JURNAL MULTIDISIPLIN MADANI (MUDIMA)

Homepage: https://journal.formosapublisher.org/index.php/mudima
ISSN: 2808-5639 (Online)
Research Article

Volume 3, No 12, December (2023)	DOI: https://doi.org/10.55927/mudima.v3i12.7072	Page: 2517- 2525

Ergonomic Issue in Dental Students

Grace Monica[1*], Natalia Puri Handayani[2]
Universitas Kristen Maranatha, Bandung
Corresponding Author: Grace Monica grace.monica@dent.maranatha.edu

ARTICLE INFO

Keywords: Ergonomics, Dental Students, Curriculum, Musculoskeletal Disorder

Received : *2 November*
Revised : *17 November*
Accepted : *18 December*

ABSTRACT

Ignoring work positions that are continuously carried out will cause musculoskeletal disorders in the future. Ergonomic positions have become a part of the dentistry curriculum. However, because the content is not directly related to dentistry, it is often ignored by the dental students. Purpose: to evaluate how much important is ergonomic position for dental students, and how the ergonomic curriculum provided can be applied in treating patients. Methods: This is a cross-sectional study by conducting a survey of 70 alumni of Undergraduate Study Program on Faculty of Dentistry who are currently undergoing a professional program at the Teaching Dental Hospital, which was obtained by accidental sampling. Respondents were asked to fill the questionnaire. Results: The ergonomic position was considered very important (48.57%), it was often forgotten (38.57%) and difficult to apply in certain cases (21.43%). 62.86% of respondents realized that the position was not appropriate when it is difficult to gain visual access. Respondents hope that ergonomics is given as often as possible in practical training and given as early as possible in dental curriculum. Conclusions: Continuing education on practical training and given as early as possible is necessary to improve the application of ergonomic positions to dental students

INTRODUCTION

Dental practitioners often prioritize visualization while treating patients, and often forget the neutral position that should be maintained when performing treatment. The neutral position is a position where the muscles are in a natural position, without coercion, free from pressure, and symmetrical, considering the physiology of human body movement (Pirvu, Patrascu, Pirvu, & Ionescu, 2014). Certain cases sometimes make dental practitioners make certain movements which ultimately violate ergonomic positions.

Ergonomic positioning in dentistry can be achieved by maintaining posture while carrying out treatment, arranging the workspace to make the movements carried out effectively and efficiently, and using tools that will support the working position (Pirvu, Patrascu, Pirvu, & Ionescu, 2014). Arranging working space can be done easily because it involves factors outside the human body. Ergonomics experts have designed and measured the ideal equipment used by dental practitioners in such a way (Deolia, et al., 2018). Currently, many tools have been created in the field of dentistry that can support working positions. For examples, dental stools in the form of horse saddles, loupes, tools with handles which are light and easy to grip (Hokweda, Wouters, Ruijter, & Zijlstra-Shaw, 2007) (García-Vidal, et al., 2019) (Das, Motghare, & Singh, 2018). However, getting the body in the correct position while working takes a long time.

Negligence in maintaining posture while working can cause musculoskeletal disorders in the future. Based on a review of several literatures, around 65% of dentists in the world have musculoskeletal complaints, such as pain, discomfort, decreased muscle function, and longer working hours (García-Vidal, et al., 2019). Musculoskeletal disorders are also the biggest cause of early retirement for dentists, followed by cardiovascular disease (Das, Motghare, & Singh, 2018). Musculoskeletal disorders can occur in the fingers, shoulders, hands, wrists, and back. Several factors that cause musculoskeletal disorders in dentists include repetitive movements, awkward positions, static postures, excessive exertion, duration of work, contact with hard objects, and vibrations or vibrations. Some of the symptoms of musculoskeletal disorders include excessive fatigue in the shoulders and neck, tingling, burning or other pain in the arms, weakness when gripping or cramping in the hands, numbness of the fingers, inability to hold objects, hypersensitivity of the hands and fingers (García-Vidal, et al., 2019) (Das, Motghare, & Singh, 2018) (Gupta, Bhat, Mohammed, Bansal, & Gupta, 2014) (Datkar, Akash, & Kale, 2022).

A study in 2018 was conducted on 75 dentists by observing work posture while treating patients, it was found that none of the dentists kept their neck in the correct position during treatment, most of them could not maintain their back position. Only 15 practitioners were able to maintain their posture during the treatment (Deolia, et al., 2018).

Ergonomics positions has been learned when someone is studying dentistry. Almost all dental faculties in the world include ergonomics module in their curriculum (J C Beach, 1998) (Talpos-Niculescu, et al., 2022) (Almosa & Zafar, 2019). Although not written specifically, ergonomics module in dental education in Indonesia has also been one of the competency standards for dentists. However, ergonomics is given in different ways and times at each university (Talpos-Niculescu, et al., 2022) (Faust, 2020).

Module of ergonomic position is often set aside than other modules in dentistry. Dental students often ignore this module and prefer attention to module related to clinical practice (Talpos-Niculescu, et al., 2022). The purpose of this study was to evaluate how much important is ergonomic position for dental students, and how the ergonomic curriculum provided can be applied in treating patients.

METHODS

This is a cross-sectional study by conducting a survey of 70 alumni of Undergraduate Study Program on Faculty of Dentistry who are currently undergoing a professional program at the Teaching Dental Hospital in Bandung, Indonesia. Respondents were obtained by accidental sampling with a minimum sample size of 69 people. Respondents were asked to fill in open and closed questions in the questionnaire. Questions are included: experience of obtaining ergonomics modules, memories of ergonomics modules that had been given, knowledge of ergonomics, opinions about ergonomics, application of ergonomics principles while treating patients, and expectations for further ergonomics modules.

RESULTS AND DISCUSSION

58 women (83%) and 12 men (17%) are participated in this study. As many as 27% of respondents have studied for two years. Based on their memory, 80% of respondents stated that ergonomics module was given in the undergraduate program, 58% of respondents stated that ergonomics modulewas given through tutorial modulein the undergraduate program, 55% stated that ergonomics modulewas given during the skills lab in the undergraduate program, 15% of respondents stated that ergonomics module was given during field study in the undergraduate program, 75% stated that ergonomics module was given while discussing journals in professional programs, and 65% stated that ergonomics module was given during dental profession programs. This question is designed to have more than one answer.

Regarding knowledge about ergonomics, the questionnaire was given open questions to make respondents provide answers according to their opinions. The researcher conducted an analysis of the respondents' answers and classified these answers into several categories according to the answers. Respondents know ergonomics as related to work position (45.71%), work safety (34.29%), and work efficiency (18.57%). The recognition of ergonomics module by respondents can be seen in Figure 1.

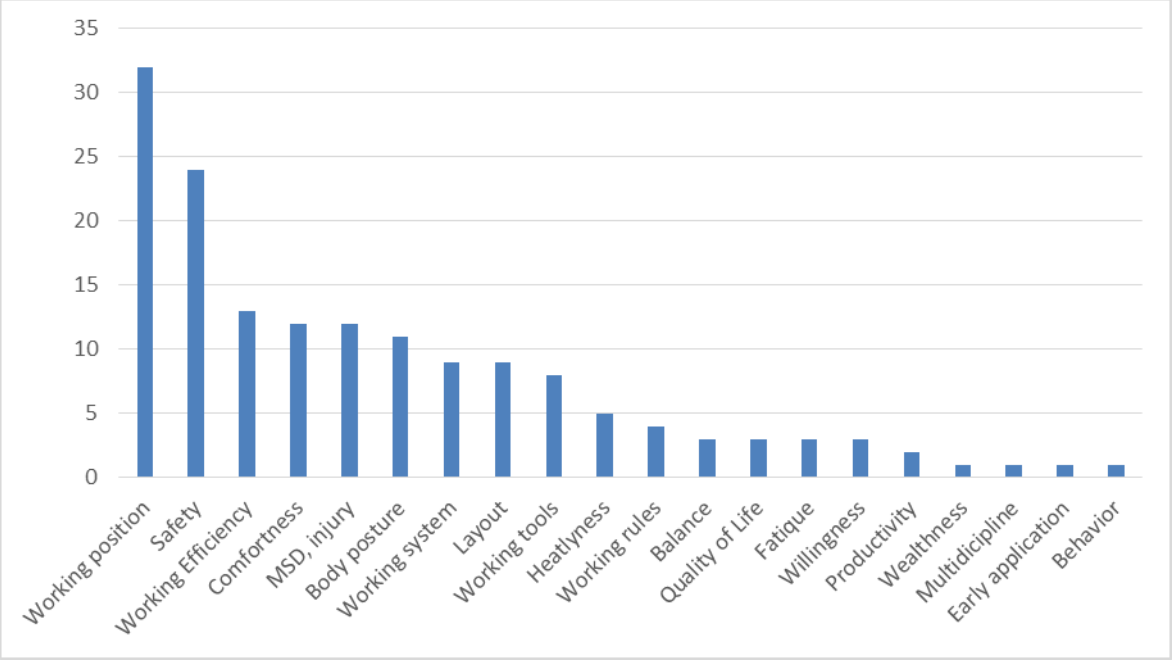

Figure 1. Respondents' Knowledge About Ergonomics

Based on open questions given to the respondents regarding their opinion about ergonomics, there were 58.57% of respondents who realized that ergonomics positions were difficult to change if already

incorrect, so they need to be implemented and taught as early as possible. 48.57% of respondents answered that ergonomics is important, and 34.28% of respondents stated that everything related to ergonomics requires adaptation. As many as 48.57% of respondents also stated that ergonomics is related to comfort, health, productivity, and work comfort (Table 1).

Table 1. Respondents' Opinion About Ergonomics

Component	Frequency	%
Important	34	48.57
Need adaptation	24	34.28
Related to comfort, health, productivity, and work comfort	34	48.57
Difficult to change if incorrect	41	58.57

The principle of ergonomics while treating patients is often forgotten by 38.57% of respondents and is difficult to applied in certain situations (21.43%). However, as many as 54.28% of respondents said they tried to maintain a neutral posture. Meanwhile, 7.14% of respondents said they were not habitual (Table 2). Questions regarding the application of ergonomics principles while treating patients are also open questions to make respondents freely expressed how they apply ergonomic positions while treating patients.

Table 2. Application of Ergonomics Principles While Treating Patients

Component	Frequency	%
Not habitual	5	7.14
Tried to keep on neutral position	38	54.28
Often forget	27	38.57
Difficult to applied in certain situation	15	21.43

Respondents were also asked about the position they felt was inappropriate while treating patients. As many as 62.86% of respondents stated that they realized that their position was not right when it was difficult to gain visual access, when caring for patients who were less cooperative (21.43%). However, as many as 5.71% of respondents felt that their position was correct when treating patients. Other positions that respondents felt were inappropriate while they treat patients can be seen in Figure 2.

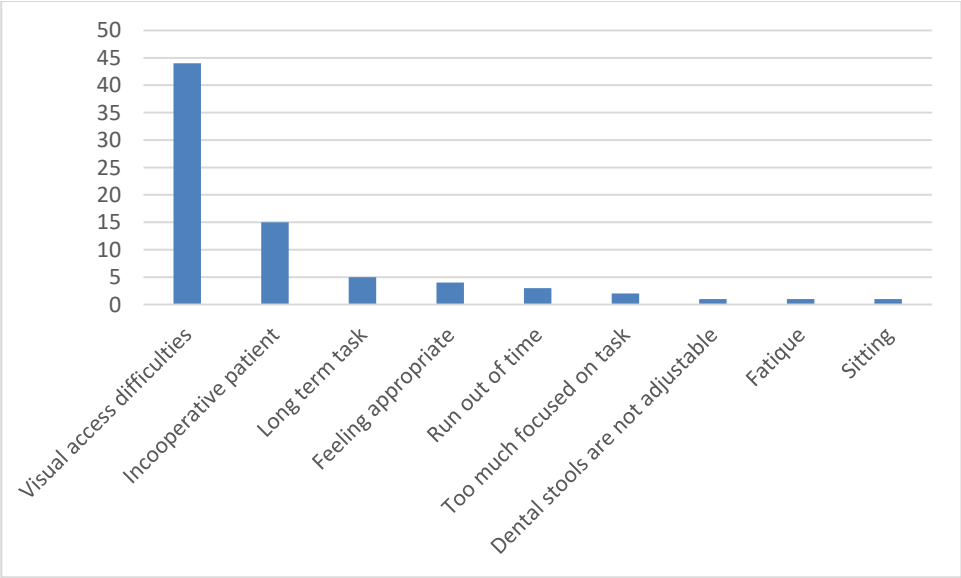

Figure 2. Moments of Inappropriate Position While Treating Patients

Respondents were given the opportunity to express their expectations regarding how to provide ergonomics module in the dental curriculum. The expectation could be written more than one. As many as 58.57% of respondents expect that ergonomics module was given as often as possible on a regular basis, 42.86% of respondents expect that ergonomics module was given in the form of practical training, and 5.71% expect that ergonomics module was given as early as possible (Table 3).

Table 3. Expectations for Further Ergonomics Modules

Expectation	Frequency	%
Module was given in the form of practical training	30	42,86
Module was given as early as possible	4	5,71
Module was given as often as possible on a regular basis	41	58,57

DISCUSSION

Ergonomics module is very important to be taught in dentistry (Moodley, Naidoo, & Wyk, 2018). Therefore, module regarding ergonomics has been included in the Indonesian Dentist Competency Standards in the aspect of work safety, which must be implemented by every Faculty of Dentistry in Indonesia (AFDOKGI, 2020). Ergonomics module at the faculty where the research held is given in several stages. The stage of providing theory regarding ergonomics is given through a tutorial module during the Undergraduate Program. While the implementation of ergonomics positions is always carried out when students take part in the skill lab while taking the Undergraduate Program, as well as during field learning experience activities. Modules regarding ergonomics in the Professional Program are not given through the provision of theory as in the Undergraduate Program but are given in certain activities such as journal reading activities and supervision when treating patients. Most of the respondents remembered when the ergonomics module was given even though they did not remember it completely.

Ergonomics can be defined as 'the applied science concerned with the design and arrangement of things that people use so that people and things interact in the most efficient and safe manner (Gupta, Bhat, Mohammed, Bansal, & Gupta, 2014). Most of the respondents know that ergonomics is related to work position, work safety, work efficiency, musculoskeletal disorders, and posture or attitude while working. Overall, the opinions of respondents

in this study have accommodated the ergonomics itself.

In this study, 21.43% of respondents stated that ergonomics was difficult to apply in certain situations. Research on ergonomics in dentistry conducted at a university in Romania revealed that positioning the patient well is the most important thing to do to get an ergonomic position, while the second thing is visualization. In addition, the presence of an operator assistant will further assist in working ergonomically (Talpos-Niculescu, et al., 2022). 62.1% of dental students in Brazil also felt this, and 44.8% of them admitted that they often forgot to apply it, and 27.6% admitted that they sacrificed ergonomics for visualization (Garcia, Gottardello, Wajngarten, Presoto, & Campos, 2017). A 2023 study at São Paulo State University (UNESP), School of Dentistry, Araraquara suggested that the biggest challenge in implementing ergonomic principles when treating patients was keeping the patient's mouth position and the operator's eyes in a good position (45.65%), positioning the patient correctly (15.22%), and working with the elbows close to the body (15.22%) (Hallak, et al., 2023).

A study on the prevention of musculoskeletal disorders in dentistry, states that education is necessary to increase understanding of the complexity of the problems caused by these multifactorial things (Valachi & Valachi, 2003). If a person has a musculoskeletal disorder, it will be very difficult to return him to his original position, therefore getting used to work ergonomically is an important thing for dentists to do. The best treatment for musculoskeletal disorders is preventing musculoskeletal disorders. Therefore, dental students need to be given a strong knowledge base regarding ergonomics (Faust, 2020).

A strong knowledge base can only be obtained if they are studying dentistry; therefore, it requires a strong commitment from dental teaching staff to form good habits from the start (Faust, 2020) (Moosa & Bhayat, 2020). Module on ergonomics needs to be given from the start because when something becomes a habit it will be difficult to change it. As also stated in this study by 58.57% respondents, it will be more difficult to change than to get used to it from the start. A study in Indonesia concluded that there is a significant correlation between working position and the risk of musculoskeletal disorders (Lestari & Palupi, 2020).

Modules on ergonomics principles are usually given to undergraduate dentistry programs. However, because its application is limited to dental simulators, when students start treating real patients, they need to readjust (Hallak, et al., 2023). Every undergraduate year had a compromised sitting position (Zúniga, et al., 2023).However, frequent assessments of the students' working positions should be made, and additional resources, including dental loupes, should be made available to aid in their maintenance (Yusof, Razli, & Nasir, 2021). Using magnifying loupes during preclinical training could improve dental students' ergonomics and potentially lower their chance of developing MSDs (Kamal, Ahmed, Habib, & Al-Mohareb, 2020). The proper application of ergonomics guarantees optimal effectiveness and guards against illnesses or injuries. It is critical to identify risk factors and implement ergonomic measures. Students are familiar with ergonomics and understand how it affects the workplace. Nevertheless, they struggle to assume an ergonomic posture (Salama & Shehab, 2023) (S & Khandelwal, 2022).

Respondents in this study expected ergonomics module to be given in the form of practical training (42.86%), given as often as possible (58.57%), and given as early as possible (5.71%). A study in South Africa stated that although knowledge of ergonomics is high, it does not guarantee that dental students will apply it properly (Moosa & Bhayat, 2020). The results of this study are similar to those at the Federal University of Maranhão in 2021 (Araújo, et al., 2021). A study in Chennai, Tamil Nadu, revealed that 75.8% of dental students wanted ergonomics material to be included in dental curriculum, and 63.1% wanted a workshop on dental ergonomics (Anu, Babu, & Kumar, 2018). Ergonomic needs to be given in theory and practice while studying at the dental faculty (Blume, et al., 2021). Research

conducted in Romania states that the practical aspect is a bigger thing that needs to be given than the theoretical aspect (Talpos-Niculescu, et al., 2022). Teaching ergonomics in dentistry is still needs to be improved, because until now musculoskeletal disorders are still a common problem for dentists (Botta-Maltese, Wajngarten, Neves, Pazos, & Garcia, 2023).

CONCLUSION

Ergonomic positioning is important for dental students, but its application when treating patients still needs to be improved. Continuing education in the form of practical training and given as early as possible is something that needs to be done to improve the application of ergonomic positions to dental students.

REFRENCES

AFDOKGI. Standar Kompetensi Dokter Gigi Indonesia.Jakarta, 2020.

Almosa NA, Zafar H. Assessment of Knowledge about Dental Ergonomics among Dental Students of King Saud University, Riyadh, Kingdom of Saudi Arabia. J Contemp Dent Pract. 2019; 20 (3):324-329. doi: 10.5005/jp-journals-10024-2517

Anu V, Babu AMS, Kumar PDM. Insights about Dental Ergonomics among Dental Students: The Need of the Hour to Recommend Dental Ergonomics in Academic Curriculum. Journal of Advanced Oral Research. 2018;9(1-2):49-54. doi:10.1177/2320206818812538

Araújo M. S.; Rodrigues V. P.; Marques R. V. C. F.; Cantanhede A. L. C.; Prado I. A.; Lago A. D. N.; Furtado G. S.; Marques D. M. C. Evaluation of knowledge and application towards ergonomic principles among undergraduate dental students. Research, Society, and Development. 2021; 10(14). DOI: https://doi.org/10.33448/rsd-v10i14.21561

Blume KS, Holzgreve F, Fraeulin L, et al. Ergonomic Risk Assessment of Dental Students-RULA Applied to Objective Kinematic Data. Int J Environ Res Public Health. 2021;18(19):10550. Published 2021 Oct 8. doi:10.3390/ijerph181910550.

Botta-Maltese A. C.; Wajngarten D.; Neves T. d. C.; Pazos J. M.; Garcia P. P. N. S. Importance of Teaching Ergonomics in Dental School Education. Journal of Advances in Medicine and Medical Research. 2023; 35(15): 71-78. DOI: 10.9734/JAMMR/2023/v35i155079Hokwe da, J. Wouters, R. d. Ruijter and S. Zijlstra-Shaw, Ergonomic requirements for dental equipment, 2007. Available at: https://esde.org/files/publication/14-ergonomic_requirements_for_dentalequipment._april2007.pdf

Beach J.C., DeBiase C.B. Assessment of ergonomic education in dental hygiene curricula. J Dent Educ. 1998; 62(6): 421-425. Available at: https://pubmed.ncbi.nlm.nih.gov/9698697/

Corrales Zúniga IA, SaucedaMalespín NL, Vega Vílchez AL, Duarte Frenky OJ, Hong G, Vanegas Sáenz JR. Evaluation of the ergonomic sitting position adopted by dental students while using dental simulators. J Dent Sci. 2023;18(2):526-533. doi: 10.1016/j.jds.2022.09.007

Datkar D; Shibal A; Kale B. Ergonomics in Dentistry: A Review. Journal of Research in Medical and Dental Science. 2022; 10(7): 87-91. Available at: www.jrmds.in eISSN No.2347-2367: pISSN No.2347-2545

Das, H., Motghare, V., & Singh, M. Ergonomics in dentistry: Narrative review. International Journal of Applied Dental Sciences. 2018. 4, 104-110.

Faust AM, Ahmed SN, Johnston LB, Harmon JB. Teaching methodologies for improving dental students' implementation of ergonomic operator and patient positioning. J Dent Educ. 2021;85(3):370-378. doi:10.1002/jdd.12438

García-Vidal JA, López-Nicolás M, Sánchez-Sobrado AC, Escolar-Reina MP, Medina-

Mirapeix F, Bernabeu-Mora R. The Combination of Different Ergonomic Supports during Dental Procedures Reduces the Muscle Activity of the Neck and Shoulder. J Clin Med. 2019;8(8):1230. doi:10.3390/jcm8081230

Gupta A.; Bhat Manohar; Mohammed Tahir. Bansal Nikita; Gupta G. Ergonomics in Dentistry. International Journal of Clinical Pediatric Dentistry. 2014; 7(1): 30-34. doi: 10.5005/jp-journals-10005-1229

Garcia P. P. N. S.; Gottardello A. C. A.; Wajngarten D.; Presoto C. D. ; Campos J. A. D. B. Ergonomics in dentistry: experiences of the practice by dental students. European Journal of Dental Education. 2017; 21(3): 175-179. https://doi.org/10.1111/eje.12197

Hallak JC, Ferreira FdS, de Oliveira CA, Pazos JM, Neves TdC, Garcia PPNS. Transition between preclinical and clinical training: Perception of dental students regarding the adoption of ergonomic principles. 2023. PLoS ONE 18(3): e0282718. https://doi.org/10.1371/journal.pone.0282718

Kamal A. M.; Ahmed D. R. M.; Habib S. F. K.; Al-Mohareb R. A. Ergonomics of preclinical dental students and potential musculoskeletal disorders. Journal of Dental Education. 2020; 84(12): 1438-1446. https://doi.org/10.1002/jdd.12369

Lestari A. I. ; Palupi R. Better early prevention: Dental student's awareness of musculoskeletal disorders. Systematic Reviews in Pharmacy. 2020;11(3): 941-945. Available at: https://www.sysrevpharm.org/articles/better-early-prevention-dental-students-awareness-of-musculoskeletal-disorders.pdf

Moodley R., Naidoo S; Wyk VJ. Applying the perceptions of graduates on their dental training to inform dental curricula from the perspective of occupational health. South African Dental Journal. 2018. 73(5): 343-347. Available at: http://www.scielo.org.za/pdf/sadj/v73n5/05.pdf

Moosa UK, Bhayat A. The Ergonomic Knowledge and Practice of Dental Students in a Tertiary Institution in South Africa. Int J Dent. 2022; 2022:4415709. Published 2022 Jul 20. doi:10.1155/2022/4415709

Pîrvu C, Pătraşcu I, Pîrvu D, Ionescu C. The dentist's operating posture - ergonomic aspects. J Med Life. 2014. Jun 15;7(2):177-82. Available at: https://pdfs.semanticscholar.org/1b17/393649f1a83ea6b490c202e19ebf16575eab.pdf

Salama A. A.; Shehab K. A. Occupational Hazards among Dental Students-Ergonomic Aspect. MSA Dental Journal. 2023; 2(1): 11-18. Available at: https://msadj.journals.ekb.eg/article_301128_7b13bc90b300bdc0c3d4000763313dff.pdf

S. Saivarshine; Khandelwal A. Assessment Of Knowledge, Attitude & Practice of Dental Students Towards Ergonomics in Dentistry. Journal for Educators, Teachers and Trainers. 2022; 13(6): 243-252.DOI: https://doi.org/10.47750/jett.2022.13.06.022

Talpos-Niculescu IC, Farkas AZ, Lungeanu D, Argeşanu V, Anghel MD, Nagib R. Perception and Knowledge of Dental Ergonomics among Romanian Dental Students. International Journal of Environmental Research and Public Health [Internet] 2022;19(24):16988. Available from: http://dx.doi.org/10.3390/ijerph192416988

Valachi B, Valachi K. Preventing musculoskeletal disorders in clinical dentistry: strategies to address the mechanisms leading to musculoskeletal disorders. J Am Dent Assoc. 2003;134(12):1604-1612. doi: 10.14219/jada.archive.2003.0106

Yusof E. M.; Razli M. A. H.; Nasir S. A. I. M. Assessment of the Working Posture among Dental Students to Prevent Musculoskeletal Disorders. Journal of Dentistry Indonesia. 2021; 28(2): 105-111. Available at: https://scholarhub.ui.ac.id/cgi/viewcontent.cgi?article=1256&context=jdi