Multidisciplinary perspectives to prevent occupational health-related conditions among dental practitioners

Rajeshree Moodley and J. Van Wyk

INTRODUCTION: The prevalence of occupational health conditions is high among dental practitioners and this study investigated the role which occupational health plays in dental training.

PURPOSE/OBJECTIVES: This study was conducted to explore occupational health and to determine the topics to include from an occupational health perspective into the dental curriculum.

METHODS: A descriptive qualitative study was conducted to explore the perceptions of dental practitioners, dental academics, physiotherapists, occupational therapists, occupational health specialists, ergonomists, optometrists and audiologists about dental training from an occupational health perspective in KwaZulu-Natal, South Africa. The interdisciplinary and multidisciplinary approach was used in this study.

RESULTS: Three main themes became evident that hinged on varying understanding of occupational health-related conditions to dental practice, how practitioners experience practising in the resource-poor settings and its impact on the dental practice. There was also a lack of awareness of the occupational health policies and practices, which could inform safe dental practice.

CONCLUSION: Dental academics should gain input from a multidisciplinary team. An occupational health course with a student-centred approach would enrich the dental curriculum and make dental practitioners more aware of occupational health issues.

Pain is also prevalent among dental students. Even more disconcerting was the finding that revealed the prevalence of pain among dental students and the fact that the percentage of pain among students steadily increased from the first (41%) to their fourth year (71%). Incorrect postures with sudden flexure of the neck and cervical twisting puts students at risk of muscle pain. Eighty percent of dental students at the University of Cartagena, South America reported pain due to clinical practice. Female students were found to be at a higher risk of developing pain. Researchers in a South African study reported a high level of stress among dental students with stress levels peaking in the fourth year of study.

Statistics among students and young practitioners indicate a need for greater awareness in dental curricula to prevent occupational health-related conditions among dentists. It is thus clear that training about primary prevention of the many occupational hazards is a necessity to ensure that students become more aware of their body position and work habits. Occupational health-related conditions are prevalent among dental practitioners. Stress, musculoskeletal disorders and percutaneous injuries are issues that are common among both young and experienced dental practitioners. To include occupational health in a dental curriculum required perspectives of various disciplines and in this study, the researcher engaged in a focus group discussion to get multi-stakeholder input into the dental curriculum. Physiotherapists, occupational therapists, occupational health specialists, ergonomists, optometrists and audiologists were also part of these discussions. This team would input from...
a coordinated range of skill, expertise and clinical experience as discussed by Young, 1998 who further stated that such a team allows input for a common goal.8

Focus group discussions were conducted to determine what could be included in the dental curriculum to make dental students aware of self-care in terms of their occupational health. The interdisciplinary and multidisciplinary approach was used in this study. A multidisciplinary approach to dental education would be to draw from different academic disciplines to redefine an approach or understanding and, in the case of this study, it would be to design a course by getting multidisciplinary input.9 The rationale for the use of this approach is that occupational health-related conditions are treated by a team of health care workers and their input was required.

The dental curriculum prepares a student for work placement and traditionally dental curricula focuses on the core competency of graduates. Education and training is vital to ensure safe and healthy working. Alli, 2001 suggested that health and safety principles be incorporated into student training relating to the needs of the profession.10

One of the major health issues that emanates from students as they progress in academic years is stress, which impacts on students’ and dental practitioners’ well-being. A study conducted in a dental school in Karnataka, India reported that stress levels among dental students showed a marked increase from first to the fourth year with stress peaking in the second and third year. Fear of failure was the highest stressor.11 Similar results can be seen in the Jordanian study where fourth and fifth-year students displayed higher levels of burnout.12 Senior students in a Saudi Arabian study showed higher levels of stress than first-year students.13 For students at a South African University, stress peaked in the fourth year (47.9%) with stressors including lack of effective teaching/lectures in the first year (49%) and lack of motivation in the second year (39.2%). A lack of student input into management decisions and the non-response by management to the needs of students were issues with fourth and fifth year students (40 and 50%).7 The research displays that there is a need to teach stress prevention at universities. It needs to be reinforced at universities where it is already being done.

This study, reports on a qualitative case study conducted in the University of KwaZulu-Natal, South Africa to elicit the occupation-related challenges experienced by dental practitioners in dental practice. This study also provided recommendations for a multidisciplinary team including other health care workers. The input included specific curriculum content/topics to ensure a more occupationally responsive dental training programme.

**RESULTS AND DISCUSSION**

The demographic details of the participants are summarised in Table 1. All participants \((n = 36)\) were qualified with an undergraduate degree (in either health science, dentistry, dental therapy or oral hygiene) and some participants had postgraduate qualifications \((n = 14)\). The table shows the years of experience as a practitioner. The average age of the participants was \(40–50\) years. Most of the participants had previous experience in curriculum development with some reporting experience also in curriculum review. Three main themes emerged in response to the questions explored (as indicated in Table 2). The themes were; varying understanding of occupational health-related conditions to dental practice and how practitioners experience practice in the resource-poor settings and its impact on the dental practice. There was also a lack of awareness of the occupational health policies and practices, which could inform safe dental practice.

Practitioners also offered recommendations for curriculum content about self-care and occupational health to include during dental training (as indicated in Table 3). Table 3 also includes the sub-themes, a basic description and the supporting evidence. The combined input of dental practitioners from multiple disciplines was beneficial in the consideration of a dental programme including occupational health principles. From the focus group discussions, it became clear that participants strongly supported the inclusion of an occupational health course. They suggested that it be introduced in dental training and for an
Table 1. Demographic information and experience (teaching and clinical) of participants

| Focus group | Average age | Profession | Post held | Qualification | Average years of experience as a practitioner | Average years of experience as an academic | Involvement in curriculum design |
|-------------|-------------|------------|-----------|---------------|---------------------------------------------|------------------------------------------|----------------------------------|
| Focus group 1- dental practitioners with occupational health problems (n = 7) | 40.7 | Dentist, dental therapist and oral hygienists | Lecturers and clinicians | Undergraduate degree (n = 5) Master's degree (n = 1) PhD (n = 1) | 19 | 6.7 | Two participants had experience with curriculum design and development |
| Focus group 2- multidisciplinary team (n = 9) | 43.7 | Optometrist, physiotherapist, ergonomist, audiologist, occupational therapist, dentist, dental therapist, dentists | Lecturers, senior lecturers, professors and clinicians | Undergraduate degree (n = 2) Master's degree (n = 2) PhD (n = 5) | 20.8 years | 1.2 | All participants except for one had experience with curriculum design and development. Three participants involved with curriculum reviews at other universities |
| Focus group 3- dental practitioners (n = 13) | 41.6 | Dentists, dental therapist and oral hygienists | Dentists, dental therapists and oral hygienists that have honorary clinical supervision posts | Undergraduate degree 9 (n = 13) | 17.5 | All participants are clinical supervisors with 2 having teaching experience | Two participants had experience with curriculum design and development |
| Focus group 4 dental academics (n = 7) | 49.1 | Dentists, dental therapist and oral hygienists | Senior tutors, lecturers and senior lecturers and clinical supervisors | Undergraduate degree (n = 2) Master's degree (n = 2) PhD (n = 3) | 23.1 | 12.1 | All participants had experience with curriculum design and development |

**CHALLENGES**

Understanding occupational health

One of the occupational health challenges is the psychological aspect of work-related musculoskeletal disorders. Participants, particularly those working in the dental field, highlighted concerns about stress management and the prevention of musculoskeletal disorders. The focus group discussions emphasized the importance of incorporating programs that address stress management and prevention. Clinical supervisors emphasized the need for curricula that include stress management strategies and programs that prepare students for public practice.

**Recommendations**

One of the key recommendations from the focus group discussions was the inclusion of a course on occupational health in the dental training. The focus group highlighted the importance of educating students on the prevention of occupational health-related issues. Recommendations included the inclusion of a year-long program that focuses on stress management and prevention of musculoskeletal disorders. Clinical supervisors recommended that input is sought from audiologists, occupational therapists, ergonomists, and researchers with expertise in occupational health to enhance the interdisciplinary approach to curriculum design.

**Dental training in South Africa**

The focus group discussions also emphasized the importance of dental training in South Africa. Participants highlighted the need for dental training programs that prepare students for private practice and public practice. The focus group group recommended that dental training programs should include practical experiences in both private and public sectors. The recommendations were based on the perception that dental practitioners must be equipped with skills that prepare them for both private and public practice.

**Dental practice group**

The focus group also discussed the implications of dental practice in South Africa. Participants highlighted the importance of dental practice in the local context. The discussions emphasized the need for dental practitioners to be aware of the local context when planning their practice. The recommendations included the importance of incorporating local context into dental practice programs to ensure that students are prepared for the unique challenges of practicing in South Africa.
Table 2. Themes emanating from focus group discussion

| Main theme                                                                 | Sub-themes                                                                 | Description                                                                                                                                  | Quotation/supporting evidence                                                                 |
|---------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Challenges experienced in dental practice and training                    | Understanding occupational health. This                                   | There were different views on what occupational health entails                                                                             | “pain relating to the work that you basically do” (focus group 4, participant 1)          |
|                                                                           |                                                                           | “the first thing that comes to your mind when you hear occupational health, that it is not just not purely physical it is the psychosocial aspects and that congruence between what you experience physically and what you experience psychologically.” (focus group 3, participant 2) |
|                                                                           |                                                                           | There was a lack of holistic understanding of what occupational health entails                                                              |                                                                                               |
|                                                                           |                                                                           | “So, I understand it to be the procedures we do, the physical activity and how it affects your quality of life. That's what I perceive it to be” (focus group 1, participant 1) |
|                                                                           |                                                                           | “I never really thought about it until I started working, and then I kind of wised-up in terms of my posture, my surroundings” (focus group 1, participant 2) |
|                                                                           |                                                                           | Lack of understanding occupational health risks and hazards inherent in the dental practice                                                  |                                                                                               |
|                                                                           |                                                                           | “I would say it is divided into two it is strictly work-related and strictly human factor related. For the work-related it seems your chair your equipment…” (focus group 4, participant 5) |
|                                                                           |                                                                           | Perception that musculoskeletal disorders (MSD) was the only occupational hazard                                                              |                                                                                               |
|                                                                           |                                                                           | “I think for me I just consider the physical.” (focus group 3, participant 3)                                                                   |                                                                                               |
| Dental practice in SA. Some were aware that high-income countries instituted better policies. | First world versus third world. Resource-poor settings were experienced as very limiting. Lack of equipment and resources in low-income countries | “When I moved to Australia I worked in a clinic there where part of our regime was at quarter to ten you would stop working and you would take your tea break and do stretching exercises. Just stretching and then before lunch we do the same before you went on lunch and that was enforced even if you had a patient you had to stop go and do you exercise.” (focus group 4, participant 5) |
|                                                                           |                                                                           | “Sometimes we use the visors for week, two weeks. I had a visor for like three weeks and I couldn’t even see properly.” (focus group 4, participant 5) |
| Dental Training under resource restricted conditions                       | Lack of resources is common as dental training or dentistry is not seen as priority in SA                                                   | “We start off wrong and that is the biggest problem. This is where it starts when you are not sitting properly everything else goes wrong because it is your positioning because we have chairs that are not working properly not adjustable properly they do not roll properly…” (focus group 4, participant 5) |
|                                                                           |                                                                           | “I also agree with what…… is saying is that if you want to make something a habit the environment has to be conducive. So, where we are teaching it not in the pre-clinic there we have typists, chairs and the one head will be right down and the other head on the top. So, we are teaching them in a wrong environment if we have the right equipment.” (focus group 4, participant 1) |
|                                                                           |                                                                           | “We start off wrong and that is the biggest problem. This is where it starts when you are not sitting properly everything else goes wrong because it is your positioning because we have chairs that are not working properly not adjustable properly they do not roll properly…” (focus group 4, participant 5) |
|                                                                           |                                                                           | “I also agree with what…… is saying is that if you want to make something a habit the environment has to be conducive. So, where we are teaching it not in the pre-clinic there we have typists, chairs and the one head will be right down and the other head on the top. So, we are teaching them in a wrong environment if we have the right equipment.” (focus group 4, participant 1) |
|                                                                           |                                                                           | Participants do not know if principles and policies were in place.                                                                            | “what lacks in private practice is policy and procedure” (focus group 1, participant 6)   |
|                                                                           |                                                                           | “Because only after I went through everything did I realise there’s a huge manual on what constitutes a hazard and repetitive strain injury. And I ticked every box and I thought oh my god, I have been through all this and I didn’t know this manual existed.” (focus group 1, participant 6) |
stretching and strengthening exercises should be undertaken to strengthen the musculoskeletal system. Dental students should be taught self-care as the research has shown that regular training can prevent MSD.24

The occupational health specialist in this study recommended that the work environment must be optimal and all risks must be avoided. He suggested that if students understood the concepts of risk assessment and workplace design, then they would be able to prevent work-related conditions. The study conducted by Khan and Chew28 recommended that theory and practice of ergonomics should be taught in dental schools as their study, which was conducted in Malaysian dental schools showed a 93% prevalence of MSD among the student participants. Good ergonomic practices can prevent MSD and should be introduced in the early years of training.3,26 Ergonomic training should focus on workstation design, physical job features, lifting, awkward postures and repetitive tasks.27

Dental practitioners should mobilise their job resources and understand the prevention of eye injuries from level one. Eye safety and eye care awareness are compulsory in dentistry as dental practitioners work with sharp and rotary instruments. The occupational health specialist in this study recommended that open communication with clients and colleagues, variability of required skills and how to increase resources in practice should be included in dental curricula.28

Clinical practice. Safe work practice and infection control were highlighted and discussed in this focus group discussion. It was recommended by Alsabaani et al.,29 that safe work practice be emphasised in the early years of dental education. The use of magnification should be introduced in the first year of training and reinforced in all years of undergraduate training. First-year students should be familiar with eye care, have regular eye checks and understand the prevention of eye injuries from level one. Eye safety and eye care awareness are compulsory in dentistry as dental practitioners work with sharp and rotary instruments. The splashes created have blood, saliva, particles of teeth, restorative materials and oils from the headpiece and micro-organisms. This leads to injuries when the eye is unprotected.29-31 When wearing eye protection, these injuries do not occur but unfortunately compliance with eye protection is poor.32,33 Dosimeters to monitor radiation exposure levels should be introduced.34 Staff and students in dental radiography currently do not use dosimeters. When one draws from Singh’s article, a single

| Recommendations for dental training and curriculum content | Recommendations for clinical practice | Should occupational health be a stand-alone module or incorporated into existing modules? |
|------------------------------------------------------------|-------------------------------------|----------------------------------------------------------------------------------|
| Participants added what they thought should be included in dental training | “Yes, so I think for me, the first step would be to get an idea of exactly how these working environments are set up. So, to have an understanding of how these working activities work, so we call that at-risk assessment. So that’s for a person who is going into a ready-made practice. But for someone who’s starting out, I’d certainly like them to have training in how to set up the optimal work environment. So, you make sure upfront that there will be no issues. For example, if you’re going to be mixing amalgam, you make sure it is done in a separate area that is adequately ventilated. If you are using noxious gases, you use it under controlled conditions. Either you have protection, if the levels are low or some extractive ventilation. So, the first step is understanding, or redesigning the work environment or designing it in a way that these are taken into consideration. It’s far better to build from scratch, bearing this in mind, than trying to fit the work to the premises. It requires more money etc. so that’s the first step. I would like dental professionals to get a sense of the risks in what they do and what health outcomes are associated with these risks. If they can understand those three concepts—risk assessment, specific risks and broad health outcomes—they would have a better understanding of how these can be addressed” (interview one-occupational health specialist) | “I think it should be a module on its own—occupational hazards. Like 10 or 20 sessions and in each session, talk about a hazard” (focus group 1, participant 3) |

Yes, so I think for me, the first step would be to get an idea of exactly how these working environments are set up. So, to have an understanding of how these working activities work, so we call that at-risk assessment. So that’s for a person who is going into a ready-made practice. But for someone who’s starting out, I’d certainly like them to have training in how to set up the optimal work environment. So, you make sure upfront that there will be no issues. For example, if you’re going to be mixing amalgam, you make sure it is done in a separate area that is adequately ventilated. If you are using noxious gases, you use it under controlled conditions. Either you have protection, if the levels are low or some extractive ventilation. So, the first step is understanding, or redesigning the work environment or designing it in a way that these are taken into consideration. It’s far better to build from scratch, bearing this in mind, than trying to fit the work to the premises. It requires more money etc. so that’s the first step. I would like dental professionals to get a sense of the risks in what they do and what health outcomes are associated with these risks. If they can understand those three concepts—risk assessment, specific risks and broad health outcomes—they would have a better understanding of how these can be addressed” (interview one-occupational health specialist) |

“I think it should be a module on its own—occupational hazards. Like 10 or 20 sessions and in each session, talk about a hazard” (focus group 1, participant 3) | “Firstly, I do not think there is a need for a module that is stand-alone because it is going to be based on everything else where the student will want to pass that module” (focus group 2, participant 5) | “So sitting position is important and I would add to that some back exercises lower back exercises, the back to me is very important.” (focus group 4, participant 5) |

I think it should be a module on its own—occupational hazards. Like 10 or 20 sessions and in each session, talk about a hazard” (focus group 1, participant 3) | “Firstly, I do not think there is a need for a module that is stand-alone because it is going to be based on everything else where the student will want to pass that module” (focus group 2, participant 5) | “So sitting position is important and I would add to that some back exercises lower back exercises, the back to me is very important.” (focus group 4, participant 5) |
accidental exposure to high radiation may produce biological effects after exposure.

LIMITATIONS OF THE STUDY
The study population is not representative of the dental practitioners and academics of South Africa but more information was gathered than in a cross-sectional study. Another limitation of a focus group discussion is that the views of one participant may affect the views of others.35

CONCLUSION
The results of the present study highlight the need to review dental curriculum and to redesign curriculum to feature occupational health. Dental academics should gain input from a multidisciplinary team. An occupational health course with a student-centred approach would enrich the dental curriculum and to redesign curriculum to feature occupational health.

AUTHOR CONTRIBUTIONS
R.M.: PHD student, all literature reviews, data collection and data analysis, interpretation of the results as well as manuscript preparation and writing. JvW: R.M.: PHD student, all literature reviews, data collection and data analysis.

ADDITIONAL INFORMATION
Competing interests: The authors declare no competing interests.

Publisher’s note: Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

REFERENCES
1. Health Professions Council of South Africa. Statistics of Persons Registered with the Council. 2017. http://www.hpcsca.co.za/Publications/Statistics. Accessed 17 December 2017.
2. Van Rensburg, H. C. South Africa—Database of publications on workplace health, wealth, health and happiness. Available at: http://univ.nuczu.edu.ua/tmp_metod/1026/FUNDAMENTAL%20PRINCIPLES%20OF%20OCCUPATIONAL%20HEALTH%20AND%20SAFETY.pdf. Accessed 7 April 2018.
3. Moodley, R. & Naidoo, S. The prevalence of musculoskeletal disorders among dentists in KwaZulu-Natal. South Afr. Dent. J. 70, 98–103 (2015).
4. World Health Organisation. Occupational Health. 2017. http://www.who.int/topics/occupational_health/en/. Accessed 17 December 2017.
5. Rising, D. W., Bennett, B. C., Hursh, K. & Plesh, O. Reports of body pain in a dental student population. J. Am. Dent. Assoc. 131, 81–86 (2005).
6. Diaz-Caballero, A., Gomez-Palencia, I. & Diaz-Cardenas, S. Ergonomic factors that cause the presence of pain muscle in students of dentistry. Medicina Oral Patología Oral y Cirugía Bucal [Internet]. Med. Oral. S. L. 15, e906–e911 (2010).
7. Wilson, V. et al. Perceived stress among dental students at the University of the Western Cape. South Afr. Dent. J. 70, 255–259 (2015).
8. Young, C. A. Building a care and research team. J. Neurol. Sci. 160, S137–S140 (1998).
9. Choi, B. C. & Pak, A. W. Multidisciplinarity, interdisciplinarity and transdisciplinarity in health research, services, education and policy: I. Definitions, objectives, and evidence of effectiveness. Clin. Invest. Med. 29, 351–364 (2006).
10. Ali, B. O. Fundamental Principles of Occupational Health and Safety: International Labour Organization (ILO) (International Labour Office, Geneva, 2001). http://univ.nuczu.edu.ua/tmp_metod/1026/FUNDAMENTAL%20PRINCIPLES%20OF%20OCCUPATIONAL%20HEALTH%20AND%20SAFETY.pdf. Accessed 7 April 2018.
11. Acharya, S. Factors affecting stress among Indian dental students. J. Dent. Educ. 67, 1140–1148 (2003).
12. Badran, D., Al-Alt, M., Dualbis, R. & Amin, W. Burnout among clinical dental students at Jordanian universities/l’usuprement professionnel chez les étudiants en dentisterie des universités jordaniennes. East. Mediterr. Health J. 16, 434 (2010).
13. Al-Sowaygh, Z. H. Academic distress, perceived stress and coping strategies among dental students in Saudi Arabia. Saudi J. 25, 97–105 (2013).
14. Burnard, P., Gill, P., Stewart, K., Treasure, E. & Chadwick, B. Analysing and presenting qualitative data. Br. Dent. J. 204, 429–432 (2008).
15. Braun, V. & Clarke, V. Using thematic analysis in psychology. Qualit. Res. Psychol. 3, 77–101 (2006).
16. Thornton, L. J., Stuart-Buttle, C., Wyzynski, T. C. & Wilson, E. R. Physical and psychosocial stress exposures in US dental schools: the need for expanded ergonomics training. Appl. Ergon. 35, 153–157 (2004).
17. R Moodley, S Naidoo & Wyk, J. V. The prevalence of occupational health-related concerns among oral health practitioners in KwaZulu-Natal, South Africa. South African Dental Journal 72, 7 (2017). https://doi.org/10.17159/2519-0105/2017/v72i10a1
18. Atchison, K., Mascaréñash, A. K. & Bhooopathi, V. Developing a flexible core Dental Public Health curriculum for predoctoral dental and dental hygiene schools. J. Public Health Dent. 75, S12–S52 (2015).
19. Baldwin, P. J., Dodd, M. & Rennie, J. S. Cross-infection control: young dentists—work, wealth, health and happiness. Br. Dent. J. 186, 30–36 (1999).
20. Schmid, K., Schwager, C. & Dreier, H. Needlestick injuries and other occupational exposures to body fluids amongst employees and medical students of a German university: incidence and follow-up. J. Hosp. Infect. 65, 124–130 (2007).
21. Dong, H. et al. The effect of tool handle shape on hand muscle load and pinch force in a simulated dental scaling task. Appl. Ergon. 38, 525–531 (2007).
22. Feng, B., Liang, Q., Wang, Y., Andersen, L. L. & Szeto, G. Prevalence of work-related musculoskeletal symptoms of the neck and upper extremity among dentists in China. BMJ 4, e00651 (2014).
23. Laroche, C., Barr, A., Dong, H. & Rempel, D. Effect of dental tool surface texture and material on static friction with a wet gloved fingertip. J. Biomech. 40, 697–701 (2007).
24. Rafei, F., Zamani Jam, A., Shahrahvar, A., Raaf, M. & Esfandianzadeh, A. Prevalence of upper extremity musculoskeletal disorders in dentists: symptoms and risk factors. J. Environ. Public Health 2015, 1–6 (2015).
25. Khan, S. A. & Yee Chew, K. Effect of working characteristics and taught ergonomics on the prevalence of musculoskeletal disorders amongst dental students. BMC Musculoskelet. Disord. 14, 118 (2013).
26. Kurus, Ş., Evgiren, S., Akbulut, N., Oztas, B. & Vaizoglu, S. A. Work characteristics and musculoskeletal disorders among postgraduate dental students: a pilot study. J. Musculoskelet. Pain. 22, 62–67 (2014).
27. Punnett, L., Cherniack, M., Henning, R., Morse, T. & Faghri, P. A conceptual framework for integrating workplace health promotion and occupational ergonomics programs. Public Health Rep. 124, 16–25 (2009).
28. Hakanen, J. J., Bakker, A. B. & Demerouti, E. How dentists cope with their job demands and stay engaged: the moderating role of job resources. Eur. J. Orol. Sci. 113, 479–487 (2005).
29. Alisabani, N. A. et al. Occupational ocular incidents in dentists: a multicentre study in southwestern Saudi Arabia. Int. Dent. J. 67, 371–377 (2017).
30. Leggatt, P. A., Kedjarune, U. & Smith, D. R. Occupational health problems in modern dentistry: a review. Ind. Health 45, 611–621 (2007).
31. Azodo, C. C. & Ezeja, E. B. Work-related ocular events among Nigerian dental surgeons. Ann. Occup. Environ. Med. 27, 10 (2015).
32. Chadwick, R. G., Alatasan, M. & Raska, M. Eye care habits of dentists registered in the United Kingdom. Br. Dent. J. 203, E7–E7 (2007).
33. Farrier, S. L., Farrier, J. N. & Gilmour, A. S. M. Eye safety in operative dentistry—a study in general dental practice. Br. Dent. J. 200, 218–223 (2006).
34. Singh, H. P. Occupational radiation protection measures in interventional radiology: Radiology 2, 20–23 (2016).
35. Crawford, L., Gutierrez, G. & Harber, P. Work environment and occupational health of dental hygienists: a qualitative assessment. J. Occup. Environ. Med. 47, 623–632 (2005).