

*Original*

## Evaluation of the Occupational Hazards among Clinical Dental Students and House Officers in Napata College in 2022

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### ABSTRACT

**Background:** Dental clinic environment is very demanding and stressful with its occupational hazard that affecting the dentist well-being in addition to their physical health. **Objective:** Evaluation of Occupational Hazards among Clinical Dental Students and House Officers in Napata College. **Material and Methods:** Cross sectional study was conducted on December 2022. A total of 95 dental students and house officers (54 from 4<sup>th</sup> year) (30 from 5<sup>th</sup> year) (11 house officers) were involved from Napata College, Dentistry Programme, Sudan. Data was collected using self-administered questionnaires including demographic and questions of knowledge and attitude regarding Occupational Hazards among Clinical Dental Students and House Officers. The data was entered and analyzed using SPSS version 22. **Results:** (66.3 %) of clinical dental students and house officers were female. Regarding the occupational hazard, the majority of the participants 44.2 %, complained of back pain, 55.8 % of students experienced sharp instruments injury and 42.1% of them washing then disinfecting the area of injury. 98% of the participants had good knowledge about personal protective equipment (PPE) and 70.5 % were using these equipments in their dental practice. 75.8 % of dental students and house

officers strongly agree that sitting in correct position will help in avoiding musculoskeletal symptoms. 55.8% of participants strongly agree that rubber dam is mandatory in any restorative procedure **Conclusion:** This study showed a high prevalence of occupational hazards in Napata dental clinic, especially for the musculoskeletal disorder and sharp instrument injury .Considerable variation with knowledge, practice and management toward Occupational hazard among the participants.

**Keywords:** Occupational Hazards, Dental students, house officers, personal protective equipment (PPE), harp instruments injury

**Introduction:**

Every profession has its own hazards and risks. Occupational hazard defines as risks related to the working environment that affect the individual well-being and can lead to life threatening accidents, minor or serious injuries, allergic reaction and systemic effects; in addition to these; there are also immediate or later consequences. According to World Health Organization the term "hazard" refers to an inherent property of an agent, or situation having the potential to cause adverse effects when an organism, system, or population is exposed to that agent. "Risk", by contrast, means the likelihood of causing adverse health effects (1)

Dental clinic environment is very demanding and stress full affecting the dentist well-being in addition to their mental and physical health. (2)

Occupational hazard among dentists can be classified into:

Infection transmission, stress, Allergic reactions, Physical hazards, hazards caused by dental material (mercury), ionizing and non-ionizing radiation, and anesthetic gases. (3).

Dentists are at risk of eye fatigue and pain because of working in low-light environment (4).

Latex gloves (dusted with cornstarch powder) form an efficient barrier against most pathogens. Unfortunately most of the professionals are allergic to latex content of gloves (5).

During many dental procedures, the use of a rubber dam will eliminate virtually all contamination arising from saliva or blood. (6)

Prevention from contamination and cross-infection can be done by effective sterilization of instruments using autoclave before and after use (5).

Implementing infection-control precautions is the standard of care to protect both patients and dental care professionals and to ensure a safe working environment. Among such precautions are personal protective equipments (PPE) (7).PPE such as gown, gloves, face mask and eye protection have been shown to be an effective means of preventing the transmission of pathogens (8).

Aseptic Non-Touch Technique (ANTT) was developed as a guideline for practice in the aseptic technique and was recommended as an example of best practice in the aseptic technique (9). In contrast with other health care professionals, dentists are in close contact with their patients and they used sharp and rotary instrument. So it's

mandatory to understand the characteristics of the occupational accidents and their consequences. Because they may lead to a life threaten conditions. The aim of this study was to evaluate the occupational hazard among clinical dental students and house officers in Napata College, Dentistry Programme, and identify the most common hazards and assess the knowledge, attitude and practice of clinical dental student and house officers to ward occupational hazards.

### **Material and Methods:**

This descriptive cross-sectional faculty based study was conducted on December 2022. A total of 95 dental students and house officers (54 from 4<sup>th</sup> year) (30 from 5<sup>th</sup> year) (11 house officers) were involved from Napata College, Dentistry Programme, Sudan. This study excluded the preclinical dental students.

The ethical clearance was taken from the research technical and ethical committee at the Napata College, Program of Dentistry. The participants' privacy and confidentiality were maintained. Each participant was consented, explaining some of the key elements of this study and what expected from them, and whether they agree to take part in the study.

A well designed valid questionnaire was used to collect data from study participants.

Questionnaire was based on socio-demographic information and other questions regarding common occupational hazards occurs at Napata dental clinic , knowledge, attitude and practice of clinical dental student and house officers toward occupational hazards . Data collected were computerized through Microsoft Excel. The data were analyzed through SPSS Version 22. The data was presented as percentages and frequency in tables and graphs.

### **Results:**

The study included 95 dentists (63 female's 66.3 % /32 males 33, 7 %). Regarding educational level (53 students were from the fourth year (55.8%), (31 students were from the fifth year (32, 6 %) and (11 house officers (11.6)). The age group showed that ((77)81.1 % were 18-24 years old, ((14)14.7 % were 25-30 years) and ((4)4.2% were 31-45 years) as seen in table 1.Regarding musculoskeletal symptoms our result showed that44.2 % of the participants complained of back pain followed by neck pain which was 20% followed by shoulder pain 15.8 %, followed by knee pain 4.2 % and equal percentage between hand, wrist and eye pain which was 3.2 % and the lowest percentage goes to elbow pain by 2% .7.4 % of the students didn't complain of any type of musculoskeletal pain as seen in table 2.

Regarding sharp instruments injury 55.8 % of students experienced sharp instruments

injury while the others 44.2 % didn't experience any sharp instruments injury as seen in figure 1.

42.1% of the participants had good knowledge about how to act toward these types of injuries by washing then disinfecting while 5.3 % preferred to totally neglect the injury and don't pay attention to it as seen in table 3. 82% of the participants had well knowledge about single hand technique to cover the needle while 18% never heard about this technique as seen in figure 2. 77% of participants committed to perform this technique in clinic. Where the rest neglected the importance of this technique as seen in figure 3. Regarding visual problems and fatigue 2. 41 % of participants complained of vision problems that appeared after they started clinical training, 34% did not complain and 25% of participants some time complained of vision problems and fatigue as seen in figure 4. Regarding the allergic reactions caused by dental material 70 % of the participants who said yes in allergic question were allergic to latex and 4% were allergic to eugenol as seen in figure 5 and table 4 . 98% of the participants had good

knowledge about personal protective equipments (PPE) and 70.5 % were using these equipments in their dental practice as seen in figure 6 and table 5.

### **Knowledge, attitude and Practice about the Occupational Hazards:**

55.8% of participants strongly agree that rubber dam is mandatory in any restorative dental procedure. 37.9 % agree that Mercury in amalgam restorative material can affect their health. 75.8 % of dental students and house officers strongly agree that sitting in correct position will help in avoiding musculoskeletal symptoms and 71.6% strongly agree that radiation could affect their health.

Regarding the use of dental instrument 89.5% of the participant strongly agree about the mandatory of using sterile instrument at any procedures ,76.8% of them had well knowledge about aseptic non touching technique ,69.5% were strongly agree on putting all the used instrument in the tray and 78.9 % strongly agree on the mandatory of using dental barrier rap (isolation) for dental chair , all these results were seen in table 6 .

Table 1: The age, gender and educational level of the participants

Age Group	Frequency	Percent
18 - 24 Years	77	81.1%
25 - 30 Years	14	14.7 %

31- 45 Years	4	4.2%
Total	95	100.0%
<b>The Gender</b>	<b>Frequency</b>	<b>Percent</b>
Female	63	66.3%
Male	32	33.7%
Total	95	100.0%
<b>The education level</b>	<b>Frequency</b>	<b>Percent</b>
Fifth Year	31	32.6 %
Fourth Year	53	55.8%
House Officers	11	11.6%
Total	95	100.0%

Table 2: The musculoskeletal Symptoms (pain) among participants:

Management of the sharp instrument injury	Frequency	Percent
Disinfect it only	16	17%
Wash it then compress your finger to make it bleed	34	35.7%
Wash it then disinfect it	40	42.1%
You don't pay attention to it	5	5.2%
Total	95	100.0%

Table 3: The management of the sharp instruments injury among dental students and house officers:

Musculoskeletal symptoms'	Frequency	Percent
Back pain	42	44.2%
Elbow pain	2	2%
eye	3	3.2%
hand or wrest pain	3	3.2%
Knee pain	4	4.2%
Neck pain	19	20.0%
No	7	7.4%
Shoulder pain	15	15.8%
Total	95	100.0%

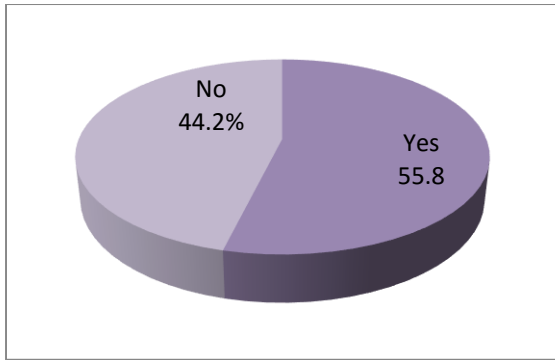


Figure 1: The sharp instruments injury (needle, files, burs ...etc) among dental students and house officers.

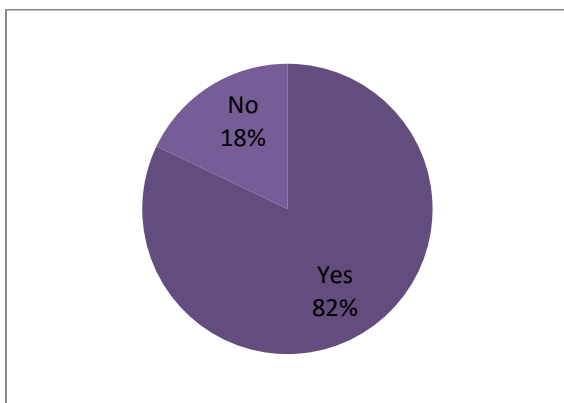


Figure 2: The knowledge about single hand technique to cover the needle

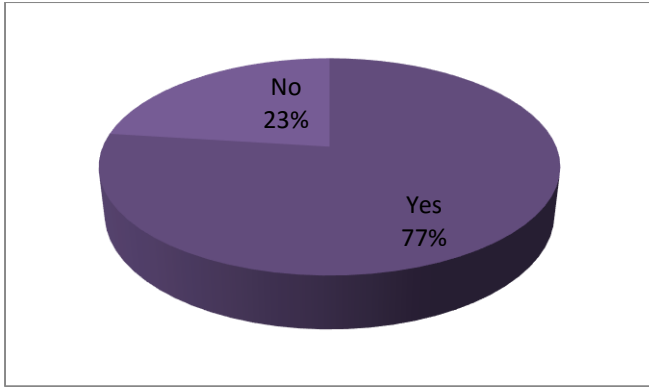


Figure 3: The recapitulate the needle after using it with single hand technique to cover the needle.

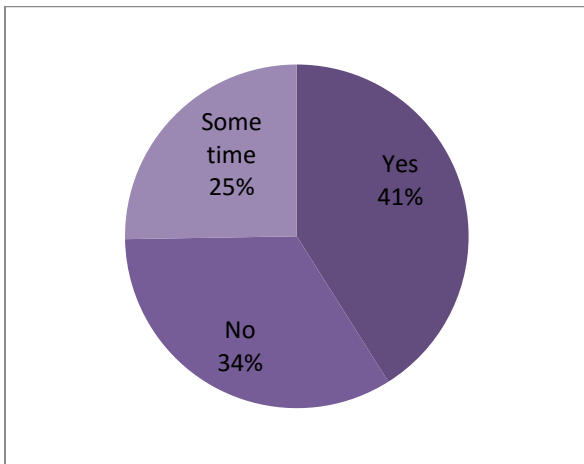


Figure 4: The Complained of vision problems or fatigue after clinical training.

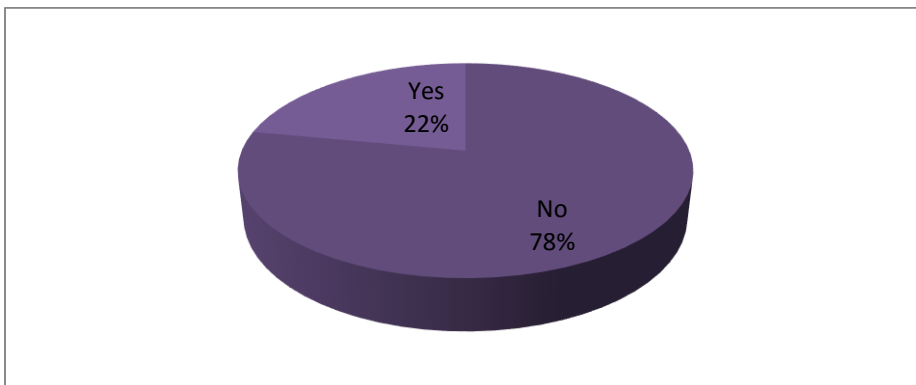


Figure 5: The allergy or irritation due to dental material

Table 4: If yes, the material that cause allergy to the dental students and house officers:

The material that cause allergy	Frequency	Percent
Eugenol	4	4.2%
Latex	70	73.7 %
Other	21	22.1%
Total	95	100.0%

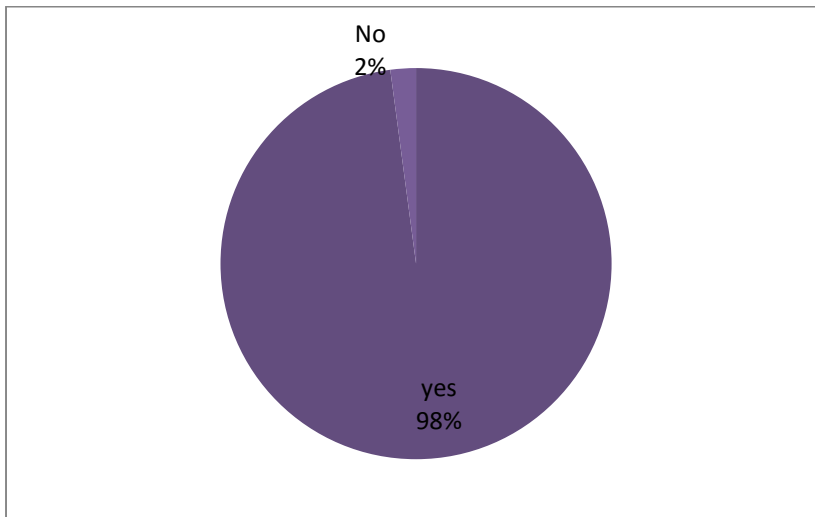


Figure 6: Knowledge about personal protective equipments (PPE)

Table 5: The wearing of all the personal protective equipments while performing dental procedures (goggle, mask, gloves, lab coat, gown, head mask):

The wearing of (PPE)	Frequency	Percent
No	7	7.4%
Sometimes	21	22.1%
Yes	67	70.5%
Total	95	100.0

Table 6: Knowledge, attitude and Practice about the Occupational Hazards:

Statement	Strongly dis agree	Disagree	Neutral	Agree	Strongly agree	Total
Rubber dam is mandatory in any restorative(operative ) dental procedure	1(1.1%)	4(4.2%)	6(6.3%)	31(31.6%)	53(55.8%)	95(100%)
Mercury in amalgam restorative material can affect your health	4(4.2%)	6(6.3%)	14(14.7%)	36(37.9%)	35(36.8%)	95(100%)
Sit in the correct position in clinical procedures help in avoiding musculoskeletal symptoms	0(00)	2(2,1%)	2(2.1%)	19(20%)	72(75.8%)	95(100%)
Radiation may affect your health	0(00)	0(00)	0(00)	27(28.4%)	68(71.6%)	95(100%)
You have to make sure that all instruments are sterile before you start the procedure	0(00)	1(1.1%)	1(1.1%)	8(8.4%)	85(89.5)	95(100%)
Using aseptic non touch technique(ANTT) by avoid touching any unnecessary area while performing dental procedures	0(00)	1(1.1%)	3(3.2%)	22(23.2%)	69(72.6%)	95(100%)
All used instruments should be put in the tray	1(1.1%)	3(3.2%)	4(4.2%)	21(22.1%)	66(69.5%)	95(100%)
Isolation of dental chair with dental barrier film (Wrapping ) is mandatory	0(00)	1(1.1%)	0(00)	19(20%)	75(78.9%)	95(100%)

## Discussion:

The researchers hope that the result assembled from this piece of work will shed some light on the issue handheld which is the occupational health of the clinical Dental Students and House Officers in Napata collage programe of dentistry Sudan

The study included 95 dentists (66.3%) were females and (33, 7%) were males. The sample included (55.8%) fourth year students, (32, 6%) fifth year students, and (11, 6%) house officers. 81.1% were in age group (18-24 years old).

### Occupational hazards:

As mentioned in this studies result, the prevalence's of the identified occupational hazards regarding musculoskeletal symptoms were (100%) with high percentage for back pain by 44.2% ,sharp instrument injury (55.8 %), visual symptoms and eye fatigue (41.1%) , and allergic reactions caused by dental material mainly latex by (73.7 %%) .Similar finding reported in a study among Libyan dentists in 2015 by Arheiam et al , the students

stated that musculoskeletal problems were the most frequently reported (48.2%), followed by percutaneous injuries (35%), eye problems (22%), allergy (11%) and hearing problems (7.6%) (10).

Previous researches showed that the prevalence and location of musculoskeletal problems are influenced by posture and work habits, work station design, rest period during work as well as demographic factors. (10)

In this study, the most common occupational hazard identified was the musculoskeletal involvement, with the back pain being the most common symptom followed by neck pain and shoulder pain. This finding was in line with another study done by Raghad Hashim et al among dental students in UAE 2021 with the low back pain was the highest percentage followed by neck pain and shoulder pain (11). Our finding was not in agreement with a cross-sectional study conducted by Raneem A Felemban et al in Jeddah, Saudi Arabia, in which they found that the highest prevalence was for neck pain (69.2%), followed by shoulder

pain (67.1%) and lower back pain (65%) (12).

In the presence of blood and saliva needle and sharp instrument injuries can cause life threatening infection (hepatitis B, hepatitis C and HIV /AIDS) and the dentist are in high risk to exposure to this type of accident. (13)

In the present study more than half of participant experienced sharp instruments injury (needle, files, burs ...etc ), this result was in agreement with study done by Namarig and Elsadig about knowledge ,attitude and practice of final dental students toward sharp instrument injuries in Khartoum state 2017 , they found that 67.27% of participants were exposed to sharp instruments injury(14).

Most of our participants dealt with injury by washing and disinfecting the area. This is a good technique for immediate handling of these accidents.

Most of the study's participants have good knowledge regarding single hand technique to cover the needle and most of them recapitulated the needle after using it with single hand technique to cover the needle. This result was in accordance with the study of Pavithran et al in which 69% of dental

professional in Bangalore, India were follow one handed needle recapping technique (15)

Majority of dental students and house officers Complained of vision problems or fatigue after clinical training, this study result was in agreement with Khalid Al-A li and Raghad Hashim who found that 53% of dentists reported having eye problems(16).

It has been suggested that most eye problems are usually seen in the daily life and may not be occupationally related, they may be due to mobile, and TV, laptops concentration or eye diseases, however, and they may affect the work of dentists or be aggravated by their occupation (17).

In the present study more than half of our participants did not have allergy or irritation due to dental material and who said that they complained of dental material allergy, most of them said latex gloves allergy.

Body sweat inside latex gloves may make the latex proteins soluble, thus allowing absorption through skin and sensitizing the wearer (18). Latex allergy may cause contact dermatitis, hypersensitivity reaction characterized by irritation, urticaria, erythema and

may extend to most severe reaction of anaphylaxis(19).

The finding regarding latex allergy was in agreement with the study done by Azizah yusoff et all among dental professional in Malaysia which showed that 26.9% of respondents were reported to have latex gloves allergic problem (20).

Personal Protective Equipment [PPE] have strong role in prevention and control of infection.

In the present study most of the participants had good knowledge about [PPE] and wearing of all the personal protective equipment ( goggle, mask, gloves, lab coat , gown, head mask ) while performing dental procedures. Our result is similar or agree with the result obtained by Valendriyani Ningrum and Abu Baker where 91, 7% of the dental students compliance and used the personal protective equipment [PPE] and 83.3% had solid understanding and good knowledge of how to use PPE (21).

In the Knowledge, attitude and practice about the occupational hazards, we found that majority of students Strongly agree that rubber dam is mandatory in any dental operative procedure which is similar to Yazeed Ahmed Al Awwad

etal who reported that 97.7% of the students agreed upon the important of using rubber dam (22).Rubber dam provide safety to the patient and operator by decreasing the risk of transferring infective agents between dentists and patient by its excellent isolation to the operative field (23).

In this study regarding the hazard of amalgam restoration 37.9% of our participants agree that Mercury in amalgam restorative material can affect their health. This result was in agreement and in line with the result of Dr. Haifa Barakah et al in which dental students had high knowledge regarding hazardous issue of mercury in amalgam restoration by mean of 42. Dental amalgam is well known for its durability, cost effective, strength and it used mainly for posterior teeth, the exposure to mercury in the amalgam restoration occurs during placement or removing the restoration, if the recommended global guide line to handling and removal technique are followed the risks of adverse effects of amalgam mercury could be minimized and become safe (24).

In the present study 75.8% of dental students and house officers strongly agreed that sit in the correct position in clinical

procedures help in avoiding musculoskeletal symptoms.

This result was in accordant with a study conducted by Rania M. El-sallamy et al in which they concluded that most of the students (83.3%) knew the best posture of the dentist sitting (25).

Most of the participants strongly agree that radiation may affect their health.

Study conducted by Mahabob et al supported our finding, where the majority of study participants (89.7%) were believed that dental X-rays are harmful and 56% of them were aware about the harmful effects of radiation exposure (26).

Although the radiation hazard by the dental radiograph is low but the accumulation of such low level radiation in the human body over long time can pose threat to health (27).

In this study regarding the sterilization 89.5% strongly agree that all instruments were sterile before they started any procedure. As most instrument directly contact mucosa, blood, saliva and may penetrate oral tissues, it is essential that contaminated instruments be cleaned and sterilized by using acceptable methods like ( autoclave)(28). Chowdhary and

Saralaya agree with our study, their results showed that 100% of dental students used sterile instruments (29).

The aseptic non touch technique(ANTT) is aseptic technique used during clinical procedures to prevent microbial contamination of aseptic part and sites by ensuring that they are not touched either directly or indirectly and this technique include decontaminate and wash the hands and wear suitable gloves, clean tray ,open and prepare all equipment on the tray or trolley. This Technique minimize the contamination from all pathogen with always wash hand effectively and Take appropriate precautions (30). In present study 72.6% of participants used aseptic non touch technique (ANTT) by avoid touching any unnecessary area while performing dental procedures. Also majority of students and house officers put the all used instruments in the tray.

In dental practice, infectious diseases can be transmitted in many routes such as direct contact with blood, oral fluid and other body secretion, also in direct contact with contaminated instruments, operative equipments and dental chair surface is very possible (31)

Isolation of dental chair with dental barrier film (Wrapping ) is mandatory in majority of dental students and house officers

.Study conducted by Arwa Mahasneh et al supported our findings, where surface disinfection was reported by the majority of dentists (74.7 %) and 56% of them reported that they use surface barriers for dental unit surface (32).

**Conclusion:** Overall, this study showed high prevalence of occupational hazards in Napata dental clinic, especially for the musculoskeletal disorder and sharp instrument injury. Considerable variation with practice and management toward these hazard among the participants showed up, this prevalence indicate the importance for early education to improve the awareness and knowledge.

**Recommendation:** Healthy and safety measures could be adopted in order to prevent our colleagues from harmful situations that would affect their life, health and social well-being. This may include : demonstration of the precautions that could be taken when exposing to sharp instruments injury by lectures , videos , or poster on the wall of the dental clinic, using of the dental magnification instrument to avoid the eye fatigue, demonstration of the correct positions to set in the dental chair in order to avoid the musculoskeletal symptoms and focusing on the importance of regular exercises, increase the level of the awareness toward the personal protective equipment and single hand techniques and using sterile instrument ,their important role in prevention from infections , hand disinfection , soap in

dental clinic and using the aseptic non touch technique(ANTT).

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**References:**

- 1-SivakumarI, Arunachlalam KS,Solomon EG. occupational health hazards in a prosthodontic practice :review of risk factors and management strategies .The journal of advanced prosthodontics.2012;4(4):259-65.
- 2-Moodley R, Naidoo S, Van Wyk j. The prevalence of occupational health related problems in dentistry: A review of the literature. Journal of occupational health .2018; 60(2):111-25.
- 3- Al-aslami RA, Elshamy FMM, Maamar EM, Shannaq AY, Dallak AE, Alroduni AA. Knowledge and awareness towards occupational hazards and preventive measures among students and dentists in Jazan Dental College, Saudi Arabia. Open Access Maced J Med Sci .2018; 6(9):1722-6.
- 4-Afshar MK, Faryabi R, Afshar MK, Torabi M. Evaluation of the frequency

of occupational hazards among a group of Iranian general dentists and its prevention criteria. *Pesqui Bras Odontopediatria Clín Integr.* 2022; 22:e210076.

5-Babaji P, Samadi F, Jaiswal JV, Bansal A. Occupational hazards among dentists :a review of literature . *Journal of International Dental and Medical Research.*2011; 4(2):87-93.

6-Jolanta S. Occupational Hazards of Dentistry. *Ann Agric Environ Med.* 1999; 6: 13- 19.

7-Gordon B, Burke F, Bagg J, Marlborough H, McHugh E. Systematic review of adherence to infection control guidelines in dentistry. *J Dent.* 2001;29(8):509–516.

8-Gershon RR, Karkashian C, Vlahov D, Grimes M, Spannhake E. Correlates of infection control practices in dentistry. *Am J Infect.* 1998;26(1):29–34.

9- Pratt RJ, Pellowe CM, Wilson JA, Loveday HP, Harper PJ, Jones SRLJ, McDougall C, Wilcox MH. Epic2: National evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England. *J Hosp Infect* 2007; 65(1)S1–64.

10-ArheiamA, Ingafou M. Self-reported Occupational Health Problems

among Libyan Dentists. *The Journal of Contemporary Dental Practice,* January 2015;16(1):31-35.

11-Hashim R,Salah A,Mayahi F,Haidary S.Prevalence of postural musculoskeletal symptoms among dental students in United Arab Emirates.*BMC Musculoskeletal Disorders .*2021;22:30:1-5.

12-Felemban RA, Sofi RA, Alhebshi SA, Alharbi SG, Farsi NJ, Abduljabbar FH, Farsi JM. Prevalence and predictors of musculoskeletal pain among undergraduate students at a dental school in Saudi Arabia. *Clinical, Cosmetic and Investigational Dentistry.* 2021;13:39.

13-Feranandes LHF ,QNunes WB,Silliva LC,Wanderley RL,BarrosCMB,Cavalcati AL.Needlestick and sharp instruments injuries among Brazilian dentistry students.*Contemp Clin Dent .*2017;8(1):112-115.

14-Fadl NSM,Eltayeb EM. knowledge ,attitude and practice of final dental students toward sharp instrument injuries in Khartoum state 2017 .*Medical and Research puplication International Open Access.*2022;6:1.

15- Pavithran VK,Murali R, Krishna M,Shamala A,Yalamalli M,Kumar AV.

Knowledge, attitude, and practice of needle stick and sharps injuries among dental professionals of Bangalore, India. *J Int Soc Prevent Communiti Dent.* 2015;5:406-12.

16-Al-Ali K, Hashim R Occupational health problems of dentists in the United Arab Emirates. *Int Dent J.* 2012;82(1):556.

17-Chwanadisai S, Kukiattrakoon B, Yaping B, Kedjarune U, Leggat PA. Occupational health problems of dentists in southern Thailand. *Int Dent J.* 2000; 50(1):36-40.

18- Beezhold DH, Kostyal DA, Wiseman J. The transfer of protein allergens from latex gloves. A study of influencing factors. *AORN J.* 1994;59(3):605-342.

19-Chin SM, Ferguson JW, Bajurnows T. Latex allergy in dentistry. Review and report of case presenting as a serious reaction to latex dental dam. *Aus Dent J.* 2004;49(3):146-148.

20-Yusoff A, Murray SA, Normastura A R, John J, Mohammad D, Tin-Oo MM. Self Reported Latex Glove Allergy among Dental Personnel in Kelantan State, Malaysia. *International Medical Journal.* 2013;20(3):343-345.

21- Ningrum V, Bakar A. Assessment of Gender, Role Model, Patient Involvement and Knowledge on compliance using Personal Protective Equipment (PPE) among Dental Students: Across Sectional Study. *Advance in Health Science Research.* 2022;47:160-163.

22- Alawwad, Zaman H, Javed MG. Knowledge and Attitudes of Undergraduate Dental Students regarding Rubber Dam use at Qassim University. *P JMHS.* 2021;15(8):1-4.

23- Abuzenada BM. Attitude of Dental Students towards the Rubber Dam Use in Operative Dentistry. *J Pharm Bioallied Sci.* 2021;13(1):S637-41.

24- Barakah HM, Hasan MB, Alfehaid A, Altayyar R, Alsaykhan M. Knowledge and awareness of dental practitioners, interns and assistants towards mercury hazards in dental amalgam. *International journal of applied Dental Science.* 2021;7(2):288-292.

25- El-Sallamy RM, Atlam SA, Kabbash I, El-fatah SA, El-Flaky A. Knowledge, attitude, and practice towards ergonomics among undergraduates of Faculty of Dentistry, Tanta University, Egypt. *Environmental Science and Pollution Research.* 2018 Nov;25(31):30793-801.

26-Mahabob MN, Alabdulsalam M, Alabduladhem A, Alfayz S, Alzuriq A, Almomin AM. Knowledge, Attitude and Practice about radiation safety among the undergraduates in Eastern province dental college. *J Pharm Bioallied Sci.* 2021;13(2):S1442-S1447.

27-Hobbs JB, Goldstien N, Lind KE, Elder D, Dodd GD, 3<sup>rd</sup>, Borgstede Jp. Physician knowledge of radiation exposure and risk in medical imaging. *J Am Coll Radiol.* 2018;15:34-43.

28-Sachdeva A, Sharma A, Bhateja S, Arora G. Knowledge, Attitudes, and Practice Regarding Sterilization Protocol among Undergraduate Dental Students in Faridabad City: A Questionnaire-Based Study. *Journal of Indian Academy of Oral Medicine and Radiology.* 2019;31(1).

29-Chowdhary S, Saralaya S. Knowledge, Attitudes, and Practice (KAP) of undergraduate dental students about sterilization/ disinfection methods. *International Journal Dental and Medical Sciences Research.* 2022;4(4):489-495.

30-Jakson D, Wall D, Bedward J. The sociocultural contribution to learning: Why did my students fail to learn Aseptic Non-Touch Technique? Multidimensional factors

involved in medical students failure to learn this skill. *Medical Teacher.* 2012;34(12).

31-Ahmed LA, Rehan EA, Pani SC. Compliance of Saudi dental students with infection control guidelines. *Int Dent J.* 2013;63(4):196-201.

32-Mahasneh AM, Alakhras M, Khabour OF, Al-Sadi AG, Al-Mousa DS. Practice of Infection control Among Dental Care Provider: Across Sectional Study. *Clinical, Cosmetic and Investigational Dentistry* 2020;12:281-289.