



Bibliometric Analysis of Triggers on Environmental Stress Among Medical and Health Sciences Students at the University

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Abstract

Continuing to improve services to students while studying on campus, lecturers and all elements at the university need information about triggers of environmental stress among medical and health sciences students. Thus, the purpose of this study was to explore triggers of environmental stress among medical and health sciences students in the university through bibliometric analysis by analysing the network visualisation, overlay visualisation and density visualisation on the topic. Bibliometrics analysis was used in assessing related topics. The data sources were based on online searches via <https://app.dimensions.ai/>. Data was collected on 3 December 2023. The literature followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart. Data were analysed using VOSviewer and further analysed and reviewed by co-occurrence and co-authors. Four major themes of environmental stress were found in this study: 1) The internal situation in the university; 2) External situations outside of the university; 3) Comfort situation during the study; 4) Academic process. Environmental stress factors related to internal situation in the academic situation were academic stress, air pollution, anxiety in the academic process, COVID-19, depression, fear, medical student, nursing student, physical activity, school regulation, smoking and uncertainty of study. From the visualisation and density visualisation, it can be seen that the academic process related to the duration of study was a trending theme discussed in several papers related to triggers of environmental stress among students in the university. All elements of the university especially policy makers should pay attention to this problem to reduce the risk of stress while students are studying.

Key words: Environmental stress; Students; Trigger; University; Medical Sciences; Health sciences.

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Introduction

A conducive university environment can improve student learning motivation so that it will have an impact on learning achievement.¹ A conducive university environment here includes good relations between fellow students and the relationship between students and lecturers.² On

the other hand, an unhealthy environment will make students feel stressed and ultimately reduce the learning motivation and achievement of students.³

The university environment can be divided into

two major parts: physical and non-physical.⁴ The physical environment such as changes in temperature, both rising and falling temperatures affect work performance, but sometimes it also reduces work performance.⁵ An increase in temperature to a certain limit causes arousal which stimulates work performance but after passing a certain threshold this increase in temperature begins to interfere with body temperature which results in disruption of work performance as well.⁶ The literature generally shows that the factors that affect the physical work environment are: temperature, noise, lighting and air quality.²

The non-physical factor most often discussed and related to student learning motivation is the working relationship formed at the university between students and other students, students and campus staff or students and lecturers.⁷ The study results show that the relationship is a critical strategic issue for organisations because the relationship between the employee can significantly impact morale, motivation and productivity.⁸ Another theory says people work for money but for more than money.⁹ Most students want to be respected as a student on campus and the working relationship between students and all elements of the campus is also a fundamental thing that needs attention.¹⁰

In continuing to improve services to students while studying on campus, lecturers and all elements at the university need information about triggers of environmental stress among students. The results of bibliometric analyses may guide the identification of all triggers of environmental stress among students in the university by determining the main research areas of existing publications in specific fields. Moreover, the bibliometric analysis enables researchers to easily obtain information about subjects of interest from among numerous and increasing number of published articles.¹¹ There is no bibliometric analysis on the publication of research topics triggers of environmental stress among students at the university. Thus, the purpose of the study was to explore triggers of environmental stress among students in the university through bibliometric analysis by analysing the network visualisation, overlay visualisation and density visualisation on the topic.

Methods

Bibliometrics analysis was more suitable for quantitatively analysing the distribution of research papers that discuss triggers of environmental stress among students in the university. Bibliometric analysis is essential in assessing related topics searched based on the repetition term received.¹² The data sources used in this study were based on online searches via <https://app.dimensions.ai/>. Data was collected on 3 December 2023. The literature search used the stages following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart.¹³

Paper restricted in publications years 2015-2023, focuses on the field of health sciences, biomedical and clinical science, nursing, public health, psychology and human society. The article evaluated only article publication type. The book and chapter types were excluded.

Selecting data

The stages in PRISMA included identification, screening and including as shown in Figure 1. Stage 1 (identification) detected 158,764 records from *dimensions.ai*, taking into account, each of the main search terms 'trigger' AND 'environmental stress' AND 'student' AND 'university', article and proceeding document type and range period of publication from 2015 to 2023. In stage 2 (screening), the option "article title, abstract" was selected in the field of each search term, resulting in 152,982 articles being excluded. In phase 3 (included), the final sample yielded 5,782 articles. The detail of the process is shown in Figure 1.

Data analysis

Data were analysed using *VOSviewer*. *VOSviewer* is a computer program for creating and viewing bibliometric maps.¹⁴ The type of analysis was selected to create a map based on text data. In this study, the analysis was reviewed by co-occurrence and co-authors.

a) Co-occurrence procedures

The procedure for co-occurrence analysis went through the following stages: The data source was selected, data were read from references manager files. Selected fields were chosen from

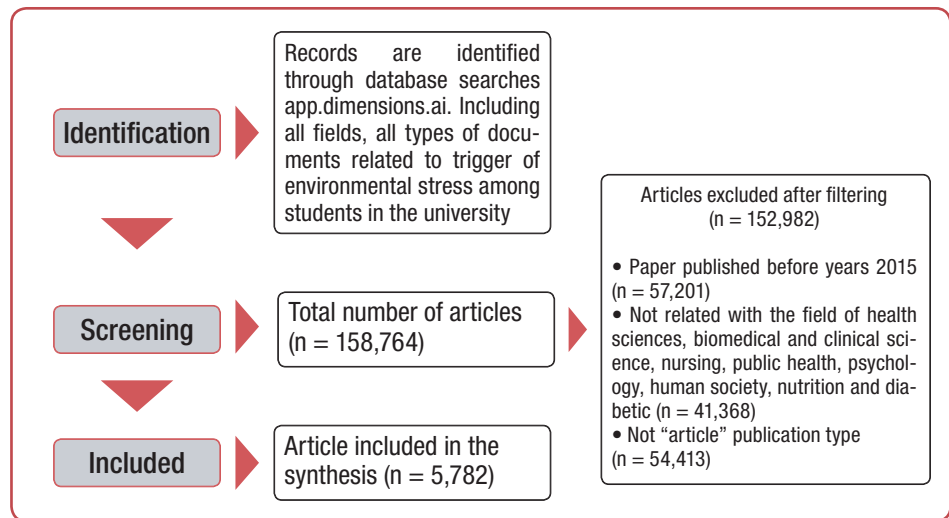


Figure 1: PRISMA flow chart

PRISMA: preferred reporting items for systematic reviews and meta-analyses

which title and abstract fields were extracted. The counting method selected was full counting. The threshold selected was the minimum number of occurrences of a term was 10. Chosen several terms amounted to 133.

b) Co-authors procedures

The procedure for co-author analysis went through the following stages: The data type was chosen and a map based on bibliographic data was created. A co-authorship map based on bibliographic data was chosen. Chosen data

source was: read data from reference manager files. Supported file type: ris. Chosen the type of analysis and counting method was: the type of analysis was co-authorship and the counting method was full counting. Chosen threshold was: the maximum number of documents of an author was 2. Of the 2,624 authors, 49 met the threshold. For each of the 49 authors, the total strength of the co-authorship links with other authors was calculated. The authors with the greatest total link strength were selected. The number of selected authors was 49.

Results

From the network visualisation Figure 2 and overlay visualisation Figure 3, it can be seen that academic issues, namely the duration of the study

were a trending theme discussed in several papers related to triggers of environmental stress among students in the university.

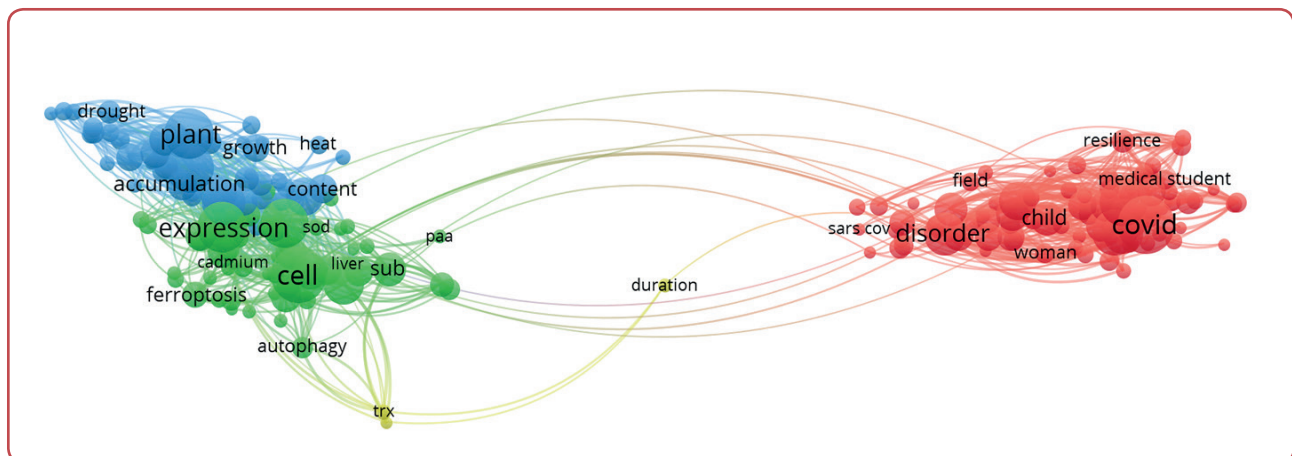


Figure 2: Network visualisation

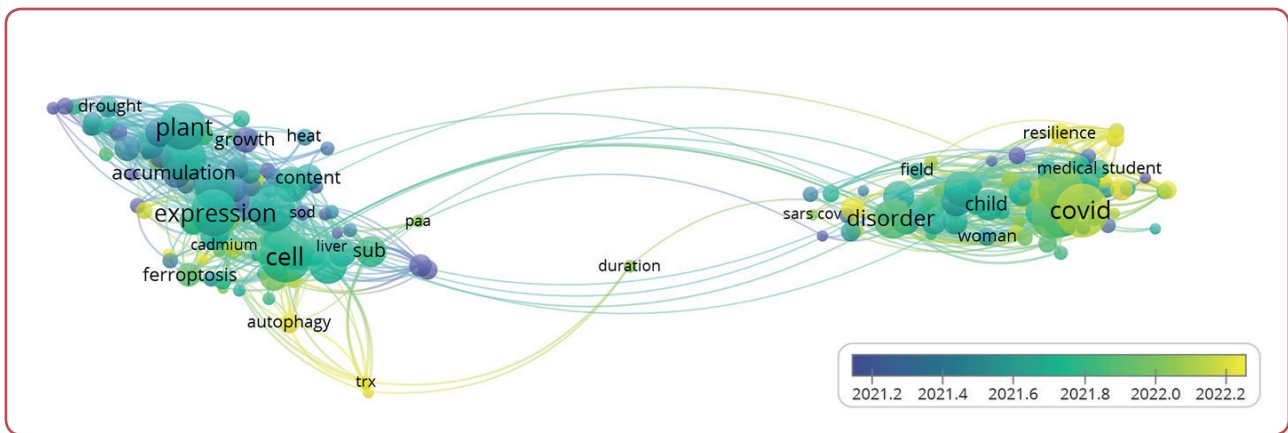


Figure 3: Overlay visualisation

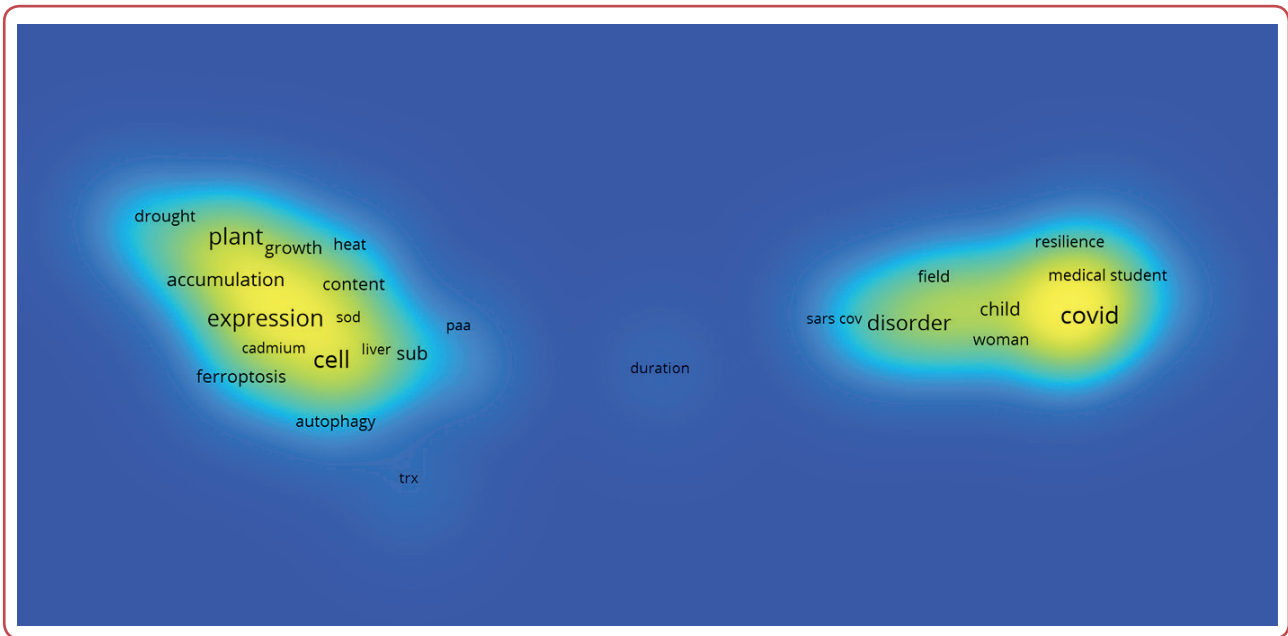


Figure 4: Density visualisation

Through the bibliometric analysis process, it can be concluded that the triggers of environmental stress among students in the university were grouped into four themes: internal situation in the university (academic stress, air pollution, anxiety in academic process, coronavirus disease, depression, fear, medical students, nursing student, physical activity, school regulation, smoking, uncertainty), external situation outside of university (oxidative stress), comfort situation during study (drought tolerance, low temperature) and academic process (duration).

Apart from that, from Figure 4 density visualisation, it can be seen that the academic process related to the duration of study was a trending theme discussed in several papers

related to triggers of environmental stress among students in the university.

Discussion

The internal situation in the university

This study investigated several environmental stress factors related to internal situations in the academic situation such as academic stress, air pollution, anxiety in the academic process, coronavirus disease, depression, fear, medical students, nursing students, physical activity, school regulation, smoking and uncertainty.

The educational journey for nursing, medical and health sciences-related students is punctuated by a university's internal situation of stress-inducing factors that extend beyond the conventional academic stressors.¹⁵ The academic rigours inherent in the pursuit of a healthcare degree encapsulate a formidable array of demands, encompassing the mastery of a dense and complex body of knowledge, the acquisition of critical clinical skills and the execution of high-stakes practical assessments.¹⁶ This intense academic workload often precipitates heightened levels of stress and anxiety, which can manifest in various forms, including performance anxiety, test anxiety and a pervasive fear regarding the ability to synthesise and apply knowledge in real-world clinical settings.¹⁷ Such stress is frequently compounded by environmental and lifestyle factors present within the university setting, such as air pollution and smoking activity on campus. These elements, often overlooked, can further deteriorate the mental and physical well-being of students, undermining their academic endeavours and contributing to a cascade of health-related stress outcomes.^{16, 17}

In recent times, the advent of the coronavirus disease (COVID-19) pandemic has introduced additional, unprecedented stressors into the academic milieu of healthcare students.^{18, 19} The exigencies of the pandemic have led to a radical transformation in academic regulations and the structure of educational delivery, engendering an atmosphere fraught with uncertainty and apprehension.^{20, 21} Students have been obliged to adapt to rapidly evolving teaching methods, often with diminished access to hands-on clinical experiences, which are vital to their education and future practice.²⁰ These pandemic-related academic disruptions are paralleled by the broader psychological impacts of the disease, including elevated concerns about personal and familial health risks, which have been shown to exacerbate feelings of depression and anxiety within this student population.²¹ Furthermore, the pandemic has spotlighted the criticality of physical activity as a mitigative measure against stress, even as the constraints of study and infection control measures have made regular exercise more challenging. The cumulative effect of these stressors has culminated in a sense of graduate uncertainty, where students are left to ponder the stability and structure of their future roles in a healthcare system that has been deeply shaken by a global health crisis.^{22, 23} Addressing

these multifactorial stressors calls for a holistic and responsive approach from academic institutions, necessitating the provision of comprehensive mental health support, the adaptation of curriculum and assessment methods to accommodate the nuances of pandemic-era education and the fostering of environments conducive to physical and psychological wellness.^{24, 25}

External situations outside of the university

Oxidative stress is discovered as an external situation which triggers environmental stress among nursing, medical and health-related students' university students in this study. Oxidative stress arises from a combination of environmental factors, such as air pollution and smoking and the chronic psychological stress associated with the demands of their studies.^{26, 27} Intense academic workloads and high-stakes clinical environments may increase endogenous free radicals, leading to cellular damage.²⁸ This is compounded by lifestyle factors common among students, including poor sleep, diet and insufficient exercise, which can all contribute to oxidative imbalance. Although the direct link between academic and oxidative stress warrants further research, recognising and addressing these contributors is crucial for promoting long-term health in future healthcare professionals.^{29, 30} Implementing stress reduction programs, nutritional guidance and healthy lifestyle promotion within academic curricula may help mitigate these risks.

Comfort situation during the study

The ambient conditions within educational settings, notably temperature, play a pivotal role in shaping the learning experience and comfort of nursing and medical students.¹⁶ A suboptimal thermal environment, particularly one that is excessively cold, can precipitate a range of physiological and psychological stress responses that impede cognitive function and academic performance.⁷ Cold classroom temperatures have been associated with decreased manual dexterity, reduced concentration and heightened perception of discomfort, which can challenge students' tolerance and adaptability, particularly during prolonged study periods.³¹ This form of environmental stress can subtly yet significantly contribute to the overall stress burden experienced by these students, whose academic rigours already place substantial demands on their cognitive resources.³² Recognising the

impact of thermal stress on student well-being and learning efficacy, there is an emerging imperative for academic institutions to consider and regulate classroom temperatures to foster an environment conducive to comfort and optimal learning.³¹ This consideration is particularly salient in the context of nursing and medical education, where the synthesis of complex information and the performance of precise clinical skills are paramount.^{16, 17}

Academic process

The temporal dimension of academic processes, characterised by prolonged durations of study, is a significant source of stress for nursing, medical and health sciences-related students.^{16, 17} The extensive periods required for mastering the expansive curricula of healthcare disciplines can lead to chronic stress, manifesting as both psychological strain and physical exhaustion. The relentless pressure to absorb voluminous medical knowledge within limited timeframes often necessitates extended study sessions, which can disrupt circadian rhythms, impair sleep quality and exacerbate cognitive overload.³³ This sustained intellectual exertion, without adequate rest, can diminish students' capacity for information retention and analytical thinking, critical faculties in the medical field. Furthermore, the constant state of academic engagement can preclude necessary leisure and social activities, contributing to a sense of isolation and burnout.³⁴ Acknowledging the deleterious effects of such prolonged academic engagement, it is incumbent upon educational institutions to implement pedagogical strategies that optimise learning while minimising stress.¹⁶ Such strategies could include modular curricula, integrated learning approaches and sufficient rest periods, which collectively aim to enhance academic efficiency and preserve the mental and physical well-being of the students.

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Conflicts of interest

The authors declare that there is no conflict of interest.

Conclusion

Through the bibliometric analysis process, it can be concluded that the triggers of environmental stress among students in the university are grouped into four themes: internal situation in the university (academic stress, air pollution, anxiety in academic process, coronavirus disease, depression, fear, medical students, nursing student, physical activity, school regulation, smoking, uncertainty), external situation outside of university (oxidative stress), comfort situation during study (drought tolerance, low temperature) and academic process (duration). All elements of the university especially policy makers should pay attention to this problem to reduce the risk of stress while students are studying.

Ethics

This study was a secondary analysis based on the currently existing dataset from the *Dimensions.ai* and did not directly involve with human participants or experimental animals. Therefore, the ethics approval was not required in this paper.

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Data access

The data that support the findings of this study are available from the corresponding author upon reasonable individual request.

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References

- Schunk DH. Learning theory: an educational perspective. 6th edition. Boston, MA: Pearson Education, Inc; 2012.
- Flynn O, Fullen BM, Blake C. Migraine in university students: A systematic review and meta-analysis. *Eur J Pain (United Kingdom)*. 2023;27(1):14-43. doi:10.1002/ejp.2047.
- Córdova A, Caballero-García A, Drobnic F, Roche E, Noriega DC. Influence of stress and emotions in the learning process: the example of COVID-19 on university students: a narrative review. *Healthcare*. 2023;11(12):1787. doi:10.3390/healthcare11121787.
- Tahmassian K, Moghadam NJ. Relationship between self-efficacy and symptoms of anxiety, depression, worry and social avoidance in a normal sample of students. *Iran J Psychiatry Behav Sci*. 2011;5(2):91-8. PMID: 24644452.
- Garatti M, Costa R, Reghizzi SC, Rohou E. The impact of alias analysis on VLIW scheduling. In: Zima HP, Joe K, Sato M, Seo Y, Shimasaki M, Eds. High performance computing. ISHPC 2002. *Lect Notes Comput Sci*. 2002;2327:93-105. doi:10.1007/3-540-47847-7_10.
- Gray K, Chapman W, Khan UR, Borda A, Budge M, Dutch M, et al. The rapid development of virtual care tools in response to COVID-19: case studies in three Australian health services. *JMIR Form Res*. 2022 Apr 6;6(4):e32619. doi: 10.2196/32619.
- Attia M, Ibrahim FA, Elsady MA, Khorkhash MK, Rizk MA, Shah J, et al. Cognitive, emotional, physical, and behavioral stress-related symptoms and coping strategies among university students during the third wave of COVID-19 pandemic. *Front Psychiatry*. 2022;13:933981. doi:10.3389/fpsy.2022.933981.
- Parihar A, Devanathan N, Sepulveda MN, Sevilla-Martir JF. Financial impact of the Indiana University student-run free clinic. *J Community Health*. 2023 Oct;48(5):878-81. doi: 10.1007/s10900-023-01234-4.
- Pranata S, Harriami R, Kurnia A, Wulandari H, Sepriana D, Bistara DN. Sociological public perception of the coronavirus disease 2019 situation in Indonesia: A phenomenological study. *Iran J Psychiatry Clin Psychol*. 2022;28(1):122-37. doi:10.32598/ijpcp.28.1.4082.1.
- Hsieh M. A preliminary study of bullying on University of Nursing in Taiwan. *Eur J Public Health*. 2022;32(Suppl 3):ckac131.428. doi:10.1093/eurpub/ckac131.428.
- Wu YY, Chou WH. A bibliometric analysis to identify research trends in intervention programs for smartphone addiction. *Int J Environ Res Public Health*. 2023;20(5):3840. doi:10.3390/ijerph20053840.
- Pahwa B, Goyal S, Chaurasia B. Understanding anterior communicating artery aneurysms: A bibliometric analysis of top 100 most cited articles. *J Cerebrovasc Endovasc Neurosurg*. 2022 Dec;24(4):325-34. doi: 10.7461/jcen.2022.E2022.01.001.
- Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021 Mar 29;372:n71. doi: 10.1136/bmj.n71.
- Van Eck NJ, Waltman L. Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*. 2010;84(2):523-38. doi:10.1007/s11192-009-0146-3
- Mulianda D, Rahmanti A, Margiyati M, Sari NW, Haksara E, Pranata S. Behavioral activation, mindfulness exercises, and loving-kindness meditation exercises as effective therapies to reduce stress among nursing students' during COVID-19 pandemic. *Open Access Maced J Med Sci*. 2022;10(G):228-32. doi:10.3889/oamjms.2022.8695.
- Zheng YX, Jiao JR, Hao WN. Stress levels of nursing students: A systematic review and meta-analysis. *Medicine (Baltimore)*. 2022 Sep 9;101(36):e30547. doi: 10.1097/MD.00000000000030547.
- Abdulghani HM, AlKhanhal AA, Mahmoud ES, Ponnampertuma GG, Alfaris EA. Stress and its effects on medical students: a cross-sectional study at a college of medicine in Saudi Arabia. *J Health Popul Nutr*. 2011;29(5):516-22. doi:10.3329/jhpn.v29i5.8906.
- Tamulevicius N, Save R, Gandhi N, Lubiak S, Sharma S, Aguado Loi CX, et al. Perceived stress and impact on role functioning in university students with migraine-like headaches during COVID-19. *Int J Environ Res Public Health*. 2023 Apr 13;20(8):5499. doi: 10.3390/ijerph20085499.
- Usher Am K, Jackson D, Massey D, Wynaden D, Grant J, West C, et al. The mental health impact of COVID-19 on pre-registration nursing students in Australia: Findings from a national cross-sectional study. *J Adv Nurs*. 2023;79(2):581-92. doi:10.1111/jan.15478.
- Sa'diyah H, Rahma Pratiwi EY. The effect of online learning on students learning motivation. *IJPSE Indones J Prim Sci Educ*. 2021;2(1):11-8. doi:10.33752/ijpse.v2i1.2063.

21. Salari N, Hosseinian-Far A, Jalali R, Vaisi-Raygani A, Rasoulpoor S, Mohammadi M, et al. Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: a systematic review and meta-analysis. *Global Health.* 2020 Jul 6;16(1):57. doi: 10.1186/s12992-020-00589-w.
22. Bogaert B, Kozlakidis Z, Caboux E, Péron J, Saintigny P. What went right during the COVID crisis: The capabilities of local actors and lasting innovations in oncology care and research. *PLOS Glob Public Heal.* 2023;3(9):e0002366. doi:10.1371/journal.pgph.0002366.
23. Lyng HB, Ree E, Wibe T, Wiig S. Healthcare leaders' use of innovative solutions to ensure resilience in healthcare during the Covid-19 pandemic: a qualitative study in Norwegian nursing homes and home care services. *BMC Health Serv Res.* 2021;21(1):878. doi:10.1186/s12913-021-06923-1.
24. Boston-Fleischhauer C. The global pandemic. *JONA J Nurs Adm.* 2021;51(6):304-6. doi:10.1097/nna.0000000000001017.
25. Desmarais C, Roy M, Nguyen MT, Venkatesh V, Rousseau C. The unsanitary other and racism during the pandemic: analysis of purity discourses on social media in India, France and United States of America during the COVID-19 pandemic. *Anthropol Med.* 2023;30(1):31-47. doi:10.1080/13648470.2023.2180259.
26. Pizzino G, Irrera N, Cucinotta M, Pallio G, Mannino F, Arcoraci V, et al. Oxidative stress: harms and benefits for human health. *Oxid Med Cell Longev.* 2017;2017:8416763. doi: 10.1155/2017/8416763.
27. Sharifi-Rad M, Anil Kumar NV, Zucca P, Varoni EM, Dini L, Panzarini E, et al. Lifestyle, oxidative stress, and antioxidants: back and forth in the pathophysiology of chronic diseases. *Front Physiol.* 2020 Jul 2;11:694. doi: 10.3389/fphys.2020.00694.
28. Pisoschi AM, Pop A, Iordache F, Stanca L, Predoi G, Serban AI. Oxidative stress mitigation by antioxidants - An overview on their chemistry and influences on health status. *Eur J Med Chem.* 2021 Jan 1;209:112891. doi: 10.1016/j.ejmech.2020.112891.
29. Rani V, Deep G, Singh RK, Palle K, Yadav UC. Oxidative stress and metabolic disorders: Pathogenesis and therapeutic strategies. *Life Sci.* 2016 Mar 1;148:183-93. doi: 10.1016/j.lfs.2016.02.002.
30. Moshtagh M, Moodi M, Moezi SA, Sharifi F, Khazdair MR. Inflammatory and oxidative stress biomarkers in the elderly, the Birjand longitudinal aging study. *Biomed Res Int.* 2023;2023:4683542. doi:10.1155/2023/4683542.
31. Meece JL, Anderman EM, Anderman LH. Classroom goal structure, student motivation, and academic achievement. *Annu Rev Psychol.* 2006;57:487-503. doi: 10.1146/annurev.psych.56.091103.070258.
32. Troy D, Anderson J, Jessiman PE, Albers PN, Williams JG, Sheard S, et al. What is the impact of structural and cultural factors and interventions within educational settings on promoting positive mental health and preventing poor mental health: a systematic review. *BMC Public Health.* 2022 Mar 17;22(1):524. doi: 10.1186/s12889-022-12894-7.
33. Boskma ACP, Wolthuis FW, Roelofs PDDM, van Wijlen AT, van Schie JE, de Man-van Ginkel JM, et al. Experienced career perspectives of nursing students and their supervisors in learning departments: a qualitative study. *BMC Nurs.* 2023 Sep 27;22(1):332. doi: 10.1186/s12912-023-01479-3.
34. Virpi V, Anna-Maria T, Kristina M. Practical nursing students' learning and assessment during work-based placement: A qualitative study. *Nurs Open.* 2023;10(9):6150-64. doi:10.1002/nop2.1849.