

International Healthcare Research Journal (IHRJ)

E - I S S N : 2 4 5 6 - 8 0 9 0

Volume 4, Issue 8 (November 2020)
Published: 25th November, 2020



| <u>EDITOR-IN-CHIEF AND PUBLISHER</u> | | <u>Co-Editor</u> |
|---|---|--|
| <p>Dr. Vatsul Sharma, MDS(Public Health Dentistry) Consultant Dental Specialist Ex-Senior Lecturer Department of Public Health Dentistry Sri Sukhmani Dental College Dera Bassi (SAS Nagar) 140507 Punjab India +91 8607700075 vatsulsharma0075@gmail.com editor.ihrj@gmail.com</p> | <p>PUBLICATION ADDRESS 66 A Day Care Centre Housing Board Colony Kalka (Panchkula) Haryana, India-133302</p> | <p>Dr. Sahil Thakar, MDS(Public Health Dentistry) Consultant Dental Surgeon Senior Lecturer Department of Public Health Dentistry School of Dental Sciences Sharda University Greater Noida -201310 +91 9990036390 sahilsinghthakar22@gmail.com sahil.ihrj@gmail.com</p> |
| <p><u>Associate Editor</u> Dr. Ravneet Malhi, MDS(Public Health Dentistry) Department of Public Health Dentistry DJ College of Dental Sciences and Research Modinagar +91-98976601690 malhi.ravneet11@gmail.com ravneet.ihrj@gmail.com</p> | | <p><u>Editorial Coordinator</u> Parul Chawla Pharmacovigilance Specialist Masters in Systems Biology and Bioinformatics +91-8288030921 parulchawla27@gmail.com</p> |
| | <p><u>Forensic Editor</u> Dr. Taruna Malhotra, BDS, M.Sc. (Forensic Odontology) Consultant Dental Surgeon & Forensic Advisor New Delhi +91-98189 37227 tarunamalhotra7@gmail.com</p> | |

| EDITORIAL BOARD MEMBERS | |
|---|--|
| INTERNATIONAL MEMBERS | NATIONAL MEMBERS |
| <p>Dr. Richard J. Gray, DDS(Endodontics) Private Practitioner Ex-Assistant Professor Virginia Commonwealth University School of Dentistry Apex Endodontics 1149 Jefferson Green Circle Midlothian, VA 23113 USA +1 804-378-9152 toothfxr@hotmail.com</p> | <p>Dr. Anil Sharma, [MBBS, MS(General Surgery)] Private Practitioner Ex-Registrar, Ram Manohar Lohia Hospital, New Delhi Ex-Medical Officer Incharge (HCMS) +91 9416264986 dranil786@gmail.com</p> |
| <p>Dr. Arushi Khurana [MBBS,MD,PGY5 Fellow (Hematology/Oncology)] Virginia Commonwealth University Massey Cancer Center 401 College Street Box 980037 Richmond, Virginia 23298-0037 USA +1804-828-9726 arushi.khuranai@vcuhealth.org</p> | <p>Dr. Kuljit Singh Uppal,[MBBS, DLO, MS(ENT)] Ex-Associate Professor Government Medical College and Hospital (GMCH), Patiala +91 9463443940 drkuljitsinghuppal@gmail.com</p> |
| <p>Dr. Naimatullah Habibi, [BSc(General Medicine), MD(Doctor of Medicine), MD(Family Medicine)] General Practitioner 2, Merivale Drive Truganina 3029 Melbourne Victoria (Australia) +61 424808900 dr-habibi@live.com</p> | <p>Dr. Sulabh Puri, MD [MBBS, MD (Radiodiagnosis)] Senior Resident Department of Radiodiagnosis All India Institute of Medical Sciences New Delhi 1100608 +917042202050 dr.sulabhpuri@gmail.com</p> |
| <p>Dr. Syed Ameer Haider Jafri, MDS(Pedodontics and Preventive Dentistry) Registrar King Salman Armed Force Hospital Tabuk 47512 Saudi Arabia +96 6534010567 jafri.dr@gmail.com</p> | <p>Dr. Nidhi Gupta, MDS (Public Health Dentistry) Professor and Head Department of Public Health Dentistry Swami Devi Dyal Hospital and Dental College Panchkula (Haryana) 134118 +91 9876136514 nidhidentist@gmail.com</p> |
| <p>Dr. PACKO Dieu-le-veut saint-cyr Sylvestre, MBBS [Specialty career in Hématology (DES): Diploma of Specialized Study in Hematology, University of Félix Houphouët Boigny (Abidjan)] Hematologist and Urgentist Doctor Assistant professor Institute of Medicine of University of Bangui Hospital Teacher and Searcher of Hematology Department of University Hospital of Yopougon, Côte d'Ivoire +225 89 54 22 09 stcyrpacko@yahoo.fr</p> | <p>Dr. Bhuvandeep Gupta, MDS (Public Health Dentistry) Reader Department of Public Health Dentistry ITS Dental College, Hospital and Research Centre Greater Noida 201308 +91 9650757561 bhuvandentist@gmail.com</p> |
| <p>Dr Jayant Kumar Sah, MBBS, MS, M.Ch (Surgical Gastroenterology), Fellowship in Advanced Liver Transplant Assistant Professor Department of Surgery Institute of Medicine Tribhuvan University Teaching Hospital Nepal</p> | <p>Dr. Sheetal Grover, MDS (Conservative Dentistry and Endodontics) Reader Seema Dental College and Hospital Rishikesh 249203 +91 8477981601 drgroversheetal@gmail.com</p> |

| | |
|---|---|
| <p>Dr Mayank Gahlot (MDS Orthodontics) Specialist Orthodontist 307, Block A Al Attar Center Karama 116440 Dubai +971 558096897 mayankgahlot85@gmail.com</p> | <p>Dr. Nitin Gorwade, MDS (Periodontics) Senior Resident PGIMER Chandigarh 160012 +91 7738477054 rohitgorwade@gmail.com</p> |
| <p>Dr. Vivek Vijay Gupta (MDS Periodontics) Senior Lecturer Faculty of Dentistry, SEGi University Jalan Teknologi 9, PJU5, Kota Damansara Petling Jaya-47810 Malaysia +60 102924549 vivek.vvg77in@gmail.com</p> | <p>Dr. Gyanendra Mishra, MDS (Pedodontics) Medical Officer Dental Ministry of Health, Jharkhand +91 8076597879 dr.gyani2012@gmail.com</p> |
| <p>Dr. Ramya Madhuri, MDS (Oral Medicine and Radiology) Unit number 12 Building num 4277 Solumaniah Riyadh Saudi Arabia +966 555740418 kotni.ramya@gmail.com</p> | <p>Dr. Abhishek Bansal, MDS (Prosthodontics) Consultant Prosthodontist & Private Practitioner H-32/62, Sector-3, Rohini, Delhi-110085 +91 9899236125 dr.abhishekbansal05@gmail.com</p> |
| | <p>Dr. Nikhil Prakash, MDS (Prosthodontics) Senior Lecturer Department of Prosthodontics Yogita Dental College and Hospital Khed, Ratnagiri- 415709 +91 7408814400 drnikhillko@gmail.com</p> |
| | <p>Dr. Khundrakpam Nganba MDS (Pedodontics and Preventive Dentistry) Senior Lecturer Department of Pedodontics and Preventive Dentistry Maharana Pratap Dental College Gwalior-475001, India +91 8826355824 nganbawork@gmail.com</p> |

CONTENTS (VOLUME 4, ISSUE 8, NOVEMBER 2020)

| S.No | TITLE | AUTHOR NAMES | PAGE NUMBERS | DOI |
|-----------------------------|--|--|--------------|---|
| SHORT COMMUNICATION | | | | |
| 1. | Consequences of Air Pollution on Health: Time to Act Now!! | Sagar Uppal | SC1-SC7 | https://doi.org/10.26440/IHRJ/0408.11357 |
| REVIEW(S) | | | | |
| 2. | Current Trends in Orthodontics | Anindita Mallik, Yagyeshwar Malhotra, Amita Badhan, Parul Uppal Malhotra, Deepali Rasila | RV1-RV4 | https://doi.org/10.26440/IHRJ/0408.11285 |
| 3. | COVID-19 and Retinal Toxicity of Anti-Malarials | Mohit Bharti | RV5-RV11 | https://doi.org/10.26440/IHRJ/0408.11364 |
| ORIGINAL RESEARCH(S) | | | | |
| 4. | Dent-O-Myths Amid Young Community: A Cross-Sectional Study | Vinita Mary A, Kesavan R, Keerthana S, Kiruthiga G, Kowsalya M, Pooja R | OR1-OR9 | https://doi.org/10.26440/IHRJ/0408.11367 |
| 5. | Lockdown and Insomnia among Undergraduate Healthcare Students: A Cross-Sectional Study | Ramesh Sharma, Aseem Mishra, Anupam Mishra, Priyanka Chatterjee | OR10-OR13 | https://doi.org/10.26440/IHRJ/0408.11286 |



Consequences of Air Pollution on Health: Time to Act Now!!

SAGAR UPPAL

A
B
S
T
R
A
C
T

Air pollution has been shown to significantly affect one's health and lead to untimely deaths and unnecessary hospitalizations. Studies have demonstrated a direct association between air pollution and different medical conditions including respiratory and cardiovascular diseases; also, climate change is shown to be associated with air pollution. This short communication addresses the consequences of air pollution on health and request people to act now for a brighter, healthier living due to air free of pollutants.

KEYWORDS: Air Pollution, Asthma, Premature Mortality, Health

INTRODUCTION

The access of a person/community to clean air and water is a basic human right. However, rapid industrialization coupled with human greed has made our waters polluted and air toxic. This situation has been worse in developing countries exposing various communities to the hazards associated with impure air and water.

As per 2019 estimates, Bangladesh topped the chart with the most polluted air averaging at 83.30 for PM_{2.5} and very closely followed by Pakistan (Average PM_{2.5}: 65.81) and Mongolia (Average PM_{2.5}: 62.00). The country with the cleanest air was reported to be Bahamas (Average PM_{2.5}: 3.30).¹ WHO estimates that the menace of air pollution leads of the loss of approximately seven million people across the globe and 9 out of 10 people breathe air that polluted air that exceeds WHO guidelines for clean air.²

As stated above, air pollution due to Particulate matter (PM) is a major public health concern especially in urban areas. AS per WHO air quality guidelines, 80% of the population in Europe reside in areas where PM levels exceed air quality guidelines, as a result of which, their life expectancy is reduced by an average of approximately nine months.³ The toxic effects of PM air pollution manifest as cardio-respiratory diseases [MI, stroke, COPD, (lung cancer)], asthmatic exacerbations, cystic fibrosis as well as respiratory infections in children.⁴ The effect of human interests on the increase have been documented by the simulations of Fang et al. who reported that from

1860(pre-industrial) to 2000(present day), global Particle Matter (PM_{2.5}) concentrations increased by 5% due to climate change.⁵

The relation between bad air quality and its effect on health can be both direct and indirect. These particles can affect the cardiopulmonary system, lead to hospitalization due to an increase in respiratory disease (e.g. asthma, chronic bronchitis, rhinitis).⁶ Studies have also documented that environments with high levels of air pollution are responsible for an increased risk of cognitive decline and stroke.^{7,8} Studies have also drawn associations between air pollution and diabetes,⁹ diseases of rheumatic origin, neurodegenerative diseases, preterm birth and decreased reproductive health.¹⁰

The effects of ambient NO₂, SO₂, and PM₁₀ on childhood were studies by Wei et al. Shanghai, China over a 6-year research program and it was indicated that that gestational and lifetime exposures to NO₂ were risk factors for atopic eczema in childhood.¹¹ Researchers have projected that climate change would increase air pollution-related mortality with the projection having a direct effect on the pollutants.

To combat air pollution, the first WHO Global Conference on Air Pollution and Health was held at Geneva from 1st November 2018; and at the conclusion, participants agreed an aspirational goal of reducing the number of deaths from air pollution by two thirds by 2030.¹² So much was the emphasis on the reduction of



© Sagar Uppal. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY-NC 4.0, which permits unrestricted use, distribution and reproduction in any medium, provided the use is not commercial and the original author(s) and source are cited.

air pollution that Air pollution was called by Dr Tedros Adhanom, WHO's Director General as the 'new tobacco'.

Through this short commentary, I would like to invoke all governmental organizations as well as individuals to act promptly by joining hands and work together for the betterment of the community as well as for the health of our future generations.

REFERENCES

1. IQAIR. World's most polluted countries (online article). Available from: <https://www.iqair.com/us/world-most-polluted-countries> [Last Accessed on 25th September, 2020]
2. WHO. Air pollution. (online article). Available from: https://www.who.int/health-topics/air-pollution#tab=tab_1 [Last Accessed on 25th September, 2020]
3. World Health Organisation. Health effects of particulate matter: Policy implications for countries in eastern Europe, Caucasus and Central Asia. Copenhagen, Denmark: WHO Regional Office for Europe; 2013
4. Brauer M, Hoek G, Van Vliet P, Meliefste K, Fischer PH, Wijga A, et al. Air pollution from traffic and the development of respiratory infections and asthmatic and allergic symptoms in children. *Am J Respir Crit Care Med*. 2002;166:1092-8.
5. Fang Y, Naik V, Horowitz LW, Mauzerall DL. Air pollution and associated human mortality: the role of air pollutant emissions, climate change and methane concentration increases from the preindustrial period to present. *Atmos Chem Phys*. 2013;13(3):1377-94. doi: 10.5194/acp-13-1377-2013.
6. WHO. Review of evidence on health aspects of air pollution—REVIHAAP project: technical report. Copenhagen: WHO Regional Office for Europe; 2013
7. Power MC, Kioumourtzoglou MA, Hart JE, Okereke OI, Laden F, Weisskopf MG. The relation between past exposure to fine particulate air pollution and prevalent anxiety: observational cohort study. *BMJ* 2015;350, h1111. <http://dx.doi.org/10.1136/bmj.h1111>.
8. Genc S, Zadeoglulari Z, Fuss SH, Genc K. The adverse effects of air pollution on the nervous system. *J. Toxicol*. 2012;2012:782462. <http://dx.doi.org/10.1155/2012/782462>
9. Thiering E, Heinrich J. Epidemiology of air pollution and diabetes. *Trends Endocrinol Metab*. 2015;26(7):384-94.
10. Hansen C, Luben TJ, Sacks JD, Olshan A, Jeffay S, Strader L, Perreault SD. The effect of ambient air pollution on sperm quality. *Environ Health Perspect*. 2010;118(2):203-9.
11. Liu W, Huang C, Hu Y, Fu Q, Zou Z, Sun C, et al. Associations of gestational and early life exposures to ambient air pollution with childhood respiratory diseases in Shanghai, China: A retrospective cohort study. *Environ. Int*. 2016;572:34-42.
12. WHO. First WHO Global Conference on Air Pollution and Health, 30 October - 1 November 2018. (Online Article) <https://www.who.int/airpollution/events/conference/en/> [Last Accessed on 25th September, 2020]

Source of support: Nil, **Conflict of interest:** None declared

Cite this article as:

Uppal S Consequences of Air Pollution on Health: Time to Act Now!!. *Int Healthc Res J*. 2020;4(8):SC1-SC2. <https://doi.org/10.26440/IHRJ/0408.11357>

AUTHOR AFFILIATIONS: (*: Corresponding Author)

1. MBBS, Consultant General Physician, Vizag, India

Contact corresponding author at: [enauppal940\[at\]gmail\[dot\]com](mailto:enauppal940[at]gmail[dot]com)

QR CODE



Current Trends in Orthodontics

ANINDITA MALLIK¹, YAGYESHWAR MALHOTRA^{*2}, AMITA BADHAN³, PARUL UPPAL MALHOTRA⁴, DEEPALI RASILA⁵A
B
S
T
R
A
C
T

The scope for orthodontics increases as recent innovative ideas becomes successfully demonstrated and applied. The emphasis nowadays in on the holistic correction of the face rather than the dentition. In the field of orthodontics new innovations have not only increased the efficiency of an orthodontist to produce better results but at the same time, reduced the treatment duration, thus positively influencing the patient compliance. So it seems a win-win state for both the orthodontist and the patient. New solutions for the old problems have resulted in advancements in orthodontic materials and their cascading effect on appliance design and treatment strategies. This article briefly embraces us about the recent trends being followed by an orthodontist to achieve better results in shorter duration.

KEYWORDS: Orthodontics, Trends, Orthodontic Brackets

INTRODUCTION

Development is closely related with technology, which has widened the normal limits to human perception. “Paradigm shift” in the field more focuses on the soft tissue compared to the hard tissue. In this article we have broadly divided the recent trends into recent diagnostic aids, appliance design and the treatment strategies using accelerated orthodontics in adult patients.

ORTHODONTIC DIAGNOSTIC AIDS¹

Cone Beam Computed Tomography (CBCT) in orthodontics: Allows for improved diagnosis and treatment planning in specific applications:

- Management of impacted teeth and dental anomalies
- Diagnosis and assessment of dentofacial deformities—especially skeletal asymmetry
- Pre-surgical planning for orthognathic procedures and miniscrew placement

3D photography: Creates three dimensional extraoral image of patient that can aid in diagnosis and treatment planning specially in patients with dentofacial deformities.

Digital Models: there are various methods that can be acquired by intraoral scan, CBCT, by scanning an impression or plaster model. They represent as an efficient alternative to the plaster models.

LASERS (Light Amplification by Stimulated Emission of Radiation) in orthodontics:²⁻⁶

The most common lasers used in dentistry today are the CO₂ laser, the Nd:YAG laser, the erbium lasers (Er:YAG and Er,Cr:YSGG), and the diode laser. It has been seen CO₂ and Nd:YAG are not ideally suited for orthodontic applications. Erbium lasers are being extremely popular in dentistry today as they hold the singular distinction of being able to perform both hard and soft tissue procedures. But the diode laser seems to be most ideal for incorporation into the orthodontic specialty practice. Clinical application and classification of LASER is shown in figure. 1 and table 1.

RECENT ADVANCES IN APPLIANCES^{1,7-9}

Recent trends in appliance are tabulated in figure 2 and are further discussed below:

Self-ligating brackets: These brackets are not new, but have gained popularity recently. They do not require an external auxiliary ties to ligate the arch wire into the bracket slot.

Customised appliances: Orthodontic appliances that are custom made to fit each individual patient’s teeth, and designed to move teeth from their initial malocclusion to a pre-determined outcome.

Invisalign® is the first customized appliance



© Anindita Mallik et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY-NC 4.0, which permits unrestricted use, distribution and reproduction in any medium, provided the use is not commercial and the original author(s) and source are cited.

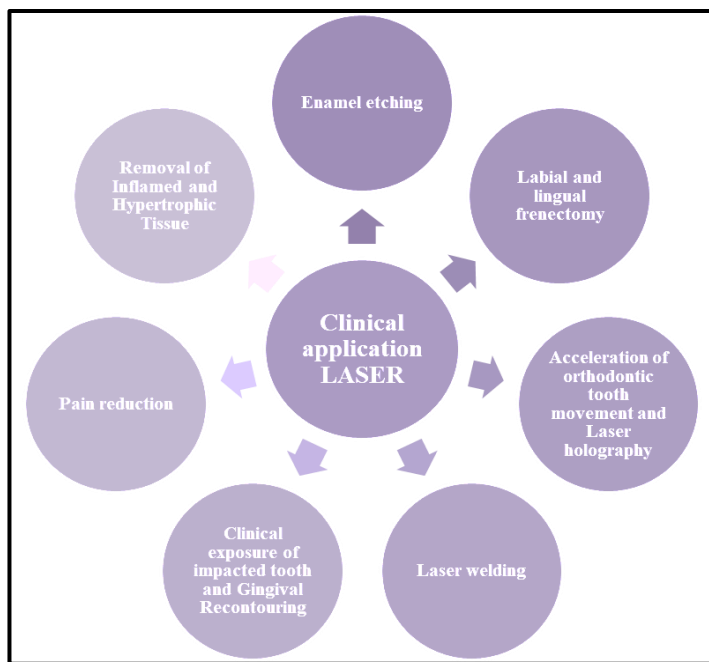


Figure 1. Clinical Application of Lasers

which uses a digital set up of the patient’s teeth to plan the final outcome and for the fabrication of the appliance. Main advantage of this appliance is invisibility compared to the available brackets and it is easier to maintain oral hygiene.

| CLASSIFICATION BASED ON USE: | | |
|------------------------------|-----------------------|---|
| LASER TYPE | WAVELENGTH | CLINICAL APPLICATION |
| • Argon | • 488, 514 nm | • Curing, soft tissue desensitization |
| • Diode | • 800-830, 950-1010nm | • Soft tissue, periodontics |
| • Nd: YAG | • 1064 nm | • Soft tissue, periodontics, desensitization, analgesia, tooth whitening, and endodontics |
| • Er: YSGG | • 2.79 μm | • Hard tissue |
| • Er: YAG | • 2.94 μm | • Hard tissue |

Table 1. Classification Based on use of Lasers

Suresmile® system: in this system an optical intraoral scanner is used to acquire a three dimensional digital model of teeth and brackets. Digital models are then used to create a set up of the teeth in the desired final positions. Customized arch wires are robotically formed to incorporate all necessary bends to exert forces and

moments to achieve the desired position of teeth. And these customized arch wires are used in non custom brackets to achieve an individualized treatment outcome.

Incognito™ system: comprise of fully customized lingual bracket system. Laboratory or digital set up is used to predetermine the desired positions of teeth. This system has been shown to be highly precise, and is an esthetic treatment option that offers greater control over tooth movement than clear aligners in many cases.

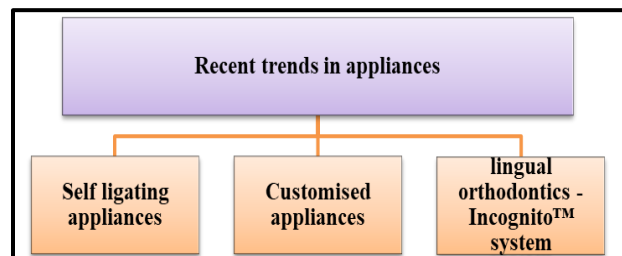


Figure 2. Recent Trends in Orthodontic Appliances

TEMPORARY ANCHORAGE DEVICES (TAD)¹⁰

Anchorage has always played a crucial role in orthodontics. Irrespective of the biomechanics incorporated into the various systems to minimize the anchorage loss in all the planes, it continues to be an area of concern. The introduction of TAD’s into the field of orthodontics has revolutionized the scope of treatment possibility. TAD’s serve as an absolute anchorage to move the teeth in the desired directions, which is impossible to be achieved with the help of conventional treatment alone.

ADULT ORTHODONTICS^{1,11}

With increase in number of adult patients seeking orthodontic treatment, the demand for esthetics during the orthodontic treatment has gained the momentum. Clear aligners and lingual orthodontic treatment satisfied a large range of patient’s expectations. On the other hand Clear aligner uses a set of aligners to correct the malocclusion from its initial phase to the final. It takes into advantage the possibilities of CAD-CAM imaging. Adult treatment can be categorized

as shown in Table 2.

| SPECIAL CONSIDERATION IN TREATMENT FOR ADULTS | | |
|---|--|--|
| COMPREHENSIVE TREATMENT | ADJUNCTIVE TREATMENT | SURGICAL ORTHODONTICS |
| <ul style="list-style-type: none"> Adults receiving comprehensive treatment are the main candidates for esthetically-enhance appliances the prime examples being clear aligners, lingual appliances, and ceramic facial brackets | <ul style="list-style-type: none"> Adults receiving adjunctive treatment are the candidates who need another treatment together with the primary treatment. | <ul style="list-style-type: none"> Surgical first approach is used widely |

Table 2. Special Consideration in Orthodontic Treatment of Adults

ACCELERATED ORTHODONTICS¹²⁻¹⁴

Many researches are underway on shortening the span of treatment, namely the corticotomy, Accelerated osteogenic orthodontics, low level laser, low frequency mechanical vibrations shown in Table 3, these methods have not gained wide acceptance due to the invasiveness and the armamentarium involved. Biological methods for accelerating tooth movement, involving the prostaglandin E (PGE), Receptor activator of nuclear factor kappa-B ligand (RANKL), Interleukin etc are subjected to large number of research at present times.

| ACCELERATED ORTHODONTICS | | |
|--|---|---|
| Drugs or Pharmacological | Physical methods | Surgery assisted |
| <ul style="list-style-type: none"> Cytokine PTH Vitamin D3 Relaxin | <ul style="list-style-type: none"> Resonance vibration Low level laser Static magnetic field Direct electric current Pulsed electromagnetic field Device assisted vibration | <ul style="list-style-type: none"> Corticotomy Wilcodontics/PAOO Peizocision Intraceptal alveolar surgery |

Table 3. Methods of Accelerated Orthodontics

Accelerated Osteogenic Orthodontics (AOO):

In this procedure, selective corticotomy are done followed by placement of bone grafting material.
 -Reflection of full thickness flaps with multiple corticotomies and the bone grafting material are placed over the decorticated areas

-Regional acceleratory phenomenon (RAP) takes place in the selected areas.

-As a result, increase in metabolic activity (including modeling and remodeling) initiated by injury to bone accelerate the teeth movement with result of short treatment period.

Modified Corticotomies: Less invasive surgical procedure--multiple vertical incisions without flap reflection.

CONCLUSION

Today's challenge in orthodontics is to improve the quality of oral health while satisfying the developing needs. In order to encounter the new challenges and to upgrade the feature of our present treatment needs the combined efforts of dental education, dental research, and dental practice will be needed. The time is not far away when there will be no impressions, no plaster models, no tracing papers, and no pliers in the orthodontic office. But it is important that these tools should be cost effective, so that benefits of these technologies can be extended to all sections of society including economically disadvantageous population and those living in remote locations.

REFERENCES

1. Proffit WR, Fields HW, Larson B, Sarver DM. Contemporary orthodontics-e-book. Elsevier Health Sciences; 2018 Aug 6.
2. Roberts-Harry D. Lasers in orthodontics. British Journal of Orthodontics. 1994;21(3):308-12.
3. Fujiyama K, Deguchi T, Murakami T, Fujii A, Kushima K, Takano-Yamamoto T. Clinical effect of CO2 laser in reducing pain in orthodontics. The Angle Orthodontist 2008;78(2):299-303.
4. Nalcaci R, Cokakoglu S. Lasers in orthodontics. European Journal of Dentistry 2013;7(Suppl 1):S119.
5. Borzabadi-Farahani A, Cronshaw M. Lasers in orthodontics. In Lasers in Dentistry—Current Concepts 2017. Springer, Cham. pp:247-71.
6. Khajuria AK, Prasantha GS, Mathew S, Khan Y. LASERS in Orthodontics. Journal of Dental and Orofacial Research. 2016;12(2):20-4.
7. Jacob J. Orthodontics and Beyond-An Overview of the Changing Concepts and Current Trends in Orthodontics. EC Dental Science 2017; 7(4):153-4.
8. Heymann GC, Grauer D. A contemporary review of white spot lesions in orthodontics. Journal of Esthetic and Restorative Dentistry. 2013;25(2):85-95.

9. Muggiano F, Quaranta A. The Incognito Appliance System: A Fully Customized Lingual Orthodontic Appliance. Webmed Central 2013;4(10):WMC004437.
<https://doi.org/10.9754/journal.wmc.2013.004437>
10. Cope JB. Temporary anchorage devices in orthodontics: A paradigm shift. Semin Orthod. 2005;11:3-9.
11. Peiro-Guijarro MA, Guijarro-Martínez R, Hernandez-Alfaro F. Surgery first in orthognathic surgery: a systematic review of the literature. American Journal of Orthodontics and Dentofacial Orthopedics. 2016;149(4):448-62.
12. Agrawal A, Gaur G, Dagur LS, Bhadauria US, Seth K, Parmar S. Fast track tooth movement: An amalgamation of periodontics and orthodontics. The Saint's International Dental Journal. 2020;4(1):23-9.
https://doi.org/10.4103/sidj.sidj_2_20
13. Zimmo N, Saleh MH, Mandelaris GA, Chan HL, Wang HL. Corticotomy-accelerated orthodontics: a comprehensive review and update. Compend Contin Educ Dent. 2017;38(1):17-25.
14. Unnam D, Singaraju GS, Mandava P, Reddy GV, Mallineni SK. Accelerated Orthodontics-An overview. J Dent Craniofac Res. 2018;3(1):4.
<https://doi.org/10.21767/2576-392X.100020>

Cite this article as:

Mallik A, Malhotra Y, Badhan A, Malhotra PU, Rasila D. Current Trends in Orthodontics. Int Healthc Res J. 2020;4(8):RV1-RV4. <https://doi.org/10.26440/IHRJ/0408.11285>

Source of support: Nil, **Conflict of interest:** None declared

AUTHOR AFFILIATIONS: (*: Corresponding Author)

1. MDS (Orthodontics and Dentofacial Orthopedics), Consultant Orthodontist, Siliguri, WB, India
2. MDS (Orthodontics and Dentofacial Orthopedics), Consultant Orthodontist, Kangra, HP, India (Corresponding Author)
3. MDS (Orthodontics and Dentofacial Orthopedics), Consultant Orthodontist, Chandigarh, India
4. MDS (Paediatric and Preventive Dentistry), Medical officer (Dental), Community Health Centre, Nalagarh, Solan, HP, India
5. MDS (Periodontics), Birmingham, Alabama, USA

Contact Corresponding Author at: y9417804155[at]gmail[dot]com

QR CODE



COVID-19 and Retinal Toxicity of Anti-Malarials

MOHIT BHARTI

A
B
S
T
R
A
C
T

The use of chloroquine and hydroxychloroquine in the tough time of COVID-19 has gained much attention. The production and use of these drugs has drastically increased in the past few months. However, it is important to know that retinal toxicity is a very rare side effect of these therapies that can lead to permanent vision loss. The mechanism is however unclear, but this toxicity might depend on the tolerance of the subjects exposed. It is important to choose the appropriate dosage which should be customized as per the patient's condition, age, body weight and comorbidities. Also, to avoid the occurrence of retinopathy, eye examination and ophthalmic screening for the patients being administered these drugs should be done. This review discusses the risk determinants, the clinical presentations and screening techniques of retinal toxicity.

KEYWORDS: Retinal Toxicity, Retinopathy, Coronavirus, Chloroquine, Hydroxychloroquine

INTRODUCTION

The exact in vitro inhibitory mechanism of Chloroquine on corona virus has already been published in a study report.¹ Based on relevant studies on chloroquine and hydroxychloroquine in the treatment of COVID-19, the inclusion of these drugs was recommended for treating this pandemic. Both chloroquine and its analogue hydroxychloroquine fall into the 4-aminoquinoline class of antimalarials and have some application in the treatment of rheumatoid arthritis, systemic lupus erythematosus, and other connective tissue diseases in addition to malaria. Its adverse effects include gastrointestinal reactions, skin and hair damage, neuromuscular abnormalities and eye lesions.²

Coronavirus is a kind of enveloped positive-sense RNA virus named after its coronal appearance under electron microscope. SARS-CoV-2, severe acute respiratory syndrome coronavirus and Middle East respiratory syndrome coronavirus belong to β genus coronavirus.³ Early studies of SARS-CoV found that chloroquine could inhibit coronavirus replication by reducing terminal glycosylation of ACE2 receptors on the cell surface and interfering with viral binding to angiotensin converting enzyme 2 receptors.⁴ Because the SARS-CoV-2 gene sequence has high homology with SARS-CoV⁵, especially its similarity to the spike glycoprotein bound by the cell surface ACE2 receptor⁶, the researchers used chloroquine to treat SARS-CoV-2 infected Vero E6 cells according

to the mechanism and confirmed that it had a clear inhibitory effect on SARS-CoV-2 in vitro.¹

In ophthalmic clinical work, the retinal toxicity of CQ and HCQ is a common cause of drug-induced retinopathy, and its exact mechanism still remains unclear. The incidence of retinal maculopathy induced by CQ has been reported to be about 10% - 25%⁷, and the incidence of retinopathy after more than 5 years of HCQ use is about 7.5%.⁸

Although HCQ is safer than CQ, both drugs can cause irreversible retinal damage, and their retinal toxicity mainly damages photoreceptor cells, mainly in the form of degeneration of the outer nuclear layer of the retina in the early stage, and patients are usually asymptomatic, but show abnormalities in fundus examination or diagnostic tests⁹ and damage to the retinal pigment epithelium occurs in the late stage.¹⁰ If damage is found before RPE damage occurs and the drug is discontinued in a timely manner, central visual acuity can be preserved¹¹, and if found late, it can lead to irreversible visual loss, and there is no effective treatment.¹² Therefore, in the treatment of COVID-19 patients with CQ and HCQ, it is necessary to guard against the risk of drug-induced retinopathy, and it is recommended to perform relevant ophthalmic screening in a proper way to maintain the incidence of drug toxicity at a low level and make the drug application safer and more reliable.



© Mohit Bharti. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY-NC 4.0, which permits unrestricted use, distribution and reproduction in any medium, provided the use is not commercial and the original author(s) and source are cited.

The mechanism by which CQ and HCQ produce retinal toxicity is still unclear, and current studies mostly focus on their effects on retinal cell metabolism and function. Evaluation of rhesus monkey eye tissues chronically administered CQ showed that CQ was widely bound in pigmented ocular tissues (RPE, iris, choroid, and ciliary body) and eventually accumulated in the retina, which may represent one of the causes for retinal toxicity.¹³ The study of RPE cells treated with CQ and HCQ found that both CQ and HCQ inhibited the uptake of organic anion-transporting polypeptide 1A2 and inhibited the cyclic absorption of all-trans retinol in RPE cells, suggesting that they might have an effect on the visual cycle.¹⁴

It has been suggested in previous studies that melanin in RPE may concentrate HCQ and enhance its toxicity, but melanin also has a role in helping RPE cells to remove intrinsic toxic substances.^{15,16} An in vitro study has also found that CQ and HCQ can increase the permeability of RPE cells and may also exert some effects on the function of RPE cells.¹⁷ A recent study found that the toxicity of CQ on RPE cells might be related to the downregulation of p150 glued protein expression, which in turn inhibited the proliferation and microtubule nucleation of RPE cells.¹⁸

Other scholars have proposed that HCQ-induced retinal degeneration occurs in the retinal photoreceptor cell layer; since HCQ can affect the pH and function of lysosomes, it may affect the autophagic function of RPE, which in turn affects the stability of photoreceptor cell membranes and ultimately produces retinal toxicity.¹⁰⁻¹⁹ In a study of optic ganglion cells exposed to CQ, it was found that the retinal toxicity of CQ might affect visual conduction by changing the dynamics of acid sensing ion channel 1a in RGCs.²⁰ These studies, however, focus on the acute effects of drugs on retinal cells and do not fully reveal the exact mechanism of chronic retinal toxicity in clinical patients.

Dosage is the most important risk factor for retinal toxicity caused by CQ and HCQ. The safe dose of CQ and HCQ recommended by the American Academy of Ophthalmology in 2016 Recommendations on Screening for Chloroquine (CQ) and Hydroxychloroquine (HCQ)

Retinopathy is 2.3 mg/kg and 5 mg/kg daily, respectively, and it is pointed out that attention should still be paid to adjusting the dose for patients with short stature and low body mass.²¹

A previous study has found that the application of a dose > 5.0 mg/kg significantly increases the risk of retinopathy, especially the use of extremely high doses.⁸ Recent studies have revealed that the incidence of retinopathy within 1 to 2 years can be 25% to 40% in patients treated with HCQ at 800 - 1000 mg (approximately 20 mg/kg) daily.²²⁻²³ In contrast, the incidence of retinopathy within 5 years was less than 1% in case of HCQ treatment at low doses of 4.0 - 5.0 mg/kg.⁸ Therefore, the use of CQ or HCQ in the treatment of COVID-19 should be controlled as far as possible within the safe dose range. At present, in the clinical studies registered in China for the treatment of COVID-19, the recommended dosage of chloroquine phosphate is 0.5 ~ 1g oral daily.²⁴ The duration of medication is inseparable from the dose of medication and is also a risk factor for retinal toxicity caused by CQ and HCQ. Patients with retinopathy caused by CQ and HCQ mostly have a long history of medication, but acute toxic retinopathy caused by high-dose chloroquine requires increased vigilance. Because CQ and HCQ are slowly excreted from the human body and carry some risks after long-term use even at the recommended dose, a previous study has pointed out that the cumulative dose of the drug may be associated with the occurrence of retinopathy.²⁵ Therefore, it is recommended that, for patients who use CQ and HCQ for a long time, their the previous medication history after starting treatment with CQ or HCQ should be carefully reviewed and attention should be paid to the presence or absence of visual impairment during their medication, and the patients should cooperate with timely screening.

CQ and HCQ are mainly eliminated via the kidneys, and a study has found that patients with renal diseases are at higher risk of drug toxicity.²⁶ The liver is also involved in the metabolism of CQ and HCQ, but there is no clear evidence of an association between liver disease and retinal toxicity. Since critically ill patients with COVID-19 often present with systemic multiple organ failure²⁷, and unpredictable levels in blood may occur with impaired liver and kidney function, so the dose used and the frequency of ophthalmic

screening are recommended to be adjusted moderately according to the patient's plasma concentration. The patients with retinal or macular disease may be at a higher risk for retinopathy, and it is clinically recommended that the drugs with retinal toxicity should not be used if patients have the underlying diseases of retinal dystrophy or severe degeneration. At the same time, patients with retinal or macular diseases may lead to abnormal testing results, which may interfere with ophthalmic screening during medication. Therefore, caution should be exercised for the use of CQ and HCQ in patients with underlying eye diseases.²¹

It is recommended to perform proper baseline examination to rule out retinal or macular diseases and learn the basic conditions of the patient's retina. Clinically, it is believed that elderly patients may be at risk of retinopathy due to their weak resistance to drug toxicity and slow rate of drug metabolism. However, recent demographic studies have found no definitive link between age and the risk of ocular toxicity with drugs.⁸ It has been shown that some patients with ABCA4 gene abnormalities have genetic predisposition to HCQ retinal toxicity.²⁸ A new study has suggested that some non-pathogenic polymorphic ABCA4, such as small alleles of common genetic variants in ABCA4, may instead have a protective effect.²⁹ Genetic polymorphisms in cytochrome P450 may also affect plasma concentrations as well as the ocular toxicity of drugs.³⁰

Early patients with retinopathy caused by CQ and HCQ usually present with normal vision or even without any visual symptoms, and only a few patients may present with paracentral scotomas and fine punctate pigment spots in the macular area during reading. If exposure to drugs is continued, the dysfunctional area expands, RPE is involved, characteristic bullseye maculopathy may occur in the fundus, visual acuity decreases, and late lesions invade the fovea, resulting in loss of visual acuity; in addition, macular cystic edema may also occur, with extensive RPE and retinal atrophy.³¹⁻³² Its bullseye like typical manifestations occur due to RPE depigmentation in a circle of the macular central fovea. European patients mostly present with typical parafoveal photoreceptor layer injury³³, while Asian patients often present with injury near the vascular arch at the parafoveal margin.³⁴ Some auxiliary examinations show

abnormal results, such as multifocal electroretinography showing diminished perifoveal response and enhanced fundus autofluorescence, spectral-domain optical coherence tomography showing parafoveal thinning and destruction of the hierarchy of the external membrane and ellipsoid band, while the structure just below the fovea being relatively intact, presenting a flying saucer sign.³⁵ Visual field detection results are characterized by bilateral reproducible persistent paracentral or central visual field blind spots under stimulation on the white light threshold and may also have other visual field abnormalities.³⁶ If retinopathy occurs relatively slowly after medication, retinopathy should be closely monitored. If it is not enough to affect vision, it is unnecessary to discontinue the drug. Once retinal toxicity is significantly aggravated, the risk of continuing medication should be discussed with an ophthalmologist. In addition, the use of CQ and HCQ may cause vortex keratopathy or whorl keratopathy, but it is mostly reversible after discontinuation of the drug and there is no direct evidence related to the severity of retinopathy.^{37,38}

Retinal damage caused by HCQ and CQ is often irreversible, and screening, although not reducing drug-induced retinal damage, can detect retinal toxicity before vision is significantly affected, so as to guide medication. HCQ and CQ are potentially effective drugs for the treatment of COVID-19, and screening should be regarded as a means of preventing severe retinal damage to support the safe application of HCQ or CQ in patients and detect the potential risk of retinal damage at an early stage. If a patient has retinopathy, such as maculopathy, glaucoma, and so on, the drug should be used with caution, or the lower dose should be maintained. If there are signs of retinal damage during treatment, ophthalmic examinations should be repeated to verify the examination results. If it is determined that the damage occurs, the dose should be adjusted according to the patient's actual conditions to control the progression of damage. For screening retinopathy due to early HCQ and CQ, visual field testing has good sensitivity, but reliability cannot be guaranteed due to the presence of subjective factors in patients. Some objective tests show a good sensitivity for early lesions, such as mfERG, SD-OCT and FAF. Therefore, it is recommended to combine with objective examination at the

same time of visual field testing to produce reliable screening results.

Under the condition of excluding patient's subjective factors, perimetry is a more sensitive method to detect the retinal condition of patients. For the screening of retinopathy caused by HCQ and CQ, foreign studies mostly recommend the use of the standard procedure of 10-2 visual fields with a white target, and it is believed that the test results have a good sensitivity.²¹ At the same time, the subjectivity of perimetry cannot be neglected, and the results of perimetry are not enough to be used as a confirmation of retinal damage, and repeated testing should be performed in combination with other objective test results. With the development of injuries caused by CQ and HCQ, SD-OCT examination can find damage to the parafoveal photoreceptor cell layer in European patients, while damage near the extrafoveal vascular arch is more common in Asian patients. Due to the different location of retinopathy in Asian patients compared to European patients, it is particularly important to perform wide-angle scanning or direct scanning of the vascular arch region in Asian patients. SD-OCT examination in patients with advanced retinopathy caused by HCQ may present with a typical flying saucer sign, that is, a relatively normal foveal retina, thinning of the outer retina of the parafovea, destruction of structures such as the external membrane and ellipsoid zone, resembling a flying saucer shape.³⁵

SD-OCT may not be as sensitive as visual field testing and mfERG, but when local retinal thinning occurs, it is basically certain that retinal damage has been caused. mfERG can objectively record early lesions in the para-retinal fovea and extramacular regions by electrophysiological means, with a sensitivity close to that of perimetry, which can provide objective evidence for patients with abnormal perimetry.³⁹ Studies have found that mfERG signal may be weakened after HCQ administration⁴⁰, and mfERG signal may be recovered to some extent after drug discontinuation and has a negative correlation with drug accumulation⁴¹, suggesting that mfERG can be used as a reference index for drug dose adjustment. However, due to the low application rate of mfERG, there are limited physicians who

can skillfully complete the examination procedure, which limits the application of this method to some extent. FAF is of high value for the examination of posterior fundus injury and is most sensitive for the examination of RPE damage, which may detect early injury in macular foveal or extramacular photoreceptor before SD-OCT shows retinal thinning.⁴² When the damage reaches a late stage, RPE loss is manifested as a dark area with reduced autofluorescence. Wide-angle image mode should be used for Chinese patients when CQ and HCQ retinal toxicity is confirmed by FAF testing. When ophthalmoscopy can detect visible changes in the fundus, retinopathy often has reached an advanced stage of irreversible damage, and retinopathy can be detected earlier by other techniques.⁴³

At the same time, ophthalmoscopy performed at a close doctor-patient distance will increase the risk of exposure of ophthalmologists, so ophthalmoscopy is not recommended. Tests such as time-domain optical coherence tomography, fundus fluorescein angiography, full-field electroretinography, Amsler chart, color vision test, and electrooculography are not recommended screening methods due to insufficient sensitivity.^{23,44} It is worth mentioning that although full-field electroretinography cannot detect early retinopathy, it may be helpful in judging damage other than the macula.⁴⁵

There is no specific treatment for retinopathy caused by CQ and HCQ, so early preventive screening appears to be more important. Early macular changes may be reversible after discontinuation of the drug and damages caused at the advanced stage are irreversible. For most patients, retinopathy may tend to be stable after drug discontinuation, but some patients still have the possibility of progression of lesions after drug discontinuation, which may be related to slower metabolism of HQ.²⁷ Once the occurrence of retinopathy is confirmed, clinicians should consider prompt discontinuation of medication and inform patients of the risk of further visual impairment based on the severity of retinopathy. It is generally recommended that patients with retinopathy caused by CQ and HCQ avoid excessive exposure to sunlight and ingest sufficient lutein and zeaxanthin to protect

photoreceptor cells in the fovea; however, the practical value of these recommendations is unclear due to the lack of clinical evidence.²¹

CONCLUSION

Chloroquine and hydroxychloroquine have definite inhibitory effects on SARS-CoV-2, and they are recommended for the treatment of COVID-19. Retinal damage caused by it occurs mostly after long-term medication; however, due to different physical constitutions in different patients, there are also some differences in tolerance to the drug, short-term application of high-dose drugs can significantly increase the risk of retinal damage. Therefore, in the treatment of COVID-19 with CQ and HCQ, it is important to recognize the characteristics of retinopathy caused by such drugs, pay attention to adjusting the dose according to the actual conditions of patients, use necessary ophthalmic screening for patients at higher risk, and use relative caution in patients with retinal or macular diseases. The application of risk screening methods can help detect early retinal damage and guide clinical adjustment of medication dose. For patients with retinopathy, if necessary, the drug should be discontinued and switched to other therapeutic drugs. At present, CQ and HCQ have achieved promising therapeutic effects in the treatment of COVID-19. The proportion and severity of toxic retinopathy during the treatment remain to be further studied. Before the exact research results are obtained, we still need to exercise caution during the application of CQ and HCQ.

REFERENCES

1. Wang M, Cao R, Zhang L et al. Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) in vitro. *Cell Res.* 2020;30(3):269-71.
2. Jorge A, Ung C, Young LH et al. Hydroxychloroquine retinopathy-implications of research advances for rheumatology care. *Nat Rev Rheumatol* 2018;14(12):693-703.
3. Carlos WG, Dela Cruz CZ, Cao B et al. Novel Wuhan (2019-nCoV) Coronavirus. *Am J Respiratory Crit Med.* 2020;201(4): 7-8.
4. Lan J, Ge J, Yu J et al. Structure of the SARS-CoV-2 spike receptor binding domain bound to the ACE2 receptor. *Nature* 2020;581(7807):215-20.
5. Zhou P, Yang XL, Wang XG, et al. A pneumonia outbreak associated with new coronavirus of probable bat origin. *Nature* 2020; 579(7798):270-3.
6. Xu X, Chen P, Wang, J et al. Evolution of the novel coronavirus from the ongoing Wuhan outbreak and modelling of its spike protein for risk of human transmission. *Sci China Life Sci.* 2020;63(3):457-60.
7. Finbloom DS, Silver K, Newsome DA, et al. Comparison of hydroxychloroquine and chloroquine use and the development of retinal toxicity. *J Rheumatol.* 1985;12(4):692-4.
8. Melles RB, Marmor MF. The risk of toxic retinopathy in patients on long term hydroxychloroquine therapy. *JAMA Ophthalmol.* 2014;132(12):1453-60.
9. Nika M, Blachley TS, Edwards P et al. Regular examinations for toxic maculopathy in long term chloroquine or hydroxychloroquine users. *JAMA Ophthalmol.* 2014; 132(10):1199-208.
10. Marmor MF. Comparison of screening procedure in hydroxychloroquine toxicity. *Arch Ophthalmol.* 2012;130(4):461-9.
11. Marmor MF, Hu J. Effect of disease stage on progression of hydroxychloroquine retinopathy. *JAMA Ophthalmol.* 2014;132(9):1105-12.
12. Marmor MF, Melles RB. Hydroxychloroquine and the retina. *JAMA Ophthalmol.* 2015;133(8):847-8.
13. Rosenthal AR, Kolb H, Bergsma D, et al. Chloroquine retinopathy in the rhesus monkey. *Invest Ophthalmol Vis Sci.* 1978;17(12):1158-75.
14. Xu C, Zhu L, Chan T, et al. Chloroquine and hydroxychloroquine are novel inhibitors of human organic anion transporting polypeptide 1A2. *J Pharm Sci.* 2016;105(2):884-90.
15. Lee MG, Kim SJ, Ham DI, et al. Macular retinal ganglion cell inner plexiform layer thickness in patients on hydroxychloroquine therapy. *Invest Ophthalmol Vis Sci.* 2014;56(1): 396-402.
16. deSisterness L, Hu J, Rubin DL, et al. Localization of damage in progressive hydroxychloroquine retinopathy on and off the drug: inner versus outer retina, parafovea versus peripheral fovea. *Invest Ophthalmol Vis Sci.* 2015; 56(5):3415-26.
17. Korthagen NM, Bastiaans J, vanMeurs JC, et al. Chloroquine and hydroxychloroquine increase retinal pigment epithelial layer permeability. *J Biochem Mol Toxicol.* 2015;29(7):299-304.

18. Chen TY, Lien WC, Cheng HL, Kuan TS, Sheu SY, Wang CY. Chloroquine inhibits human retina pigmented epithelial cell growth and microtubule nucleation by downregulating p150glued. *J Cell Physiol.* 2019;234(7):10445-7. <https://doi.org/10.1002/jcp.27712>.
19. Yusuf IH, Sharma S, Luqmani R, Downes SM. Hydroxychloroquine retinopathy. *Eye (Lond).* 2017;31(6):828-45. <https://doi.org/10.1038/eye.2016.298>.
20. Li X, Fei J, Lei Z, et al. Chloroquine impairs visual transduction via modulation of acid sensing ion channel 1a. *Toxicol Lett.* 2014;228(3):200-6.
21. Marmor MF, Kellner U, Lai TY, Melles RB, Mieler WF. American Academy of Ophthalmology. Recommendations on Screening for Chloroquine and Hydroxychloroquine Retinopathy (2016 Revision). *Ophthalmology.* 2016;123(6):1386-94.
22. Leung LS, Neal JW, Wakelee HA, Sequist LV, Marmor MF. Rapid Onset of Retinal Toxicity From High-Dose Hydroxychloroquine Given for Cancer Therapy. *Am J Ophthalmol.* 2015;160(4):799-805.e1. <https://doi.org/10.1016/j.ajo.2015.07.012>.
23. Navajas EV, Krema H, Hammoudi DS, Lipton JH, Simpson ER, Boyd S, Easterbrook M. Retinal toxicity of high-dose hydroxychloroquine in patients with chronic graft-versus-host disease. *Can J Ophthalmol.* 2015;50(6):442-50.
24. Gao J, Tian Z, Yang X. Breakthrough: Chloroquine phosphate has shown apparent efficacy in treatment of COVID-19 associated pneumonia in clinical studies. *Biosci Trends.* 2020;14(1):72-73.
25. Marmor MF, Kellner U, Lai TY, Lyons JS, Mieler WF. American Academy of Ophthalmology. Revised recommendations on screening for chloroquine and hydroxychloroquine retinopathy. *Ophthalmology.* 2011;118(2):415-22.
26. Chiang E, Jampol LM, Fawzi AA. Retinal toxicity found in a patient with systemic lupus erythematosus prior to 5 years of treatment with hydroxychloroquine. *Rheumatology (Oxford).* 2014;53(11):2001. <https://doi.org/10.1093/rheumatology/keu317>.
27. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet.* 2020;395(10223):507-13.
28. Shroyer NF, Lewis RA, Lupski JR. Analysis of the ABCR (ABCA4) gene in 4-aminoquinoline retinopathy: is retinal toxicity by chloroquine and hydroxychloroquine related to Stargardt disease? *Am J Ophthalmol.* 2001;131(6):761-6.
29. Grassmann F, Bergholz R, Mändl J, Jägle H, Ruether K, Weber BH. Common synonymous variants in ABCA4 are protective for chloroquine induced maculopathy (toxic maculopathy). *BMC Ophthalmol.* 2015;15:18.
30. Lee JY, Vinayagamoorthy N, Han K, Kwok SK, Ju JH, Park KS, et al. Association of Polymorphisms of Cytochrome P450 2D6 With Blood Hydroxychloroquine Levels in Patients With Systemic Lupus Erythematosus. *Arthritis Rheumatol.* 2016;68(1):184-90.
31. Modi YS, Singh RP. Bull's-Eye Maculopathy Associated with Hydroxychloroquine. *N Engl J Med.* 2019;380(17):1656.
32. Kellner S, Weinitz S, Farmand G, Kellner U. Cystoid macular oedema and epiretinal membrane formation during progression of chloroquine retinopathy after drug cessation. *Br J Ophthalmol.* 2014;98(2):200-6.
33. Melles RB, Marmor MF. Pericentral retinopathy and racial differences in hydroxychloroquine toxicity. *Ophthalmology.* 2015;122(1):110-6.
34. Lee DH, Melles RB, Joe SG, Lee JY, Kim JG, Lee CK, Yoo B, Koo BS, Kim JT, Marmor MF, Yoon YH. Pericentral hydroxychloroquine retinopathy in Korean patients. *Ophthalmology.* 2015;122(6):1252-6.
35. Chen E, Brown DM, Benz MS, Fish RH, Wong TP, Kim RY, et al. Spectral domain optical coherence tomography as an effective screening test for hydroxychloroquine retinopathy (the "flying saucer" sign). *Clin Ophthalmol.* 2010;4:1151-8.
36. Easterbrook M. An ophthalmological view on the efficacy and safety of chloroquine versus hydroxychloroquine. *J Rheumatol.* 1999;26(9):1866-8.
37. Paim-Marques L, Carneiro P, Verçosa IC, Appenzeller S. Corneal vortex keratopathy in childhood-onset systemic lupus erythematosus (c-SLE). *Clin Rheumatol.* 2019;38(10):2851-5.
38. Lacava AC. Ocular complications of chloroquine and derivatives therapy. *Arq Bras Oftalmol.* 2010;73(4):384-9.
39. Lai TY, Ngai JW, Chan WM, Lam DS. Visual field and multifocal electroretinography and their correlations in patients on hydroxychloroquine therapy. *Doc Ophthalmol.* 2006 May;112(3):177-87.
40. Maturi RK, Yu M, Weleber RG. Multifocal electroretinographic evaluation of long-term

hydroxychloroquine users. Arch Ophthalmol. 2004;122(7):973-81.

41. Lyons JS, Severns ML. Using multifocal ERG ring ratios to detect and follow Plaquenil retinal toxicity: a review : Review of mfERG ring ratios in Plaquenil toxicity. Doc Ophthalmol. 2009;118(1):29-36.

42. Kellner U, Renner AB, Tillack H. Fundus autofluorescence and mfERG for early detection of retinal alterations in patients using chloroquine/hydroxychloroquine. Invest Ophthalmol Vis Sci. 2006;47(8):3531-8.

43. Missner S, Kellner U. Comparison of different screening methods for chloroquine/hydroxychloroquine retinopathy: multifocal electroretinography, color vision, perimetry, ophthalmoscopy, and fluorescein

angiography. Graefes Arch Clin Exp Ophthalmol. 2012;250(3):319-25.

44. Eldeeb M, Chan EW, Omar A. Case Report: Hydroxychloroquine Retinopathy. Optom Vis Sci. 2018;95(6):545-9.

45. Nair AA, Marmor MF. ERG and other discriminators between advanced hydroxychloroquine retinopathy and retinitis pigmentosa. Doc Ophthalmol. 2017 Jun;134(3):175-83.

Cite this article as:

Bharti M. COVID-19 and Retinal Toxicity of Anti-Malarials. Int Healthc Res J. 2020;4(8):RV5-RV11. <https://doi.org/10.26440/IHRJ/0408.11364>

Source of support: Nil, **Conflict of interest:** None declared

AUTHOR AFFILIATION:

Masters in Pharmacy (Pharmacology), MDU, Rohtak

Address of Author:

H.No. 402
Gandhi Nagar
Rohtak-124001

Contact Author at: 30mohitbharti[at]gmail[dot]com



Dent-O-Myths Amid Young Community: A Cross-Sectional Study

VINITA MARY A. ¹, KESAVAN R. ², KEERTHANA S. ^{*3}, KIRUTHIGA G. ³, KOWSALYA M. ³, POOJA R. ³

INTRODUCTION: The word 'Myth' is derived from the Greek word "Mythos", meaning the stories passed by a group of certain population having a strong impact on seeking general and dental treatment even during illness.

AIM: The aim of this study was to access the prevalence of dental myths among the young population and to interpret their level of knowledge, awareness and perception.

MATERIALS AND METHOD: A cross-sectional questionnaire survey was conducted amongst 500 young population of age between 18-28 years between May to August 2020, COVID-19 pandemic period. A pretested validated questionnaire was formatted on Google forms and circulated in various social media platforms. The collected data was subjected to statistical analysis.

RESULTS: The mean age of the study population was 22.66±2.38 years, and 59% were females and 41% were males. About 65% (325) and 56% (280) of the study subjects believed correctly that mouthwash alone will not maintain oral health and chewing gum will not clean their teeth, respectively. When asked about their responses in case of pain in oral cavity, most people 46% (230) reported they would visit a dentist and major segment of study subjects 56% (281) believed that there can be more methods for treating oral pain other than the extraction of the tooth itself.

CONCLUSION: The result of this study revealed that the younger population are more aware and didn't believe much regarding various dental myths.

KEYWORDS: Beliefs, Population, Community

A
B
S
T
R
A
C
T

INTRODUCTION

India has a wide cultural, ethnic, geographical and religious diversity which plays an integral role in shaping the system of individual's beliefs. Culture is represented by the beliefs, values shared by the people and it has its own influence on a person's general perspective of things.¹ Unfortunately, false beliefs, i.e., myths were handed down to generations to believe and are still held in high esteems in certain population.²

The word 'Myth' was derived from the Greek word "Mythos", meaning the stories passed by a group of certain population having a strong impact on seeking general and dental treatment even during illness.³ According to Merriam Webster online dictionary, Myth is defined as a popular belief or tradition which has grown up around someone or something.² Dental myths are very common in India. Generally, one's actions are preceded by perceptions. Perception is a process, through which an individual becomes aware, conscious and can process, interpret the information regarding the situation. But this is subjective in nature and can differ from person to person based on different

factors. Thus, the same information of a particular situation can be processed differently by two different individuals.⁴ Factors that leads to the evolution of dental myths are socio-cultural factors, blind traditional beliefs, lack of basic education, lack of awareness and non-scientific knowledge.⁵

One's strong belief in myths can turn a simple problem into a chronic disease that may end upon high financial cost treatment because of the lack of knowledge to treat it at an initial stage.³ The faith on myths should be eradicated at the bud stage by providing proper education, health care awareness and through advertisements in television, social media and other media outlets etc. The aim of this study was to access the prevalence of dental myths among the present young population to interpret their level of knowledge, awareness and perception.

MATERIALS AND METHOD

A cross-sectional questionnaire survey was conducted to access the prevalence of various dental-myths



© Vinita Mary A. et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY-NC 4.0, which permits unrestricted use, distribution and reproduction in any medium, provided the use is not commercial and the original author(s) and source are cited.

believed among young population of age between 18-28 years. The study was conducted during the COVID-19 lockdown period. A pretested and validated electronic questionnaire assessing the knowledge, awareness and perception of young adults regarding prevalent dental myths was framed on online filling format using Google forms. Then the link was circulated on various social media platforms such as WhatsApp, Messenger and Instagram, with a note explaining the purpose of the study.

The questionnaire was designed in accordance with the factors believed by people traditionally, mostly with the close-ended questions and a few open-ended questions to offer the subject the opportunity to express his/her views. The study was conducted between 21st May 2020, and 7th August 2020. The participants were asked to complete and submit the responses. It took about 5-7 minutes to complete the survey. Form limiter was used to limit multiple responses from same participant and to limit the data collection up to 500 responses.

The questions were framed to access the knowledge, awareness and perception of dental myths among the young population. Data was analyzed by the t-test using SPSS version 16.0

RESULT

A descriptive cross-sectional survey was conducted to evaluate the prevalence of dental myths among the young population. The age of the study population ranged from 18-28years (Mean- 22.66; SD+2.38, Figure 1) and 295 (59%) were females and 205 (41%) were males (Figure 2).

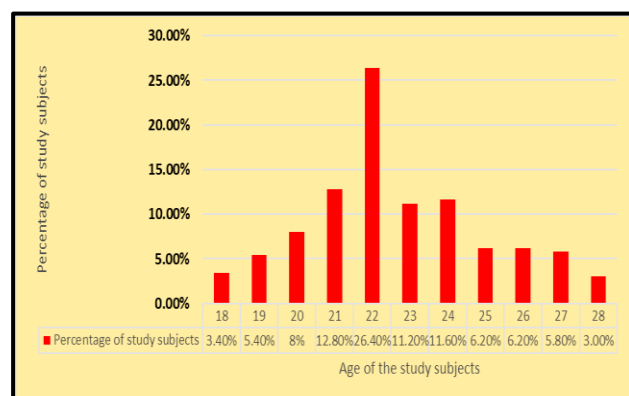


Figure 1. Distribution of study subjects according to age

When questioned about 'brushing pattern and techniques', 67% (335) considered erroneously that

bleeding while brushing was not a important sign for poor gingival health and almost 68% (343) reported that they would stop brushing if their gums started bleeding.

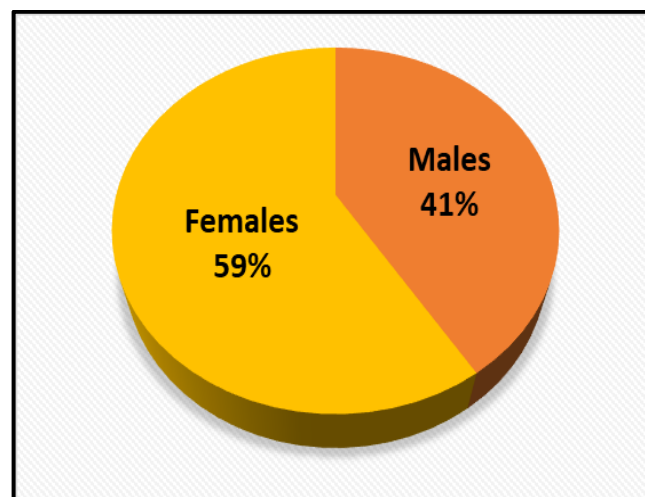


Figure 2. Distribution of study subjects according to gender

About 65% (325) and 56% (280) of the study subjects believed correctly that mouthwash alone will not maintain oral health and chewing gum will not clean their teeth, respectively. When asked about their responses in case of pain in oral cavity, most people 46% (230) reported they would visit a dentist and major segment of study subjects 56% (281) believed that there can be more methods for treating oral pain other than the extraction of the tooth itself. When questioned that

"Is it okay to have a decayed tooth if it doesn't cause any pain?", 61% (305) of the study subjects agreed that it was not okay, also 58% (292) acknowledged that teeth will not always regrow in place of the extracted decayed teeth and about 62% (314) of study subjects admitted that extraction of wisdom teeth will not lead to loss of wisdom. Additionally, most of the study subjects, 65% (326), denied the generally dispersed myths regarding the malalignment of teeth that irregularly placed tooth was fortunate. When questioned about the artificial tooth replacements, 68% (344) didn't agree with the shared myth that artificial tooth was extracted from another human. Regarding the relationship between the oral health and overall health, 59.6% (298) were in agreement.

According to the study subjects, the food items causing tooth stains ranged from tea/coffee(28%), chocolate(15%), beverages(8%), banana stem(5%), and

| QUESTION | RESPONSE | N | % |
|--|---------------------|-----|------|
| Do you think bleeding while brushing is normal? | Yes | 99 | 19.8 |
| | No | 335 | 67 |
| | May be | 66 | 13.2 |
| If your gums are bleeding, will you still brush your teeth? | Yes | 157 | 31.4 |
| | No | 343 | 68.6 |
| Do you think scaling (Tooth Cleaning) will make your teeth weak? | Yes | 116 | 23.2 |
| | No | 204 | 40.8 |
| | May be | 126 | 25.2 |
| | Don't know | 56 | 11.2 |
| Do you think cleaning with salt water or gargling makes your teeth white or shiny? | Yes | 145 | 29 |
| | No | 201 | 40.2 |
| | May be | 119 | 23.8 |
| | Don't know | 35 | 7 |
| Do you think using mouth wash alone is enough to maintain good oral health? | Yes | 137 | 27.4 |
| | No | 325 | 65 |
| | Don't know | 38 | 7.6 |
| Do you think retention of milk tooth (deciduous tooth) is normal? | Yes | 149 | 29.8 |
| | No | 225 | 45 |
| | Don't know | 126 | 25.2 |
| Do you think treating milk tooth is not necessary as they will exfoliate? | Yes | 140 | 28 |
| | No | 171 | 34.2 |
| | May be | 92 | 18.4 |
| | Don't know | 97 | 19.4 |
| Do you think placing the exfoliated upper deciduous teeth in cow-dung and lower teeth in roof top will make the permanent tooth to erupt straight? | Yes | 69 | 13.8 |
| | No | 228 | 45.6 |
| | May be | 81 | 16.2 |
| | Don't know | 122 | 24.4 |
| How do you prefer to treat a painful teeth? | Salt with hot water | 156 | 31.2 |
| | Clove oil | 87 | 17.4 |
| | Camphor | 27 | 5.4 |
| | Visit dentist | 230 | 46 |
| Do you think that any of the following will reduce pain? | Alcohol | 34 | 6.8 |
| | Tobacco | 25 | 5 |
| | Aspirin | 168 | 33.6 |
| | None of the above | 273 | 54.6 |
| Do you think dental treatments are always painful? | Yes | 120 | 24 |
| | No | 202 | 40.4 |
| | May be | 142 | 28.4 |
| | Don't know | 36 | 7.2 |
| Do you think extraction of teeth is the only way for immediate relief of pain? | Yes | 91 | 18.2 |
| | No | 281 | 56.2 |

| | | | |
|--|------------|-----|------|
| | May be | 75 | 15 |
| | Don't know | 53 | 10.6 |
| Do you think removal of upper teeth will cause loss of vision? | Yes | 56 | 11.2 |
| | No | 257 | 51.4 |
| | May be | 75 | 15 |
| | Don't know | 112 | 22.4 |
| Do you think teeth lost due to caries / mobility will lead to short sightedness? | Yes | 69 | 13.8 |
| | No | 238 | 47.6 |
| | May be | 65 | 13 |
| | Don't know | 128 | 25.6 |
| Do you think it is okay to have a decayed tooth if it doesn't cause any pain? | Yes | 84 | 16.8 |
| | No | 305 | 61 |
| | May be | 59 | 11.8 |
| | Don't know | 52 | 10.4 |
| Do you think irregularly placed tooth or gap between teeth is lucky? | Yes | 74 | 14.8 |
| | No | 326 | 65.2 |
| | May be | 53 | 10.6 |
| | Don't know | 47 | 9.4 |
| Do you think artificial teeth are natural teeth that are extracted from another human? | Yes | 57 | 11.4 |
| | No | 344 | 68.8 |
| | May be | 40 | 8 |
| | Don't know | 59 | 11.8 |
| Do you think removal of wisdom tooth will lead to loss of wisdom? | Yes | 58 | 11.6 |
| | No | 314 | 62.8 |
| | May be | 47 | 9.4 |
| | Don't know | 81 | 16.2 |
| Do you think all dental treatment during pregnancy should be avoided? | Yes | 212 | 42.4 |
| | No | 102 | 20.4 |
| | May be | 101 | 20.2 |
| | Don't know | 85 | 17 |
| Do you think oral health has relationship with rest of the body? | Yes | 298 | 59.6 |
| | No | 99 | 19.8 |
| | May be | 53 | 10.6 |
| | Don't know | 50 | 10 |
| Do you think chewing gum will clean your teeth? | Yes | 98 | 19.6 |
| | No | 280 | 56 |
| | May be | 91 | 18.2 |
| | Don't know | 31 | 6.2 |
| Do you know that there are two types of dentition in human beings? | Yes | 243 | 48.6 |
| | No | 88 | 17.6 |
| | May be | 55 | 11 |
| | Don't know | 114 | 22.8 |
| Do you think teeth will always regrow in the place of extracted decayed tooth? | Yes | 84 | 16.8 |
| | No | 292 | 58.4 |
| | May be | 69 | 13.8 |
| | Don't know | 55 | 11 |

Table 1. Responses of study subjects according to their knowledge, awareness and perception of dental myths

miscellaneous included turmeric, colouring agents, pan chewing, candy etc (table 1).

The belief in myths were compared between male and female study subjects and the findings are as follows: When questioned about whether placing the exfoliated upper deciduous teeth in cow dung and lower teeth in roof top will make the permanent tooth to erupt straight, it was observed that more number of females had answered correctly when compared to males and the difference was significant statistically ($p=0.000$). Also, greater number of females has answered correctly that tooth extraction was not the solitary manner for pain relief when compared to males, and the difference was significant statistically ($p=0.000$). Similarly, more number of females believed that removal of wisdom tooth will not lead to forfeiture of wisdom and artificial teeth were not extracted teeth from another human being when compared to males and it was significant statistically ($p=0.000$, table 2).

DISCUSSION

Twentieth century had an upright revolution in both general and oral health in history. India has a lesser economical resource to meet the over-all population's oral health treatment requirements and this crunch is accompanied by an immense disease burden and a low literacy rate.⁶ Several factors prompt to false belief on oral health care and treatment. This also compels them to learn supplementary means of dismissing pain such as home remedies rather than consulting a professional dentist.⁷ Paul Broca stated that "the least questioned assumptions are often the most questionable".⁸

Many researches and studies were conducted among various population to assess their knowledge and awareness regarding dental myths. Since most of the myths and plenty of misconception stands out more than any other when it comes to oral health.⁹ The present study aimed to assess the acquaintance and mindfulness among the youngsters on numerous dental myths and oral practices which are widespread in India.

In the present study, 40.4% preferred neem stick for brushing and in the study conducted by Saumyendra V. Singh et al.,^{10,11} 56.7% of participants preferred the use of datoon or tree twig. The short coming of the neem-stick includes gingival trauma and occlusal wear.⁹

According to the current study, only 23.2% of the subjects reported that scaling will make their teeth

feebler with gap formation, scraping /wear of enamel or mobility and it was similar with the earlier study conducted by Kiran et al.⁵ where 24.6% of their participants perceived similar misconceptions of scaling. In another study done by Harshada Ragunathan et al.¹² in an out-patient department of a dental college, reported that about 65.9% of participants responded that professional scaling caused sensitivity which they concluded was due to their lack of awareness. This was in contrast to the present study conducted among the younger population who were more aware about oral hygiene treatment procedures.

The present study displayed 28% of the subjects believed that the treatment of milk tooth was not necessary as they will exfoliate in the future. Whereas, in a study conducted by Sharma R et al.¹³ about 58.7% of their participants and in a study by Yadav P et al.¹⁴, 46% of their subjects felt that treatment of milk tooth was not necessary as they would be replaced by permanent teeth.

For a long time, placement of tobacco was thought to relieve pain and the same was believed for the analgesic effect. But when a question was asked, which of the following will reduce pain, 6.8% of the participants reported as alcohol, 5.0% reported as tobacco and 33.6% reported as aspirin and surprisingly almost 54.6% of the participants reported as none of the above will actually reduce pain. But in the study conducted by Sharma R et al.¹³ and Raina SA et al.¹⁵ showed around 49.4% of their participants believed in the analgesic action of cloves in decayed teeth. It was found that only 17.4% of the participants in the present study believed the same. The clove oil contains active ingredient eugenol, which helps to numb and reduce pain to ease tooth ache but it was not the permanent solution. Smaller proportion of the population believe that using clove as a permanent solution and did not consider dental treatment as a mandatory option for permanent relief.

In the present study 51.3% of participants asserted that loss of vision will not occur after the extraction of upper teeth whereas only 11.2% believed this myth, which is almost similar to the study done by Saravanan N et al.¹⁶, where 20% of their respondents believed in this myth. But it is very much contrast in the study conducted by Gambhir RS et al.¹⁷, where 72.8% of participants believed that extraction of upper teeth leads to vision loss. This might be because of the inappropriate local anaesthetic block which may lead

| QUESTIONS | OPTIONS | MALE | FEMALE | p-value |
|--|---------------------|------|--------|---------|
| Do you think placing the exfoliated upper deciduous teeth in cow-dung and lower teeth in roof top will make the permanent tooth to erupt straight? | Yes | 46 | 23 | 0.000 |
| | No | 78 | 150 | |
| | May be | 32 | 49 | |
| | Don't know | 49 | 73 | |
| How do you prefer to treat a painful teeth? | Salt with hot water | 80 | 76 | 0.001 |
| | Clove oil | 32 | 55 | |
| | Camphor | 16 | 11 | |
| | Visit dentist | 77 | 153 | |
| Do you think that any of the following will reduce pain? | Alcohol | 20 | 14 | 0.003 |
| | Tobacco | 17 | 8 | |
| | Aspirin | 61 | 107 | |
| | None of the above | 107 | 166 | |
| Do you think dental treatments are always painful? | Yes | 32 | 88 | 0.001 |
| | No | 84 | 118 | |
| | May be | 68 | 74 | |
| | Don't know | 21 | 15 | |
| Do you think extraction of teeth is the only way for immediate relief of pain? | Yes | 50 | 41 | 0.000 |
| | No | 91 | 190 | |
| | May be | 43 | 32 | |
| | Don't know | 21 | 32 | |
| Do you think removal of upper teeth will cause vision loss? | Yes | 36 | 20 | 0.001 |
| | No | 90 | 167 | |
| | May be | 31 | 44 | |
| | Don't know | 48 | 64 | |
| Do you think teeth lost due to caries / mobility will lead to short sightedness? | Yes | 45 | 24 | 0.000 |
| | No | 82 | 156 | |
| | May be | 24 | 41 | |
| | Don't know | 54 | 74 | |

| | | | | |
|---|------------|-----|-----|-------|
| Do you think artificial teeth are natural teeth extracted from another human? | Yes | 38 | 19 | 0.000 |
| | No | 125 | 219 | |
| | May be | 14 | 26 | |
| | Don't know | 28 | 31 | |
| Do you think removal of wisdom tooth will lead to loss of wisdom? | Yes | 37 | 21 | 0.000 |
| | No | 106 | 208 | |
| | May be | 20 | 27 | |
| | Don't know | 42 | 39 | |
| Do you think oral health has no relationship with the rest of the body? | Yes | 54 | 45 | 0.002 |
| | No | 102 | 196 | |
| | May be | 24 | 29 | |
| | Don't know | 25 | 25 | |
| Do you think chewing gum will clean your teeth? | Yes | 55 | 43 | 0.001 |
| | No | 94 | 186 | |
| | May be | 41 | 50 | |
| | Don't know | 15 | 16 | |
| Do you know that there are two types of dentition in human beings? | Yes | 77 | 166 | 0.001 |
| | No | 42 | 46 | |
| | May be | 30 | 25 | |
| | Don't know | 56 | 58 | |

Table 2. Distribution of dental myths based on gender

to minor blurring of vision until the effect of local anaesthesia wears out.

In the present study, 42.4% participants believed that dental treatments during pregnancy should be avoided. In the study conducted by Vignesh R et al.¹⁸ about 56.8% respondents consider that it was better to avoid dental treatment during pregnancy. This shows their lack of knowledge about oral health.¹⁹ Periodontal diseases in the mother may have harmful effects on the developing foetus. Pregnant women with periodontal diseases are at greater risk of having a pre-term or low birth weight babies and high levels of cariogenic bacteria in mothers can lead to increased dental caries

in the infants. Preventive oral health care facilities should be provided during pregnancy.²⁰

Dental procedures such as diagnostic radiography, periodontal treatments, restorations and extractions are safe and are best performed during the second trimester.²¹ If examination indicates a need for scaling and root planing or other periodontal treatments, the procedures can be scheduled early in the second trimester.²⁰ Because periodontitis has been associated with several poor pregnancy outcomes, although the mechanism remains unclear and the controversy exists. The most common oral disease during pregnancy is gingivitis, as it is aggravated by fluctuations of

oestrogen and progesterone with changes in oral flora and decreased immune response.²¹ The misconceptions of dental treatments during pregnancy can be overthrown by educating them with proper brushing techniques, flossing and clear communication regarding prevention, treatment and outcomes.

In this study, participants responded that tea, coffee, pan chewing, colouring agents and candies can stain teeth whereas in the study conducted by Priyanka S et al.²² declared that cut brinjals could also stain teeth.

In the present study, 56.2% of the participants denied that extraction was the only treatment to get rid of agony and around 46.0% preferred to visit a dentist for treating a painful tooth while around 49.5% of participants in the study conducted by Mythri H in rural population of Lucknow district believed extraction of teeth was healthier than saving it.²³ This suggests that the present population had more awareness which might be due to the ease in access to the internet and ease of approach to the private dental care.

On the whole for the most part, it was pleasure to perceive that present young population did not agree to believe much in myths but still smaller proportion of populations did have faith in myths as 14.8% participants believed that irregularly placed tooth or gap between tooth was lucky while 64.4% of study population of Emerald SSN et al.²⁴ believed that it was lucky. Because of the influence of models and social media about the regularly arranged tooth, younger population desires not to have crooked tooth since it may forbid their level of confidence and charm.

Myths and folklore tales seem like too far, apart from this fast-paced, metropolitan age that we live in. The younger population have access and able to update their knowledge with the availability of technology. Internet is a boon through which one can acquire and recognize how to utilise the cutting-edge technological tools that aids them to clear their misgivings and keeping them updated about information data and news.

Limitation of The Study: The study was conducted only among the younger population of age 18-28. The prevalence of myths might be much greater in the higher age groups.

CONCLUSION

The questions in the present study were unique and consisted of common myths prevailing in India. The results of this study conclude that the younger population have better knowledge and do not believe in tittle-tattle and desire to be told about others logic than look it up for self. Finest resources to encounter myths is to base out propositions on the best accessible evidence. Evidence based dentistry progress the evidence meritoriously in dental practices. Decrypting the myths by accompanying targeted scientific programmes by the dental health care professionals, non-government and government health organisations to prevent many dental problems and to provide successful treatment. Measures to achieve equal utilisation of dental services and curbing of dental myths at grass root level can be achieved through introducing the basics of oral hygiene as a part of primary education.

Acknowledgement: We like to thank all the participants in the study for their cooperation.

REFERENCES

1. Joshi S, Garg S, Dhindsa A, Jain N, Singh S. Prevalent Dental Myths and Practices in Indian Population- A Systematic Review. *Int Healthc Res J*. 2020;3(10):316-26. <https://doi.org/10.26440/IHRJ/0310.01314>
2. Heglund SP. Dental myths: a deterrent to dental care seeking behaviors in developing countries. *Med Case Rep Rev*. 2018 1. <https://doi.org/10.15761/MCRR.1000115>
3. Renu M, Sabhya J, Shameen H, Sindhu P, Vaishnavi D, Anjana AP, et al. Prevalence of Dental Myths And Misconceptions among the Rural Population of Mangaluru City: A Cross Sectional Study. *Austin J Dent*. 2018;5(6):1120. <https://doi.org/10.26420/austinjdent.2018.1120>
4. Tewari D, Nagesh L, Kumar M. Myths Related to Dentistry in the Rural Population of Bareilly District: A Cross-Sectional Survey. *J Dent Sci Oral Rehab* 2014;5(2):58-64. <https://doi.org/10.5005/jp-journals-10039-1014>
5. Kiran GB, Pachava S, Sanikommu S, Simha BV, Srinivas R, Rao VN. Evaluation of dent-o-myths among adult population Living in a rural region of Andhra Pradesh, India: A cross-sectional study. *J NTR Univ Health Sci* 2016;5:130-6. <https://doi.org/10.4103/2277-8632.185451>

6. Kinra M, Sharma A, Tiwari A, Todkar, M, Dubey, M. Dental Myth, Fallacies and Misconceptions in Rural Population of Bhopal City: A Cross-sectional Study. *Asian Journal of Dental Sciences* 2019;1(1):1-7
7. Khan SA, Dawani N, Bilal S. Perceptions and myths regarding oral health care amongst strata of low socio economic community in Karachi, Pakistan. *J Pak Med Assoc.* 2012 Nov;62(11):198-203.
8. Kumar S, Mythri H, Kashinath KR. Clinical perspective of myths about oral Health; a hospital based survey. *Univ J Pharm.* 2014;3:35-7.
9. Brown LJ, Meskin LH. Sociodemographic differences in tooth loss patterns in U.S. employed adults and seniors, 1985-86. *Gerodontology* 1988;4:345-62.
10. Singh SV, Akbar Z, Tripathi A, Chandra S, Tripathi A. Dental myths, oral hygiene methods and nicotine habits in an ageing rural population: An Indian study. *Indian J Dent Res* 2013;24:242-4.
11. Singh SV, Tripathi A, Akbar Z, Chandra S, Tripathi A. Prevalence of dental myths, oral hygiene methods and tobacco habits in an ageing North Indian rural population. *Gerodontology.* 2012;29(2):e53-6. <https://doi.org/10.1111/j.1741-2358.2010.00395.x>.
12. Ragunathan H, Sarumathi T, Aswath N. Myths and dentistry. *Drug Invention Today* 2029;13(7):1089-92.
13. Sharma R, Mallaiah P, Margabandhu S, Umashankar GK, Verma S. Dental Myth, Fallacies and Misconceptions and its Association with Socio-Dental Impact Locus of Control Scale. *Int J Prevent Public Health Sci* 2015;1(2):14-20. <https://doi.org/10.17354/ijpphs/2015/11>
14. Yadav P, Shavi GR, Agarwal M, Choudhary P, Singh D. Myths and Misconceptions about dentistry. A cross-sectional study. *Arch of dent and Med res.* 2015; 1: 14-18
15. Raina SA, Jain PS, Warhadpande MM. Myths and taboos in dentistry. *International Journal of Research in Medical Sciences.* 2017; 5: 1936-1942. DOI: <http://doi.org/10.18203/2320-6012.ijrms20171821>.
16. Saravanan N, Thirineervannan R. Assessment of dental myths among dental patients in Salem city. *JIPHD* 2011;8(suppl 1):359-63.
17. Gambhir RS, Nirola A, Anand S, Gupta T. Myths regarding oral health among patients visiting a dental school in North India: A cross-sectional survey. *Int J Oral Health Sci.* 2015;5:9-14.
18. Vignesh R, Priyadarshni I. Assessment of the prevalence of myths regarding oral health among general population in Maduravoyal, Chennai. *J Educ Ethics Dent.* 2012;2:85-91.
19. John JR, Daniel B, Paneerselvam D, Rajendran G. Prevalence of Dental Caries, Oral Hygiene Knowledge, Status, and Practices among Visually Impaired Individuals in Chennai, Tamil Nadu. *International Journal of Dentistry* 2017;9419648. <https://doi.org/10.1155/2017/9419648>
20. Task Force on Periodontal Treatment of Pregnant Women, American Academy of Periodontology. American Academy of Periodontology statement regarding periodontal management of the pregnant patient. *J Periodontol.* 2004;75(3):495.
21. Silk H, Douglass AB, Douglass JM, Silk L. Oral health during pregnancy. *Aam Fam Physician* 2008;77:1139-45.
22. Priyanka S, Leelavathi L. Myths related to dentistry – An Overview. *Drug Invention Today* 2018;10(4):3508-11.
23. Mythri Kumar RS. Perceived myths about oral health in India. *Indian J Dent Res.* 2015; 26: 333. <https://doi.org/10.4103/0970-9290.162882>
24. Emerald SSN, Reddy CSV, Rao SN. Dental Health Myths and Misconceptions among Yanadi Tribe of Gonepalli Village, Nellore District, India: A Cross-Sectional Study. *International Journal of Humanities and Social Science Invention* 2016; 5(12):9-15.

Cite this article as:

Mary VA, Kesavan R, Keerthana S, Kiruthiga G, Kowsalya M, Pooja R. Dent-O-Myths Amid Young Community: A Cross-Sectional Study. *Int Healthc Res J.* 2020;4(8):OR1-OR9. <https://doi.org/10.26440/IHRJ/0408.11367>

AUTHOR AFFILIATIONS: (*Corresponding Author)

1. Professor and Head (ORCID ID: <https://orcid.org/0000-0003-1385-7647>)
2. Professor
3. Junior Resident

Department of Public Health Dentistry, Thai Moogambigai Dental College and Hospital, Chennai, Tamil Nadu, India

Source of support: Nil, **Conflict of interest:** None declared

Contact Corresponding Author at: [skeert.97\[at\]gmail\[dot\]com](mailto:skeert.97[at]gmail[dot]com)



Lockdown and Insomnia among Undergraduate Healthcare Students: A Cross-Sectional Study

RAMESH SHARMA¹, ANUPAM MISHRA², PRIYANKA CHATTERJEE³, ASEEM BHASKER^{3*}

INTRODUCTION: Insomnia is a risk factor for various physical and mental disorders as well can affect the academic performance of a student(s).

AIM: To assess the prevalence of insomnia among university going students (medical, dental and nursing streams) in the South Asian continent during the lockdown due to the COVID-19 pandemic

MATERIALS AND METHOD: The present study was conducted amongst 743 medical, dental and nursing undergraduate students residing in South Asia using convenience sampling. Data was collected using a pre-tested and pre-validated questionnaire [the Athens Insomnia Scale (AIS)] using google forms and had a total of 8 questions (score range 0-3) . Final scores (the individual AIS score) were obtained by adding the scores for each question (range 0 -24). The higher the score was, the worse was the sleep quality; students with score of ≥ 6 were considered insomniac. Data Analysis was done using SPSS version 21.012 by using the independent samples t-test, and multiple logistic regression.

RESULTS: A total of 921 entries were recorded, out of which 743 were complete and hence, were included in the study (response rate: 80.7%). Insomnia was reported in 421 (56.7%) students, out of which, the highest was seen among dental (62.7%), followed by medical (59.8%) and nursing (45.3%) undergraduates. The highest range of AIS was observed among females (6-22) and dental students (6-21). Gender differences revealed a significant association among females in both range obtained (t-test) ($p=0.03$) as well as the multiple linear regression analyzing insomnia in relation to gender ($p=0.03$).

CONCLUSION: There is a need to regularly assess insomnia among students and to take preventive measures incase of high prevalence is found among them, especially while pursuing academics online and from their homes due to the pandemic.

KEYWORDS: Insomnia, Sleep Deprivation, Stress

INTRODUCTION

Insomnia, a serious public health issue is a risk factor associated with various physical and mental disorders.¹ It is classified as a disease characterized by difficulty falling and/or remaining asleep, can be accompanied with early morning awakening, daytime impairment, and/or non-restorative sleep, and may be associated with a variety of psychiatric conditions (especially depression and anxiety).^{2,3}

In the Asian subcontinent, a study among Chinese adolescents was reported to be 16.9% with factors associated with insomnia being age, lack of physical exercise/poor physical health, self-selected diet, longer distance from home to school, and life stresses.⁴ Another cross-sectional study from a sample drawn from the general population of England, Wales, and Scotland, revealed that 37% of them had insomnia.⁵

Researchers have documented that insomnia is a common problem in young adults, including university students and its prevalence

varies as per geographic location.^{6,7} This can have detrimental effects on daytime activities, including studying, weakened physical, mental functions and lowered work productivity. It can also lead to anxiety and depression among students.^{2,8} It has been observed that the Grade Point Average (GPA) of a student is significantly associated with the duration of sleep; and insomnia decreases the ability to perform basic academic activities such as solving mathematical problems among students.⁹

As already the university student was under immense stress, the COVID-19 pandemic has wreaked havoc in their lives, especially international students who have been forced to remain in their native country due to travel bans/imposition. While teaching shifted to the online medium from the classroom method, many students/parents lost their jobs (part-time/full time), students experienced laggy internet speeds, and it might have been a possibility that they were attending their classes using outdated laptops/PCs (A sudden



© Ramesh Sharma et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY-NC 4.0, which permits unrestricted use, distribution and reproduction in any medium, provided the use is not commercial and the original author(s) and source are cited.

lockdown might not have given students the change to upgrade their equipment). This was in addition to the need to meet the deadlines of their assignments/projects. Hence, the aim of this study was to assess the prevalence of insomnia among university going students (medical, dental and nursing streams) in the South Asian Continent during the lockdown due to the COVID-19 pandemic.

MATERIALS AND METHOD

The present study was conducted amongst medical, dental and nursing undergraduate students residing in South Asia using convenience sampling from 01st June 2020 to 31st August, 2020 after obtaining all necessary approvals (including ethical clearance) prior to start of the study.

Data was collected using a pre-tested and pre-validated questionnaire [the Athens Insomnia Scale (AIS), Soldatos et al (2000)]¹⁰ using google forms, which is an 8-item questionnaire with each consisting of 4 parameters showing insomnia severity from none to very severe levels (0-3). Scores from each question are added to get the individual AIS score (range 0 -24). The higher the score was, the worse was the sleep quality. As per the scale, students with score of ≥ 6 were considered insomniac.

The questionnaire was distributed among various social media websites as a link to ensure maximum participation. The first page informed the students about the study objectives, that participation in the study was voluntary and they could leave filing the questionnaire in between. By clicking on the "next" button, the respondent gave his consent to participate in the study. No personal particulars were collected to keep the data confidential.

Sample Size and Statistical analysis: Based on a pilot study among 25 students, the minimum sample required was 287 (OpenEpi Software)¹¹ and to compensate for incomplete responses, the maximum sample was sought. Data Analysis was done using SPSS version 21.012 by using the independent samples t-test, and multiple logistic regression.

RESULTS

Demographic details of the study population (table 1)

A total of 921 entries were recorded, out of which 743 were complete and hence, were included in the study (response rate: 80.7%). There 219 (29.5%) medical

students, 301 (40.5%) dental students while 223 (30%) belonged to the nursing sciences. Their gender wise distribution is described in table 1. Insomnia was reported in 421 (56.7%) students, out of which, the highest was seen among dental (62.7%), followed by medical (59.8%) and nursing (45.3%) undergraduates.

| DESCRIPTION | n,% |
|-------------------|------------|
| Total Respondents | 743 (100) |
| • Medical UGs | 219 (29.5) |
| • Dental UGs | 301 (40.5) |
| • Nursing UGs | 223 (30) |
| Males | 299 (40.2) |
| Females | 514 (59.8) |
| Reported Insomnia | 421 (56.7) |
| • Medical UGs | 131 (59.8) |
| • Dental UGs | 189 (62.7) |
| • Nursing UGs | 101 (45.3) |
| Reported Insomnia | |
| • Males | 164 (38.9) |
| • Females | 257 (61.1) |

Table 1. Demographic Details of The Study Population

Responses to the Athens insomnia questionnaire (table 2)

The range of scores obtained by the respondents are shown in table 2. The highest range was observed among females (6-22) and dental students (6-21). Gender differences revealed a significant association among females ($p=0.03$) as compared to their male counterparts.

Relationship between insomnia, gender and course pursued using multivariate regression analysis (table 3)

The multiple linear regression model to analyze insomnia in relation to gender and course pursued revealed a statistical significant association in relation to gender with females being more affected ($p=0.03$), while no significant difference were observed in relation to the specialization of the student (table 3).

DISCUSSION

The results of the present study revealed a 56.7% prevalence of insomnia among medical, dental and nursing undergraduate students, and is on the higher end as compared to medical students of countries including Pakistan (40.74%)¹³, Brazil, (28.15%) and Iran (42%).¹⁴ In contrast, Sing CY et al. reported a 68.8% prevalence of insomnia among a sample of Chinese college students. These differences can be due to socio-

| QUESTIONS | MALES | FEMALES | P value | MEDICAL | DENTAL | NURSING | p value |
|-----------|---------|---------|---------|---------|---------|---------|---------|
| Range | 3-20 | 6-22 | 0.03 | 5-21 | 6-21 | 3-19 | NS |
| Mean±SD | 13±2.45 | 15±1.23 | | 11±3.52 | 11±6.09 | 10±2.22 | |

Table 2. Responses to the Athens Insomnia Questionnaire (NS: Non Significant)

cultural beliefs, curriculum and individual stress levels of the student.¹⁵

The multiple linear regression model revealed that females were significantly more associated to have insomnia and these findings are in agreement to previous studies by various authors.^{2,16,17} In contrast, Pallos et al.¹⁸ reported males had a higher rate of insomnia as compared to females. Such increased statistics among females in the present study could be due to the fact that during lockdown, apart from studies, most females had to assist in homely work, which had significantly increased during the lockdown.

The results of the present study are consistent with the findings that students belonging to medical and allied sciences appear to be vulnerable to poor sleep due to duration and intensity of their curriculum, clinical duties and both pre-clinical clinical assignments.¹⁹ This burden can be assessed by the fact that as while researchers have estimated sleep disorders in the general population to be around 15-35%, medical students showed a prevalence of insomnia of 30%.²⁰ As per Jiang et al., who documented the prevalence of insomnia among university students from 9.4% to 38.2%, the prevalence of insomnia among medical, dental and nursing students in on the higher side as stated above and as per the findings of the present study.

It is also to be noted that the present study was done during the lockdown period, which makes it unique in nature as a comprehensive literature search did not reveal any such study(ies) during this time. Therefore, the presence of insomnia directed in the present study could be higher as compared to pre-COVID times. However, the study meets the aim and objectives of the

present study and respective councils and student bodies can implement regulations in place to reduce stress among students in the wake of another, god forbid, global pandemic.

The limitations of the present study could be the under/over reporting of data by the students, and social desirability bias. However, no personal details were collected and students were assured of the confidentiality of their data to reduce the probability of such a bias and it can be safely stated that the results of the present study can be generalized for the medical, dental and nursing students belonging to the South Asian continent.

CONCLUSION

Based on the results of the present study, a high prevalence of insomnia was found between medical, dental and nursing undergraduate students and there needs to be regular assessment of insomnia and stress among the students and preventive measures adopted incase a high prevalence of insomnia is found among them.

REFERENCES

1. Kaneita Y, Ohida T, Osaki Y, Tanihata T, Minowa M, Suzuki K. Insomnia Among Japanese Adolescents: A Nationwide Representative Survey. *Sleep* 2006;29(12):1543-50.
2. X.-l Jiang, X.-y. Zheng, J. Yang, C.-p. Ye, Y.-y. Chen, et al. A systematic review of studies on the prevalence of Insomnia in university students. *Public Health* 2015; 129(12):1-6. <https://doi.org/10.1016/j.puhe.2015.07.030>.
3. Taylor DJ, Lichstein KL, Durrence HH. Insomnia as a health risk factor. *Behav Sleep Med.* 2003;1:227-247.
4. Liu X, Uchiyama M, Okawa M, Kurita H. Prevalence and correlates of self-reported sleep problems among

| | PREDICTOR | COEFFICIENT | SD | t | p-Value |
|----------|----------------|-------------|------|------|---------|
| INSOMNIA | Gender | -5.64 | 3.99 | 2.34 | 0.03* |
| | Course Pursued | 21.2 | 2.33 | 6.54 | 0.08 |

Table 3. Relationship Between Insomnia, Gender and Course Pursued Using Multivariate Regression Analysis

Chinese adolescents. *Sleep* 2000;23:27-34.

5. Stewart R, Besset A, Bebbington P, et al. Insomnia comorbidity and impact and hypnotic use by age group in a national survey population aged 16 to 74 years. *Sleep*. 2006;29:1391-1397
6. Ohayon MM. Epidemiology of insomnia: what we know and what we still need to learn. *Sleep Med Rev* 2002;6(2):97e111.
7. Samaranyake CB, Arroll B, Fernando AR. Sleep disorders, depression, anxiety and satisfaction with life among young adults: a survey of university students in Auckland, New Zealand. *N. Z. Med. J.* 2014;127(1399):13e22.
8. Sarsour K, Van Brunt DL, Johnston JA, Foley KA, Morin CM, Walsh JK. Associations of nonrestorative sleep with insomnia, depression, and daytime function. *Sleep Med* 2010;11(10):965e72.
9. Kelly WE, Kelly KE, Clanton RC. The relationship between sleep length and grade-point average among college students. *Coll Stud J.* 2001;35:84-6.
10. Soldatos CR, Dikeos DG, Paparrigopoulos TJ. Athens insomnia scale: validation of an instrument based on ICD-10 criteria. *Journal of Psychosomatic Research* 2000;48 (6):555-60.
11. Dean AG, Sullivan KM, Soe MM. OpenEpi: Open Source Epidemiologic Statistics for Public Health, Version. www.OpenEpi.com, updated 2013/04/06, accessed 2020/04/17.
12. IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.
13. Shakeel HA, Maqsood H, Ishaq A, Ali B, Hussain H, Khan AR, et al. Insomnia among medical students: a cross-sectional study. *Int J Res Med Sci.* 2019 Mar;7(3):893-8. <http://dx.doi.org/10.18203/2320-6012.ijrms20190944>
14. Atkinson G, Davenne D. Relationship between sleep, physical activity and human health. *Physiol Behav.* 2007;90(2-3):229-35.
15. Sing CY, Wong WS. Prevalence of Insomnia and Its Psychosocial Correlates Among College Students in Hong Kong, *Journal of American College Health* 2010;59(3):174-82. <http://dx.doi.org/10.1080/07448481.2010.497829>
16. Voelker R. Stress, sleep loss, and substance abuse create potent recipe for college depression. *J Am Med Assoc.* 2004;291(18):2177e9.
17. Johnson EO, Roth T, Schultz L, Breslau N. Epidemiology of DSM-IV insomnia in adolescence: lifetime prevalence, chronicity, and an emergent gender difference. *Pediatrics* 2006;117(2):e247e56.
18. Pallos H, Gergely V, Yamada N, Miyazaki S, Okawa M. The quality of sleep and factors associated with poor sleep in Japanese graduate students. *Sleep Biol Rhythms* 2007;5:234e8
19. Wong JG, Patil NG, Beh SL, Cheung EP, Wong V, Chan LC, et al. Cultivating psychological well-being in Hong Kong's future doctors. *Med Teach.* 2005;27:715-9.
20. Foley DJ, Monjan AA, Brown SL, Simonsick EM, Wallace RB, Blazer DG. Sleep complaints among elderly persons: an epidemiologic study of three communities. *Sleep.* 1995;18(6):425-32.

Cite this article as:

Sharma R, Mishra A, Chatterjee P, Bhasker A. Lockdown and Insomnia among Undergraduate Healthcare Students: A Cross-Sectional Study. *Int Healthc Res J.* 2020;4(8):OR10-OR13. <https://doi.org/10.26440/IHRJ/0407.10286>

AUTHOR AFFILIATIONS: (*Corresponding Author)

1. MD (Preventive and Social Medicine), Consultant and Practising Physician, Navi Mumbai, Maharashtra, India
2. BDS, Consultant Dental Surgeon, Rameshwaram, Tamil Nadu, India
3. B.Sc. (Nursing), Shree Ram Hospital and Pathology Centre, Orissa, India

Source of support: Nil, **Conflict of interest:** None declared

Contact Corresponding Author at: aseembhasker[at]gmail[dot]com