SMAD

Impacts on medical students' mental health in the Coronavirus pandemic: An integrative review

Angela Chaves de Oliveira Garcia[1]
  https://orcid.org/0000-0001-5337-1110
Hairina Ester de Carvalho[1]
  https://orcid.org/0000-0001-6291-421X
Andressa Bueno Florêncio[1]
  https://orcid.org/0000-0002-4076-0958
Beatriz Aparecida Fernandes[1]
  https://orcid.org/0000-0003-2610-3633
Cleide Augusta de Queiroz[1]
  https://orcid.org/0000-0002-2677-080X
Rafael Costa Pereira[1]
  https://orcid.org/0000-0003-1503-7992
Vanessa Luzia Queiroz Silva[1]
  https://orcid.org/0000-0002-1217-5030
Mateus Goulart Alves[1]
  https://orcid.org/0000-0003-0680-6817

[1] Faculdade Atenas, Unidade Passos, Passos, MG, Brasil.

Objective: to identify the impacts on medical students' mental health and their prevalence in the face of the pandemic caused by the coronavirus. **Methodology**: an integrative review conducted in the Medical Literature Analysis and Retrieval System Online, Scientific Electronic Library Online and *Literatura Latino-Americana e do Caribe em Ciências da Saúde* databases, using the "Mental health" and "Medical students" descriptors and relevant acronyms for the Coronavirus disease 2019. **Results**: the final sample of this study consisted of 21 articles discussing depression, anxiety, stress, psychological distress and psychological or behavioral changes. **Conclusion**: the pandemic caused by the coronavirus disease had different repercussions on the mental health of medical students, observing anxiety and depression disorders, mood swings, stress, psychological distress and difficulty in university engagement. This study contributes to identifying the main impacts of the reality imposed by the new coronavirus, stimulating the implementation of future strategies to support mental health during medical training.

Descriptors: Pandemics; Coronavirus; COVID-19; Mental Disorders; Student Health; University.

Impactos na saúde mental de estudantes de medicina na pandemia por Coronavírus: revisão integrativa

Objetivo: identificar os impactos na saúde mental dos estudantes de medicina e sua prevalência diante da pandemia pelo coronavírus. **Metodologia**: revisão integrativa nas bases de dados *Medical Literature Analysis and Retrieval System Online*, *Scientific Electronic Library Online* e Literatura Latino-Americana e do Caribe em Ciências da Saúde, utilizando-se os descritores "Mental health", "Medical students" e sigla pertinente para a doença por Coronavírus 2019. **Resultados**: a amostra final deste estudo foi composta por 21 artigos discorrendo sobre depressão, ansiedade, estresse, sofrimento psicológico e mudanças psicológicas ou comportamentais. **Conclusão**: a pandemia causada pela doença do coronavírus repercutiu de diferentes maneiras na saúde mental dos estudantes de medicina, sendo observados transtornos de ansiedade e depressão, alterações de humor, estresse, sofrimento psicológico e dificuldade no engajamento universitário. Este estudo contribui com a identificação dos principais impactos da realidade imposta pelo novo coronavírus, estimulando a implementação de futuras estratégias de apoio à saúde mental no decorrer da formação médica.

Descritores: Pandemia; Coronavírus; COVID-19; Transtornos Mentais; Saúde do Estudante; Universidade.

Impactos en la salud mental de los estudiantes de medicina durante la pandemia del Coronavirus: revisión integradora

Objetivo: identificar los impactos en la salud mental de los estudiantes de medicina y su prevalencia ante la pandemia provocada por el coronavirus. **Metodología**: revisión integradora en las bases de datos *Medical Literature Analysis and Retrieval System Online, Scientific Electronic Library Online* y Literatura Latinoamericana y del Caribe en Ciencias de la Salud, utilizando los descriptores "Salud mental", "Estudiantes de medicina" y acrónimo relevante para la enfermedad por Coronavirus 2019. **Resultados**: la muestra final de este estudio consistió en 21 artículos que discutían depresión, ansiedad, estrés, sufrimiento psicológico y cambios psicológicos o de comportamiento. **Conclusión**: la pandemia provocada por la enfermedad por coronavirus repercutió de diversas formas en la salud mental de los estudiantes de medicina, se observaron trastornos de ansiedad y depresión, cambios de humor, estrés, sufrimiento psicológico y dificultad para cumplir con los compromisos universitarios. Este estudio contribuye a identificar los principales impactos de la realidad impuesta por el nuevo coronavirus, y a estimular la implementación de futuras estrategias de apoyo a la salud mental durante la formación médica.

Descriptores: Pandemias; Coronavirus; COVID-19; Trastornos Mentales; Salud del Estudiante; Universidad.

Introduction

After the alert of pneumonia cases in the city of Wuhan (People's Republic of China) at the end of 2019, the identification of a new type of coronavirus was confirmed on January 7th, 2020, the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), responsible for the Coronavirus Disease 2019 (COVID-19). On January 30th of the same year, the World Health Organization (WHO) declared the outbreak of the new virus as a Public Health Emergency of International Concern and, on March 11th, 2020, COVID-19 was characterized as a pandemic[1]. Consequently, the triggered state of alarm resulted in major impacts on the mental health of the global population, raising different impairment levels in psychological well-being[2-3].

Among the groups affected by the repercussions of the pandemic, the prevalence of negative effects on the mental health of the academic community is evident, including the presence of feelings of powerlessness, lack of motivation, anguish, anxiety and stress[4], in addition to even higher rates of depressive symptoms than in the general population[5]. These impairments are associated with the consequences of changes inherent to the pandemic condition, which involve the occurrence of social distancing, isolation and changes in educational methodologies[6].

Medical students in particular may have a lower quality of life when compared to the general population, given the high stress load of educational processes. Likewise, the anxiety and depression levels are considerably elevated[7]. In this sense, with COVID-19 there is an increase in the signs of psychological distress, which is associated with factors such as fear of infection by the virus, inability to maintain healthy habits, poor adaptation to remote learning and fear of prejudice to medical training[8]. These conditions imply not only the need for a careful assessment of these students, but also support and provision of adequate psychological counseling to students[9].

Thus, it is understood that the pandemic caused by COVID-19 has exerted significant impacts on the students and, particularly, on those attending medical courses at the global level. From this perspective, an in-depth analysis of the theme can favor the development of focused strategies and measures aimed at reducing the negative repercussions on the students' lives and remedying deficits in the face of the psychological distress caused. Therefore, this study aims at identifying the impacts on the mental health of medical students and their prevalence in the face of the pandemic caused by the new coronavirus 2019.

Methodology

This is an integrative literature review, prepared in accordance with the recommendations set forth in the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement[10].

Fulfillment of six stages was determined, namely: (1) Identification of the topic and elaboration of the guiding research question for the search strategy; (2) Definition of inclusion and exclusion criteria; (3) Location of the pre-selected and selected studies; (4) Categorization of the selected studies; (5) Analysis and interpretation of the results; and (6) Summary of the review[11].

To carry out the review, the following guiding question was formulated: Which are the impacts and their prevalence on the mental health of undergraduate medical students in the face of the COVID-19 pandemic?

The bibliographic survey was carried out in October 2021, through virtual access to the following databases: Medical Literature Analysis and Retrieval System Online (MEDLINE/PubMed); Scientific Electronic Library Online (SciELO); and *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (LILACS). The time limit for the search corresponded to studies published from 2020 to 2021, with the last search carried out on October 13th, 2021.

For the search in the databases, descriptors in English present in the Health Sciences Descriptors (*Descritores em Ciências da Saúde*, DeCS) were selected, namely: *Mental health*, *Medical students* and *COVID*-19, using a Boolean connector for the "and" connector (*AND*). Relevant search filters were applied according to the inclusion criteria defined.

The search was carried out simultaneously by five independent researchers, considering the use sequence of the descriptors in each database and the inclusion and exclusion criteria. Subsequently, the results obtained were compared and the disagreements in the results of the searches carried out were discussed and solved through consensus between the researchers.

Selection of the studies was carried out by carefully reading the titles and abstracts, so that only the studies that answered the search question and met the inclusion criteria were selected for the final selection. In the final selection of articles, they were read in full. The materials included were only original articles published in Portuguese and English, with free access and with a specific focus on the topic under research. Theses, dissertations, editorials, books, book chapters, review articles and letters to the editor were not included, as well as duplicate studies, published in languages other than the two defined, and which did not answer the search question.

To extract findings relevant to the study purpose, figures specially elaborated for this purpose were

Garcia ACO, Carvalho HE, Florêncio AB, Fernandes BA, Queiroz CA, Pereira RC, et al.

111

prepared, prioritizing the following criteria: author of the study, journal, year of publication, country of publication, scale used, participants/sample and main results.

The current study was not submitted to any Research Ethics Committee because it is an integrative literature review, not directly involving human beings.

Results

A priori, 371 studies were identified and, of these, 172 were read in full and in detail to identify the final sample, consisting of 21 articles, as shown in the PRISMA recommendation in Figure 1, below.
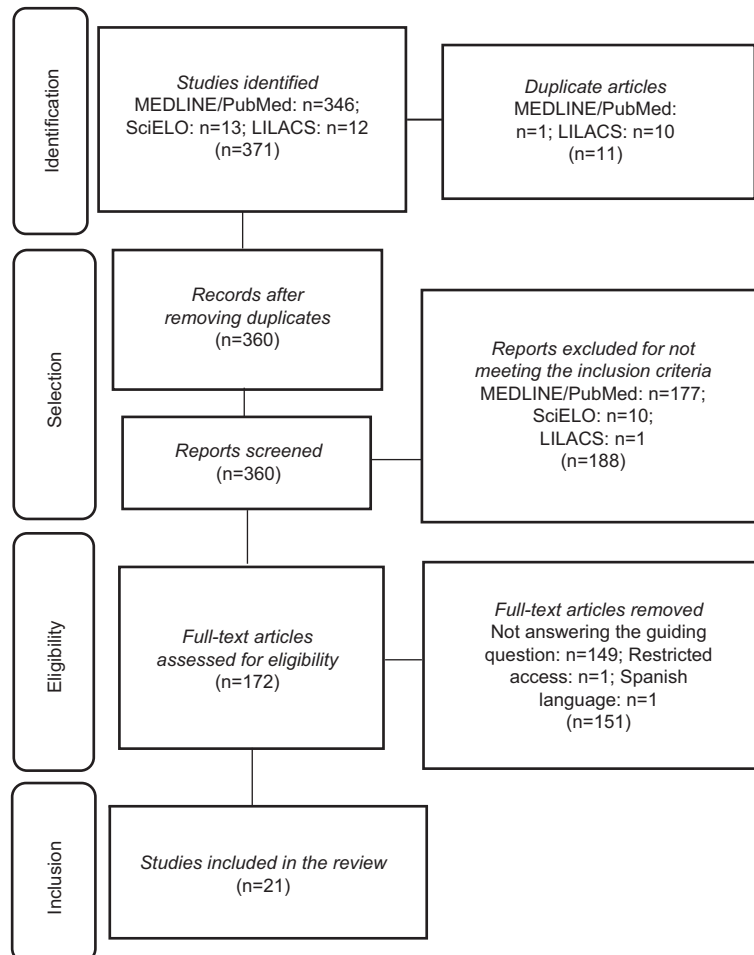

Figure 1 – Presentation of the flowchart corresponding to the process of identification, selection and inclusion of the studies, prepared based on the PRISMA recommendation. Passos, MG, Brazil, 2022

Six types of scales were used to screen mental health symptoms, namely: Generalized Anxiety Disorder-7 (GAD-7); Patient Health Questionnaire-9 (PHQ-9); 6-item and 10-item Kessler Psychological Distress Scales (K6 and K10); Depression, Anxiety and Stress Scales-21 (DASS-21); Self-Reporting Questionnaire-20 (SRQ-20); and Maslach Burnout Inventory-Student Survey (MBI-SS), in addition to other methods pertinent to each study and its authors. The sample consisting of 21 studies that addressed the impacts and their prevalence on the mental health of undergraduate medical students in the face of the pandemic was characterized in Figure 2.

As presented in Figure 2, the studies date from 2020 and 2021, with nearly 71% of the sample comprised by studies from 2021. In general, the studies selected are

of the cross-sectional type, except for one of the articles which, at first, was cross-sectional and turned into an ecological study[26].

Only one of the selected studies has a national character, with the assessment of Brazilian students' mental health[8]. Three studies evaluated medical students from China[14-15,19], whereas students from Saudi Arabia[12,30], United States of America[17,20] and Jordan[23,27] were evaluated in six articles, with two studies for each nationality. The rest of the sample was comprised by articles that evaluated students from other 11 countries. The most frequently used scales were GAD-7 and PHQ-9.

Figure 3 presents the main results of the studies that used the GAD-7 and PHQ-9 scales to screen mental health symptoms.

Author	Journal	Year	Country	Scale
Batais, et al.[12]	Medicine	2021	Saudi Arabia	GAD-7*
Saravia-Bartra, et al.[13]	*Revista de la Facultad de Medicina Humana*	2020	Peru	GAD-7*
Zhao, et al.[14]	Journal of Medical Internet Research	2021	China	PHQ-9†
Xiao, et al.[15]	International Journal of Environmental Research and Public Health	2020	China	GAD-7* PHQ-9†
Yun, et al.[16]	Frontiers in Psychiatry	2021	South Korea	GAD-7* PHQ-9†
Halperin, et al.[17]	Journal of Medical Education and Curricular Development	2021	United States of America	GAD-7* PHQ-9†
Saeed, et al.[18]	Pakistan Journal of Medical Sciences	2021	Pakistan	GAD-7* PHQ-9†
Yin, et al.[19]	Frontiers in Psychiatry	2021	China	GAD-7* PHQ-9†
Gupta, et al.[20]	Academic Psychiatry	2021	United States of America	GAD-7* PHQ-9†
Essangri, et al.[21]	The American Journal of Tropical Medicine and Hygiene	2021	Morocco	GAD-7* PHQ-9† K6‡
Arima, et al.[22]	BMJ Open	2020	Japan	K6‡
Seetan, et al.[23]	PLoS One	2021	Jordan	K10§
Vahedian-Azimi, et al.[24]	BMC Psychiatry	2020	Iran	DASS-21‖
Shailaja, et al.[25]	Industrial Psychiatry Journal	2020	India	DASS-21‖
Teixeira, et al.[8]	*Jornal Brasileiro de Psiquiatria*	2021	Brazil	SRQ-20¶
Zis, et al.[26]	International Journal of Environmental Research and Public Health	2021	Cyprus	MBI-SS**
Al-Husban, et al.[27]	Annals of Medicine and Surgery	2021	Jordan	Other method
ElHawary, et al.[28]	Canadian Medical Education Journal	2021	Canada	Other method
Pokryszko-Dragan, et al.[29]	BMC Medical Education	2021	Poland	Other method
Meo, et al.[30]	Pakistan Journal of Medical Sciences	2020	Saudi Arabia	Other method
Šimić, et al.[31]	*Medicina Academica Mostariensia*	2021	Bosnia-Herzegovina	Other method

*GAD-7 = Generalized Anxiety Disorder-7; †PHQ-9 = Patient Health Questionnaire-9; ‡K6 = Kessler 6-item Psychological Distress Scale; §K10 = Kessler 10-item Psychological Distress Scale; ‖DASS-21 = Depression Anxiety and Stress Scales-21; ¶SRQ-20 = Self-Reporting Questionnaire-20; **MBI-SS = Maslach Burnout Inventory-Student Survey

Figure 2 – Synthesis of the selected studies included in the integrative review according to author, journal, year and country of publication, and scales or other method used. Passos, MG, Brazil, 2022

Study	Participants	Results
E1[12]	322 medical students (from 1st to 5th year)	Presence of mild (62.4%), moderate (23.9%), severe (6.8%) and extremely severe (6.8%) anxiety
E2[13]	57 medical students (1st year)	Presence of some anxiety level during the pandemic in 75.4%, with mild (52.63%), moderate (7%) and severe (15.8%) anxiety
E3[14]	666 medical students (from 1st to 3rd year)	Presence of depression with 9.6% prevalence
E4[15]	620 medical students	Positive screening for anxiety in 15.8% and for depression in 24.8%
E5[16]	454 medical students (from 1st to 4th year)	Positive screening for anxiety in 18.5% and for depression in 11.9%
E6[20]	195 medical students	Positive screening for anxiety in 54.4% and for depression in 55.9%
E7[17]	1,428 medical students	No anxiety to minimal anxiety (34.1%), mild (35.3%), moderate (19.5%) and severe (11.1%) levels; no depression to minimal (44%), mild (31.7%), moderate (13.5%), moderately severe (7.6%) and severe (3.2%) levels
E8[18]	234 medical students (from 1st to 5th year)	Presence of mild (29.9%), moderate (3.8%) and severe (62.4%) anxiety; presence of mild (20.9%), moderate (44.4%), moderately severe (1.7%) and severe (18.4%) depression
E9[19]	5,502 medical students Undergraduate students from 1st to 3rd year: 4,146 undergraduate students from 4th-5th year: 1,356	Undergraduate students from 1st-3rd year: presence of minimal (77.2%), mild (18.9%), moderate (2.1%) and severe (1.9%) anxiety and minimal (64.2%), mild (25.9%), moderate (6.7%) and severe (3.3%) depression Undergraduate students from 4st-5rd year: presence of minimal (79.9%), mild (15.6%), moderate (2.8%) and severe (1.7%) anxiety and minimal (68.0%), mild (23%), moderate (5.8%) and severe (3.2%) depression
E10[21]	549 medical students 170 in the pre-clinic (1st and 2nd year) stage and 261 in the early clinic (3rd to 6th year) stage	Pre-clinic: presence of normal (30%), mild (43.5%), moderate (15.9%) and severe (10.6%) anxiety and normal (16.5%), mild (28.8%), moderate (25.3%) and severe (29.4%) depression Early clinic: presence of normal (37.2%), mild (34.5%), moderate (17.2%) and severe (11.1%) anxiety and normal (26.8%), mild (26.4%), moderate (21.5%) and severe (25.3%) depression

Figure 3 - Synthesis of the selected studies included in the integrative review according to participants and main results from the Generalized Anxiety Disorder-7 and Patient Health Questionnaire-9 scales. Passos, MG, Brazil, 2022

In Figure 3, the sample sizes varied from 57 to 5,502 medical students. The results of the studies using the GAD-7 and PHQ-9 scales showed the screening of anxiety and depression for each scale, respectively, ranging from no symptoms to very severe symptoms. Only three studies evaluated the presence of anxiety[12-13] and depression[14] in isolation.

The studies evaluating the presence of anxiety in isolation pointed out that the condition is also associated with increased preventive measures, reflecting important changes in the students' behavior[12], and that it is of major importance to develop strategies to help the population with this condition, especially women[13]. In addition to that, the study evaluating the prevalence of depression in isolation indicated interventions that allow developing positive coping styles and improved resilience, as they are important in reducing the depression levels among medical students who attend online classes in the pandemic[14].

One of the studies that jointly assessed the presence of anxiety and depression identified increases of approximately 60% and 70% in the prevalence of Generalized Anxiety Disorder and depression, respectively, suggesting that medical students may be especially susceptible to the emotional impact of the pandemic[17]. In addition to that, other studies evidenced that the pandemic has exerted an unprecedented impact on the students' lives, with mental health pressures likely to worsen among practicing physicians[15], and that many medical trainees even started to reconsider their professional choice[20].

Two articles indicated that the initial rapid increase in confirmed cases of the disease was related to mild to severe depressive symptoms[19] and that being a student, living in places with high prevalence of COVID-19 and having a history of psychiatric consultations and pre-clinical level of studies were risk factors for students with mental health symptoms during the disease outbreak[21].

Other papers showed that the increase in the prevalence of anxiety and depression related to COVID-19 was associated with a tendency towards unhealthy lifestyles[18] and that it is necessary to control the main existing influences, such as feelings of nervousness and stress, difficulty relaxing and concentrating, fear of infecting colleagues, and sensation of failure and loss of situational control, so as to minimize spread of the ailments[16].

Figure 4 presents the main results of the studies that used the K6 and K10, DASS-21, SRQ-20 and MBI-SS scales to screen mental health symptoms.

In Figure 4, considering the repetition of study 10 (E10) in Figure 3 due to the concomitant use of the GAD-7 and PHQ-9 scales, the sample sizes varied between 154 and 656 medical students. The results

evidenced the presence of psychological distress and the probability of mental disorder using the Kessler Psychological Distress Scale[21-23], of normal to extremely severe stress, anxiety and depression using the DASS-21 scale[24-25], of mood swings and depressive thoughts through the SRQ-20 scale[8] and of Burnout through the MBI-SS scale[26].

In addition to a high degree of psychological distress in students, one of the studies identified the presence of protective factors, such as being male, being married or in a stable relationship, attending the last three years of the undergraduate course and not attending the remote modality, following a healthy routine, practicing activities and not having any previous mental disorder[8]. In addition to that, another study reported that the participants in their sample with higher scores on a self-esteem scale scored lower on psychological distress measures, whereas those with higher scores on a self-efficacy scale scored higher on these measures[22].

Some studies evidenced that the aspects most affected during the pandemic involve mental health, physical fitness, exercise and studies[23,25], and that digital learning in medical studies is a detrimental factor in the students' Burnout levels and overall mental health[26]. One of the studies also indicated high severity of anxiety, stress and depression among specific subpopulations during the pandemic, as well as the feasibility of long-term negative psychological outcomes emerging among COVID-19 survivors and healthcare workers, such as Post-Traumatic Stress Disorder[24].

Figure 5 presents the main results of the studies that used other methods to screen mental health symptoms.

In Figure 5, the sample sizes varied from 59 to 620 medical students. In addition to presence of stress, anxiety and depression, the results obtained through different methods involve specific feelings associated with mental health, including distinctions between participants with and without previous depression or anxiety diagnoses and between men and women.

Two of these studies indicated that the change in the teaching model to the online format proved to be problematic for the students[29] and that online learning is inferior to face-to-face teaching, with the teaching quality decreasing since the beginning of the pandemic[28]. Likewise, one of the studies pointed out that the long-term quarantine can worsen the students' psychological and learning behavior[30].

One of the studies also showed that the pandemic especially affected the clinical level students, making them more anxious and depressed, afraid of going to the hospital and caring for patients[27], whereas another study indicated that the pandemic exerted a positive impact on the students' lifestyles[31].

Study	Participants	Results
E10[21]	549 medical students 170 in the pre-clinic stage (1st and 2nd year) 261 in the early clinic stage (from 3rd to 6th year)	Pre-clinic: no psychological distress (40%), moderate (37.1%) and severe (22.9%) Early clinic: no psychological distress (46.7%), moderate (27.5%) and severe (25.7%)
E11[22]	571 medical students (from 1st to 6th year)	Presence of a significant degree of psychological distress in 28.5%
E12[23]	553 medical students (from 1st to 6th year)	Probability of having some mental disorder: 13.2% likely to be healthy, 16.5% likely to have a mild disorder, 20.1% likely to have a moderate disorder, and 50.3% likely to have a severe disorder
E13[24]	207 intern medical students	Presence of mild (0.5%), moderate (30.4%), severe (60.9%) and extremely severe (8.2%) stress; Presence of severe (1%) and extremely severe (99%) anxiety; Presence of moderate (1.4%), severe (29%) and extremely severe (69.6%) depression;
E14[25]	530 medical students	Presence of normal (87%), mild (4.7%), moderate (4%), severe (3.2%) and extremely severe (1.1%) stress; Presence of normal (79.2%), mild (5.8%), moderate (9.1%), severe (2.6%) and extremely severe (3.2%) anxiety; Presence of normal (76.8%), mild (7.5%), moderate (7.4%), severe (3.8%) and extremely severe (4.5%) depression
E15[8]	656 medical students (from 1st to 6th year)	Mood: tense, nervous or worried participants (83.8%); sad (70.3%); crying more than usual (41.3%) Depressive thoughts: presence of loss of interest (55%); feeling of uselessness (39.2%); feeling of inability to play an useful role in life (18.6%); suicidal ideation (9.1%)
E16[26]	154 medical students (from 1st to 6th year)	Statistically significant increase in Burnout, from 27.6% during the pre-COVID-19 period to 50% during COVID-19

Figure 4 – Synthesis of the selected studies included in the integrative review according to participants and main results from the 6-item and 10-item Kessler Psychological Distress scales and the Depression, Anxiety and Stress Scales-21, Self-Reporting Questionnaire-20 and Maslach Burnout Inventory-Student Survey. Passos, MG, Brazil, 2022

Study	Participants	Results
E17[27]	415 medical students (from 1st to 6th year)	29.6% disagrees and 70.4% agrees that COVID-19 exerted and impact on mental health; 34.9% disagrees and 65.1% agrees that they were more anxious and depressed
E18[28]	248 medical students (from 1st to 4th year) 62 with previous diagnosis of depression or anxiety 186 without previous diagnosis of depression or anxiety	With previous clinical diagnosis: more depressive symptoms in 66%, unchanged in 21% and fewer depressive symptoms in 13%; more anxiety in 69%, unchanged in 21% and less anxiety in 10% Without previous clinical diagnosis: more depressive symptoms in 42%, unchanged in 42% and fewer depressive symptoms in 16%; more anxiety in 41%, unchanged in 35% and less anxiety in 24%
E19[29]	620 medical students (from 1st to 6th year)	Presence of difficulties related to commitment (lack of concentration and motivation, stress and frustration) in 19.35% and lack of social life (feeling of isolation affecting mental health) in 14.35%
E20[30]	530 medical students (from 1st to 5th year) Men: 236 Women: 294	Presence of 25% of men and 22.45% of women feeling depressed and 36.44% of men and 39.46% of women feeling hopeless, exhausted or emotionally unresponsive
E21[31]	246 pre-clinical and clinical medical students Men: 68 Women: 178	Presence of greater stress due to obligations in 58.8% of the men and 76.4% of the women; increased financial stress in 44.1% of the men and 61.2% of the women; and increased stress at home in 14.7% of the men and 31.5% of the women. 4.4% of the men and 6.7% of the women reported feeling terrified; 47.1% of the men and 59% of the women reported feeling worried; and 32.4% of the men and 48.9% of the women reported feeling helpless

Figure 5 – Synthesis of the selected studies included in the integrative review according to participants and main results derived from different methods. Passos, MG, Brazil, 2022

Discussion

In general, the studies included in this review assessed the impacts of the COVID-19 pandemic on medical students' mental health by measuring anxiety, depression, stress and psychological distress levels, as well as psychological or behavioral changes, mood swings, suicidal ideation and Burnout syndrome. The results were achieved using specific scales and methods relevant to each study.

To screen anxiety, predominantly, the 7-item Generalized Anxiety Disorder Scale (GAD-7) was used, a self-administered questionnaire commonly employed to screen and measure the severity of anxiety symptoms presented in the previous two weeks. Its items correspond to symptoms based on the criteria for Generalized Anxiety Disorder present in the Diagnostic and Statistical Manual of Mental Disorders (DSM) and each of them is scored on a four-point scale. Thus, it is possible to classify anxiety as normal (nonexistent), mild, moderate and severe[32].

Through this questionnaire, 62.4% prevalence of mild anxiety was evidenced among medical students in Saudi Arabia[12], thus denoting that a large percentage presented some anxiety level in the COVID-19 context. In fact, among university students, the anxiety symptoms predominated in medical students during the pandemic. There is also an association between a higher risk of presenting these psychological changes and greater contact with news about the pandemic, showing the need for support in this sense[33].

In students attending first year of the course at a university from Peru, the prevalence of anxiety throughout the pandemic period was 75.4%, with 52.63% also corresponding to mild anxiety[13]. In agreement with this result, another study showed high levels of psychological overload, mainly in first-year students. Some factors that can be related to the data found are the fact that they entered college shortly before the beginning of the pandemic and the lack of time to create new support networks to be able to deal with the new conditions imposed by social isolation[34]. In this sense, the high prevalence of anxiety shows the need to pay attention to medical students since the beginning of the course.

Due to the social isolation necessary as a measure to contain spread of the virus, many students also came to experience depression to varying degrees[35]. Thus, another instrument used was PHQ-9, a self-reported scale consisting of 9 items developed based on the DSM criteria for Major Depressive Disorder. It evaluates symptoms presented in the last two weeks; it also has a four-point scale and allows indicating cases of mild, moderate, moderately severe and severe depression[36].

Through the scale, 9.6% prevalence of depression was demonstrated among medical students with online education during the pandemic in China, being considered slightly low[14]. The assessment of Chinese students using the GAD-7 and PHQ-9 scales concomitantly, however, revealed that, although only ¼ were screened positive for depression, there was a higher proportion of depression in relation to the anxiety disorder[15].

In line with this result, a sample comprised by 195 medical students from the United States of America presented 55.9% and 54.4% prevalence of positive screening for depression and anxiety, respectively[20]. In contrast, 11.9% of all 454 Korean students evaluated presented depressive mood, whereas 18.5% had anxiety[16], revealing higher prevalence of the latter condition.

Evaluating the presence of anxiety and depression graded at different levels in medical students from Morocco, a higher proportion of mild anxiety and severe depression was identified in students from 1st to 2nd year, and of normal anxiety and depression in students attending 3rd to 6th year[21]. As a result, a relatively better

maintenance of mental health is noticed in students from more advanced course years, as most of them presented normal symptoms.

During the COVID-19 outbreak in China, groups of students from 1st to 3rd year and from 4th to 5th year had a higher prevalence of minimal depression and anxiety symptoms. Regarding depression, there was 64.2% and 68% prevalence in undergraduates from 1st to 3rd year and from 4th to 5th year, respectively. In turn, in relation to anxiety, there was 77.2% and 79.9% prevalence in undergraduates from 1st to 3rd year and from 4th and 5th year, respectively[19]. Thus, considering the presence of minimal symptoms, higher prevalence of anxiety symptoms was demonstrated.

In a sample of 1,428 medical students from the United States of America, the reported prevalence values of severe anxiety and depression were 11.1% and 3.2%, respectively, evidencing a higher prevalence of severe anxiety when compared to severe depression[17]. Likewise, in a sample of 234 students from Pakistan, the reported prevalence values of severe anxiety and depression were 62.4% and 18.4%, respectively[18], also evidencing a higher prevalence of severe anxiety when compared to depression at the same level.

The experience of mood swings in the face of the pandemic was also researched, and was found in 70.8% of the American medical students[20]. There is even evidence of increased dependence on certain activities, such as using screens and the Internet. For many students, the offline moment started to impose depression and sadness symptoms, reflecting the consequences of the relational limitations. Therefore, the impacts of COVID-19 were countless, as the pandemic required a new rearrangement of social interactions under the significant need for social isolation[37].

To assess these countless impacts, another instrument used was the Kessler Psychological Distress Scale, which allows estimating non-specific psychological distress. It features a ten-item version (K10), which measures the frequency with which symptoms such as nervousness, sadness, hopelessness, worthlessness and fatigue are experienced, as well as a short six-item version (K6), both assessing symptoms experienced in the previous month[38]. K6 allowed identifying the presence of 28.5% of medical students from Japan with a significant degree of psychological distress[22]. Using the same version, it was also shown that medical students in Morocco from 1st to 6th year had moderate and serious psychological distress, but that the absence of psychological distress was greater[21].

Through the K10 version, the probability of having a severe mental disorder was established in nearly half of the Jordanian medical students evaluated; in addition, evaluating the impacts of COVID-19 in different aspects,

a negative impact on the stress level was also found in 56.2% of the students[23]. In general, undergraduate students suffered such impacts on their psychological well-being, presenting depression, anxiety and stress symptoms[39], which proves the need for measures to minimize the negative effects of the pandemic.

In this same scenario, DASS-21 is one of the existing scales to assess self-reported changes in mood states. It is a questionnaire with three separate scales (consisting of 7 items each) but correlated, in order to assess depression, anxiety and stress[40]. When evaluating Iranian medical student interns, there was 60.9% prevalence of severe stress and 99% and 69.6% prevalence of extremely severe anxiety and depression, respectively[24]. This evidences intensified prevalence of extremely severe anxiety in the part of the population. However, in medical students from India, the presence of stress, anxiety and depression was evidenced in a greater proportion[25].

SRQ-20 is another self-report scale consisting of 20 items, originally developed by the WHO to indicate mental distress[41]. In Brazilian medical students, the scale evidenced some psychological or behavior-related change over the pandemic period with 81.4% prevalence. Mood swings were reported, with feelings of tension, nervousness, worry, sadness and presence of crying more than usual, as well as presence of depressive thoughts, with loss of interest, feeling of uselessness, sensation of inability to play a useful role in life and suicidal ideation[8].

For a specific evaluation of the academic community, the Maslach Burnout Inventory-Student Survey (MBI-SS) was also used. This is an academic Burnout assessment questionnaire derived from the Maslach Burnout Inventory (MBI), adapted for students; it measures 3 factors: emotional exhaustion, cynicism and academic efficacy[42]. In students attending the University of Cyprus, there was evidence of a statistically significant increase in Burnout from the pre-COVID-19 period to the COVID-19 period, as well as increased levels of cynicism[26]. In this way, the remarkable effect of the pandemic on the students' mental health was outstanding.

Other studies assessed the impacts of COVID-19 on the mental health of medical students using different methods. In Jordan, 70.4% of the medical students evaluated stated an impact on their mental health and 65.1% claimed that COVID-19 contributed to increases in depression and anxiety[27]. Likewise, medical students from Canada with a previous clinical diagnosis of depression or anxiety presented more depressive symptoms and more anxiety with COVID-19. In turn, among the students without a previous clinical diagnosis, more depressive symptoms and no change in these symptoms were found in a similar proportion (42%), as well as more anxiety (41%)[28].

Students from Polish medical schools also had difficulties in university engagement during the pandemic period, mainly complaining about difficulty concentrating, lack of motivation, stress and frustration. In addition to that, the prevalence of lack of social life was 14.35%[29], which corroborates the harms to mental health due to the sensation of isolation resulting from COVID-19. The results of the pandemic and established social isolation also exerted negative influences on the lives of students in Saudi Arabia, with ¼ of them feeling depressed during the quarantine period and more than 35% feeling hopeless, exhausted or emotionally unresponsive[30].

Finally, in the University of Mostar, the negative effects on the mental health of the students evaluated involved presence of higher stress levels due to obligations and increased financial stress and at home. These students also stated feeling terrified, concerned and helpless during the pandemic[31]. In fact, living socially isolated led students around the world to present many feelings of fear and insecurity, in addition to the various reported effects and anxiety and depression disorders[43].

The reality of the pandemic resulting from COVID-19 was established with significant changes in the lives of the entire population, affecting global mental health to different degrees. The presence of symptoms of anxiety, depression, increased stress and deficits in psychological well-being is notorious in university students from different countries, but especially among medical students. Therefore, the effects of the new coronavirus perpetuate the need for an incessant search to alleviate the mental distress of those affected, as well as for continuous support for the students who are attending medical training.

Some limitations found in this study were the difficulty finding articles focusing only on undergraduate medical students and the absence of data in some studies, in addition to the fact that the pandemic is still in force, with the possibility of other disorders being made evident until the end of this worldwide phenomenon.

The results of this study contribute to identifying the main impacts on the mental health of medical students as a result of the reality imposed by the new coronavirus; therefore, the findings are important to encourage the implementation of future mental health support strategies during medical training.

Conclusion

The pandemic caused by SARS-CoV-2 exerted an impact on the mental health of the population in different ways, especially among medical students, as they are exposed to psychological overload. The main disorders highlighted were anxiety and depression, with different changes in mood and behavior, stress, psychological

distress and difficulty in university engagement also being reported.

Acknowledgments

To the Scientific Initiation sector of the Faculdade Atenas – Campus Passos.

References

1. Organização Pan-Americana da Saúde; Organização Mundial da Saúde. Histórico da pandemia de COVID-19 [Homepage]. c2021 [cited 2021 Nov 05]. Available from: https://www.paho.org/pt/covid19/historico-da-pandemia-covid-19

2. Jané-Llopis E, Anderson P, Segura L, Zabaleta E, Muñoz R, Ruiz G, et al. Mental ill-health during COVID-19 confinement. BMC Psychiatry. 2021;21(1):194. https://doi.org/10.1186/s12888-021-03191-5

3. Rahman MA, Islam SMS, Tungpunkom P, Sultana F, Alif SM, Banik B, et al. COVID-19: Factors associated with psychological distress, fear, and coping strategies among community members across 17 countries. Global Health. 2021;17(1):117. https://doi.org/10.1186/s12992-021-00768-3

4. Ribeiro LS, Bragé EG, Ramos DB, Fialho IR, Vinholes DB, Lacchini AJ. COVID-19 pandemic effects on the mental health of an academic community. Acta Paul. Enferm. 2021;34:eAPE03423. https://doi.org/10.37689/acta-ape/2021AO03423

5. Chen RN, Liang SW, Peng Y, Li XG, Chen JB, Tang SY, et al. Mental health status and change in living rhythms among college students in China during the COVID-19 pandemic: A large-scale survey. J Psychosom Res. 2020;137:110219. https://doi.org/10.1016/j.jpsychores.2020.110219

6. Browning MHEM, Larson LR, Sharaievska I, Rigolon A, McAnirlin O, Mullenbach L, et al. Psychological impacts from COVID-19 among university students: Risk factors across seven states in the United States. PLoS ONE. 2021;16(1):e0245327. https://doi.org/10.1371/journal.pone.0245327

7. Karagöl A. Levels of Depression, Anxiety and Quality of Life of Medical Students. Psychiatr Danub [Internet]. 2021 [cited 2021 Dec 30];33(Suppl 4):732-7. Available from: https://www.psychiatria-danubina.com/UserDocsImages/pdf/dnb_vol33_noSuppl%204/dnb_vol33_noSuppl%204_732.pdf

8. Teixeira LAC, Costa RA, Mattos RMPR, Pimentel D. Brazilian medical students' mental health during coronavirus disease 2019 pandemic. J Bras Psiquiatr. 2021;70(1):21-9. https://doi.org/10.1590/0047-2085000000315

9. Huarcaya-Victoria J, Elera-Fitzcarrald C, Crisol-Deza D, Villanueva-Zúñiga L, Pacherres A, Torres A, et al. Factors associated with mental health in Peruvian medical students during the COVID-19 pandemic: a multicentre quantitative study. Rev Colomb Psiquiatr. 2021:S0034-7450(21)00108-6. https://doi.org/10.1016/j.rcp.2021.06.002

10. Ottawa Hospital Research Institute; University of Oxford; Monash University. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [Homepage]. c2022 [cited 2022 Jan 12]. Available from: http://www.prisma-statement.org

11. Botelho LLR, Cunha CCA, Macedo M. The integrative review method in organizational studies. Gestão Soc [Internet]. 2011 [cited 2022 Jan 22];5(11):121-36. Available from: https://www.gestaoesociedade.org/gestaoesociedade/article/view/1220/906

12. Batais MA, Temsah MH, AlGhofili H, AlRuwayshid N, Alsohime F, Almigbal TH, et al. The coronavirus disease of 2019 pandemic-associated stress among medical students in middle east respiratory syndrome-CoV endemic area: An observational study. Medicine (Baltimore). 2021;100(3):e23690. https://doi.org/10.1097/MD.0000000000023690

13. Saravia-Bartra MM, Cazorla-Saravia P, Cedillo-Ramirez L. Anxiety level of first-year medical students in a private university in Peru during Covid-19. Rev Fac Med Hum. 2020;20(4):568-73. https://doi.org/10.25176/RFMH.v20i4.3198

14. Zhao L, Sznajder K, Cheng D, Wang S, Cui C, Yang X. Coping Styles for Mediating the Effect of Resilience on Depression Among Medical Students in Web-Based Classes During the COVID-19 Pandemic: Cross-sectional Questionnaire Study. J Med Internet Res. 2021;23(6):e25259. https://doi.org/10.2196/25259

15. Xiao H, Shu W, Li M, Li Z, Tao F, Wu X, et al. Social Distancing among Medical Students during the 2019 Coronavirus Disease Pandemic in China: Disease Awareness, Anxiety Disorder, Depression, and Behavioral Activities. Int J Environ Res Public Health. 2020;17(14):5047. https://doi.org/10.3390/ijerph17145047

16. Yun JY, Kim JW, Myung SJ, Yoon HB, Moon SH, Ryu H, et al. Impact of COVID-19 on Lifestyle, Personal Attitudes, and Mental Health Among Korean Medical Students: Network Analysis of Associated Patterns. Front Psychiatry. 2021;12:702092. https://doi.org/10.3389/fpsyt.2021.702092

17. Halperin SJ, Henderson MN, Prenner S, Grauer JN. Prevalence of Anxiety and Depression Among Medical Students During the Covid-19 Pandemic: A Cross-Sectional Study. J Med Educ Curric Dev. 2021;8:2382120521991150. https://doi.org/10.1177/2382120521991150

18. Saeed N, Javed N. Lessons from the COVID-19 pandemic: Perspectives of medical students. Pak J Med Sci. 2021;37(5):1402-7. https://doi.org/10.12669/pjms.37.5.4177

19. Yin Y, Yang X, Gao L, Zhang S, Qi M, Zhang L, et al. The Association Between Social Support, COVID-19 Exposure, and Medical Students' Mental Health. Front Psychiatry. 2021;12:555893. https://doi.org/10.3389/fpsyt.2021.555893

20. Gupta P, Anupama BK, Ramakrishna K. Prevalence of Depression and Anxiety Among Medical Students and House Staff During the COVID-19 Health-Care Crisis. Acad Psychiatry. 2021 Oct;45(5):575-80. https://doi.org/10.1007/s40596-021-01454-7

21. Essangri H, Sabir M, Benkabbou A, Majbar MA, Amrani L, Ghannam A, et al. Predictive Factors for Impaired Mental Health among Medical Students during the Early Stage of the COVID-19 Pandemic in Morocco. Am J Trop Med Hyg. 2021;104(1):95-102. https://doi.org/10.4269/ajtmh.20-1302

22. Arima M, Takamiya Y, Furuta A, Siriratsivawong K, Tsuchiya S, Izumi M. Factors associated with the mental health status of medical students during the COVID-19 pandemic: a cross-sectional study in Japan. BMJ Open. 2020;10(12):e043728. https://doi.org/10.1136/bmjopen-2020-043728

23. Seetan K, Al-Zubi M, Rubbai Y, Athamneh M, Khamees A, Radaideh T. Impact of COVID-19 on medical students' mental wellbeing in Jordan. PLoS ONE. 2021;16(6):e0253295. https://doi.org/10.1371/journal.pone.0253295

24. Vahedian-Azimi A, Moayed MS, Rahimibashar F, Shojaei S, Ashtari S, Pourhoseingholi MA. Comparison of the severity of psychological distress among four groups of an Iranian population regarding COVID-19 pandemic. BMC Psychiatry. 2020;20(1):402. https://doi.org/10.1186/s12888-020-02804-9

25. 25. Shailaja B, Singh H, Chaudhury S, Thyloth M. COVID-19 pandemic and its aftermath: Knowledge, attitude, behavior, and mental health-care needs of medical undergraduates. Ind Psychiatry J. 2020;29(1):51-60. https://doi.org/10.4103/ipj.ipj_117_20

26. Zis P, Artemiadis A, Bargiotas P, Nteveros A, Hadjigeorgiou GM. Medical Studies during the COVID-19 Pandemic: The Impact of Digital Learning on Medical Students' Burnout and Mental Health. Int J Environ Res Public Health. 2021;18(1):349. https://doi.org/10.3390/ijerph18010349

27. Al-Husban N, Alkhayat A, Aljweesri M, Alharbi R, Aljazzaf Z, Al-Husban N, et al. Effects of COVID-19 pandemic on medical students in Jordanian universities: A multi-center cross-sectional study. Ann Med Surg (Lond). 2021;67:102466. https://doi.org/10.1016/j.amsu.2021.102466

28. ElHawary H, Salimi A, Barone N, Alam P, Thibaudeau S. The effect of COVID-19 on medical students' education and wellbeing: a cross-sectional survey. Can Med Educ J. 2021;12(3):92-9. https://doi.org/10.36834/cmej.71261

29. Pokryszko-Dragan A, Marschollek K, Nowakowska-Kotas M, Aitken G. What can we learn from the online learning experiences of medical students in Poland during the SARS-CoV-2 pandemic? BMC Med Educ. 2021;21(1):450. https://doi.org/10.1186/s12909-021-02884-5

30. Meo SA, Abukhalaf AA, Alomar AA, Sattar K, Klonoff DC. COVID-19 Pandemic: Impact of Quarantine on Medical Students' Mental Wellbeing and Learning Behaviors. Pak J Med Sci. 2020;36(COVID19-S4):S43-S48. https://doi.org/10.12669/pjms.36.COVID19-S4.2809

31. Šimić Š, Černy Obrdalj E, Bevanda M, Bevanda D, Rizikalo A, Marijanović I. Impact of COVID-19 Pandemic on Mental Health of Medical Students at the University of Mostar. Psychiatr Danub [Internet]. 2021 [cited 2022 Jan 22];33(Suppl 10):114-9. Available from: https://www.psychiatria-danubina.com/UserDocsImages/pdf/dnb_vol33_noSuppl%2010/dnb_vol33_noSuppl%2010_114.pdf

32. Sousa TV, Viveiros V, Chai MV, Vicente FL, Jesus G, Carnot MJ, et al. Reliability and validity of the Portuguese version of the Generalized Anxiety Disorder (GAD-7) scale. Health Qual Life Outcomes. 2015;13:50. https://doi.org/10.1186/s12955-015-0244-2

33. Yang KH, Wang L, Liu H, Li LX, Jiang XL. Impact of coronavirus disease 2019 on the mental health of university students in Sichuan Province, China: An online cross-sectional study. Int J Ment Health Nurs. 2021;30(4):875-84. https://doi.org/10.1111/inm.12828

34. Perissotto T, Silva TCRPD, Miskulin FPC, Pereira MB, Neves BA, Almeida BC, et al. Mental health in medical students during COVID-19 quarantine: a comprehensive analysis across year-classes. Clinics (Sao Paulo). 2021;76:e3007. https://doi.org/10.6061/clinics/2021/e3007

35. Liu J, Zhu Q, Fan W, Makamure J, Zheng C, Wang J. Online Mental Health Survey in a Medical College in China During the COVID-19 Outbreak. Front Psychiatry. 2020;11:459. https://doi.org/10.3389/fpsyt.2020.00459

36. Volker D, Zijlstra-Vlasveld MC, Brouwers EP, Homans WA, Emons WH, van der Feltz-Cornelis CM. Validation of the Patient Health Questionnaire-9 for Major Depressive Disorder in the Occupational Health Setting. J Occup Rehabil. 2016;26(2):237-44. https://doi.org/10.1007/s10926-015-9607-0

37. Shehata WM, Abdeldaim DE. Internet addiction among medical and non-medical students during COVID-19 pandemic, Tanta University, Egypt. Environ Sci Pollut Res Int. 2021;28(42):59945-52. https://doi.org/10.1007/s11356-021-14961-9

38. Easton SD, Safadi NS, Wang Y, Hasson RG 3rd. The Kessler psychological distress scale: translation and validation of an Arabic version. Health Qual Life Outcomes. 2017;15(1):215. https://doi.org/10.1186/s12955-017-0783-9

39. Guo K, Zhang X, Bai S, Minhat HS, Nazan AINM, Feng J, et al. Assessing social support impact on depression, anxiety, and stress among undergraduate students in Shaanxi province during the COVID-19 pandemic of China. PLoS ONE. 2021;16(7):e0253891. https://doi.org/10.1371/journal.pone.0253891

40. Gomez R, Stavropoulos V, Griffiths MD. Confirmatory factor analysis and exploratory structural equation modelling of the factor structure of the Depression Anxiety and Stress Scales-21. PLoS ONE. 2020;15(6):e0233998. https://doi.org/10.1371/journal.pone.0233998

41. Abuhamdah SMA, Naser AY, Abdelwahab GM, AlQatawneh A. The Prevalence of Mental Distress and Social Support among University Students in Jordan: A Cross-Sectional Study. Int J Environ Res Public Health. 2021;18(21):11622. https://doi.org/10.3390/ijerph182111622

42. Oró P, Esquerda M, Mas B, Viñas J, Yuguero O, Pifarré J. Effectiveness of a Mindfulness-Based Programme on Perceived Stress, Psychopathological Symptomatology and Burnout in Medical Students. Mindfulness (N Y). 2021:1-10. https://doi.org/10.1007/s12671-020-01582-5

43. Meng N, Liu Z, Wang Y, Feng Y, Liu Q, Huang J, et al. Beyond Sociodemographic and COVID-19-Related Factors: The Association Between the Need for Psychological and Information Support from School and Anxiety and Depression. Med Sci Monit. 2021;27:e929280. https://doi.org/10.12659/MSM.929280

Authors' contribution

Study concept and design: Angela Chaves de Oliveira Garcia, Hairina Ester de Carvalho, Andressa Bueno Florêncio, Beatriz Aparecida Fernandes, Cleide Augusta de Queiroz, Rafael Costa Pereira, Vanessa Luzia Queiroz Silva, Mateus Goulart Alves. **Obtaining data:** Angela Chaves de Oliveira Garcia, Hairina Ester de Carvalho, Andressa Bueno Florêncio, Beatriz Aparecida Fernandes, Cleide Augusta de Queiroz, Mateus Goulart Alves.

Data analysis and interpretation: Angela Chaves de Oliveira Garcia, Hairina Ester de Carvalho, Andressa Bueno Florêncio, Beatriz Aparecida Fernandes, Cleide Augusta de Queiroz, Mateus Goulart Alves. **Statistical analysis:** Angela Chaves de Oliveira Garcia, Hairina Ester de Carvalho, Andressa Bueno Florêncio, Beatriz Aparecida Fernandes, Cleide Augusta de Queiroz, Mateus Goulart Alves. **Drafting the manuscript:** Angela Chaves de Oliveira Garcia, Hairina Ester de Carvalho, Andressa Bueno Florêncio, Beatriz Aparecida Fernandes, Cleide Augusta de Queiroz, Mateus Goulart Alves. **Critical review of the manuscript as to its relevant intellectual content:** Angela Chaves de Oliveira Garcia, Hairina Ester de Carvalho, Andressa Bueno Florêncio, Beatriz Aparecida Fernandes, Cleide Augusta de Queiroz, Rafael Costa Pereira, Vanessa Luzia Queiroz Silva, Mateus Goulart Alves.

All authors approved the final version of the text.

Conflict of interest: the authors have declared that there is no conflict of interest.

Corresponding Author:
Mateus Goulart Alves
E-mail: mateus.professor.passos@uniatenas.edu.br
https://orcid.org/0000-0003-0680-6817