that they believed that they deserved more suitable tools to receive their learning. The anxiety symptoms were experienced by most students with variations of the level of anxiety that the students live through online learning. The lack of guidance and support increased the depression and anxiety feelings of students through online learning. Also, the low access to the educational platforms increased the students' feelings of depression and anxiety in the online learning process. The study recommends that the preparation and training of students for online education would help minimize depression and anxiety through the online education process.

Future Research

This study recommends the investigation of the effect of online learning on the students of different remote regions in Jordan after the pandemic, since the practice of online learning continued in different exceptional conditions.

Funding or Sources of Financial Support

The study received no financial support from any source.

Conflict of Interest

All authors declare no conflict of interest.

REFERENCES

Akpınar, E. (2021). The effect of online learning on tertiary level of students' mental health during the Covid19 lockdown. *The European Journal of Social & Behavioural Sciences*, *30* (1), 52-62. https://doi.org/10.15405/ejsbs.288

Basheti, I.A., Assaraira, T.Y., Obeidat, N.M., Al-Haq, F.A.A., & Refai, M. (2023). Assessing anxiety and depression among students post-COVID-19: Exploring associating factors. *Psychology Research and Behavior Management*, *16*, 1797-1810. https://doi.org/10.2147/PRBM.S409632

Basheti, I. A., Mhaidat, Q. N., & Mhaidat, H. N. (2021). Prevalence of anxiety and depression during COVID-19 pandemic among healthcare students in Jordan and its effect on their learning process: A national survey. *PLoS ONE*, *16* (4 April). https://doi.org/10.1371/journal.pone.0249716

Beck, A.T., Epstein, N., Brown, G., & Steer, R.A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology*, *56* (6), 893-897. https://doi.org/10.1037/0022-006X.56.6.893

Daniels, L.M., Goegan, L.D., & Parker, P.C. (2021). The impact of COVID-19 triggered changes to instruction and assessment on university students' self-reported motivation, engagement and perceptions. *Social Psychology of Education*, *24* (1), 299-318. https://doi.org/10.1007/s11218-021-09612-3

Fatema, K., Nasreen, S., Parvez, M.S., & Rahaman, M.A. (2020). Impact of using the internet on students: A sociological analysis at Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Gopalganj, Bangladesh. *Open Journal of Social Sciences*, *08* (12), 71-83. https://doi.org/10.4236/jss.2020.812007

Fitriyana, S., Respati, T., & Sartika, D. (2021). The source of stress of students during pandemic COVID-19: A qualitative study. *Global Medical and Health Communication (GMHC)*, *9* (1). https://doi.org/10.29313/gmhc.v9i1.6938

Fruehwirth, J.C., Biswas, S., & Perreira, K.M. (2021). The Covid-19 pandemic and mental health of first-year college students: Examining the effect of Covid-19 stressors using longitudinal data. *PLoS ONE*, *16* (3 March 2021). https://doi.org/10.1371/journal.pone.0247999

Gao, H., Ou, Y., Zhang, Z., Ni, M., Zhou, X., & Liao, L. (2021). The relationship between family support and e-learning engagement in college students: The mediating role of e-learning normative consciousness and behaviors and self-efficacy. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.573779

Gonzalez, T., De la Rubia, M.A., Hincz, K.P., Comas-Lopez, M., Subirats, L., Fort, S., & Sacha, G.M. (2020). Influence of COVID-19 confinement on students' performance in higher education. *PLoS ONE*, *15* (10 October). https://doi.org/10.1371/journal.pone.0239490

Hair, J., Celsi, M., Money, A., & Samouel, P. (2007). *The essentials of business numeracy*. John Wiley & Sons.

Hammerstein, S., König, C., Dreisörner, T., & Frey, A. (2021). Effects of COVID-19-related school closures on student achievement-A systematic review. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.746289

Holderieath, J., Crosby, M., & Mcconnell, T. E. (2021). *Impact of COVID-19-related transition to online instruction on student achievement*.

Jojoa, M., Lazaro, E., Garcia-Zapirain, B., Gonzalez, M.J., & Urizar, E. (2021). The impact of Covid-19 on university staff and students from Iberoamerica: Online learning and teaching experience. *International Journal of Environmental Research and Public Health*, *18* (11). https://doi.org/10.3390/ijerph18115820

Lovibond, P.F., & Lovibond, S.H. (1996). The structure of negative emotional states: Comparison of the depression anxiety stress scales (DASSs) with the Beck depression and anxiety inventories. *Behaviour Research and Therapy*, *34* (4), 335-343.

Maia, B.R., & Dias, P.C. (2020). Anxiety, depression and stress in university students: The impact of COVID-19. *Estudos de Psicologia (Campinas)*, 1-8.

Malak, M.Z., & Khalifeh, A.H. (2018). Anxiety and depression among school students in Jordan: Prevalence, risk factors, and predictors. *Perspectives in Psychiatric Care*, *54* (2), 242-250. https://doi.org/10.1111/ppc.12229

Ministry of Education. (2021). *Ministry of education annual book*.

Noviati, E., Kurniawan, R., Herdiana, R., Sukmawati, I., & Lismayanti, L. (2020). *The effect of the duration of playing online games on students' depression level*. https://doi.org/10.2991/ahsr.k.200723.078

Onyeaka, H., Ajayi, K.V., Muoghalu, C., Eseaton, P.O., Azuike, C.O., Anugwom, G., Oladunjoye, F., Aneni, K., Firth, J., & Torous, J. (2022). Access to online patient portals among individuals with depression and anxiety. *Psychiatry Research Communications*, *2* (4), 100073. https://doi.org/10.1016/j.psycom.2022.100073

Paudel, R., Shrestha, S., & Gurung, L. (2021). Knowledge, attitude and practice regarding prevention and control of COVID-19 among nurses of tertiary care hospitals. *Journal of College of Medical Sciences-Nepal*, *17* (2), 136-144. https://doi.org/10.3126/jcmsn.v17i2.34328

Pelucio, L., Simões, P., Dourado, M.C.N., Quagliato, L.A., & Nardi, A.E. (2022). Depression and anxiety among online learning students during the COVID-19 pandemic: A cross-sectional survey in Rio de Janeiro, Brazil. *BMC Psychology*, *10* (1). https://doi.org/10.1186/s40359-022-00897-3

Rawashdeh, A.Z., Al Mohammed, E.Y., Arab, A.R., Al Alara, M., & Al-Rawashdeh, B. (2021). Advantages and disadvantages of using e-learning in university

education: Analyzing students' perspectives. *Electronic Journal of E-Learning*, *19* (2), 107-117. https://doi.org/10.34190/ejel.19.3.2168

Schröpfer, K., Schmidt, N., Kus, S., Koob, C., & Coenen, M. (2021). Psychological stress among students in health-related fields during the Covid-19 pandemic: Results of a cross-sectional study at selected Munich universities. *International Journal of Environmental Research and Public Health*, *18* (12). https://doi.org/10.3390/ijerph18126611

Starkey, M., Wiest, D., & Qaseem, A. (2016). Improving depression care through an online learning collaborative. *American Journal of Medical Quality*, *31* (2), 111-117. https://doi.org/10.1177/1062860614555883

Sundarasen, S., Chinna, K., Kamaludin, K., Nurunnabi, M., Baloch, G.M., Khoshaim, H.B., Hossain, S.F.A., & Sukayt, A. (2020). Psychological impact of Covid-19 and lockdown among university students in Malaysia: Implications and policy recommendations. *International Journal of Environmental Research and Public Health*, *17* (17), 1-13. https://doi.org/10.3390/ijerph17176206

Suryatiningsih, N., Mabaroh, B., & Pradikto, S. (2021). The impacts of Covid-19 on the students' learning behavior. *Journal Universitas Muhammadiyah Gresik Engineering, Social Science, and Health International Conference (UMGESHIC)*, *1* (1), 48. https://doi.org/10.30587/umgeshic.v1i1.2416

Trifan, A., Antunes, R., & Oliveira, J.L. (2021). Machine learning for depression screening in online communities. *Advances in Intelligent Systems and Computing*, *AISC*, *1240*, 102-111. https://doi.org/10.1007/978-3-030-54568-0_11

Zhonggen, Y. (2021). The effects of gender, educational level, and personality on online learning outcomes during the COVID-19 pandemic. *International Journal of Educational Technology in Higher Education*, *18* (1), 1-17