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The Role of Smartwatches in One's Health: A Short Commentary

SANJANA SAYEED¹

Technology today is reaching newer milestones with every passing day. A significant contribution of technology to the society is the advancement in the normal “watch” worn in a human’s hand, and giving birth to the “smartwatch”. Its applications ranges from monitoring one’s heart rate, sleep habits physical activity, blood pressure, SpO₂ level, phone notifications as well as performing various other functions.

It has been reported that low physical activity is currently the fourth leading risk factor for mortality worldwide.¹ Even though the scientific literature shows limited evidence supporting the use of wearable fitness trackers leads to an improvement in health,² these devices are gaining popularity each day and new fitness devices appear on the consumer market regularly.

These watches can potentially transform health care by supporting/evaluating health one’s routine life as they are familiar to most people, are easily available, have near-real time continuous monitoring of physical activity and physiological measures, provide tailored messaging and reminders, enable communication between patients, family members, and health care providers.³

Two identified areas where the benefits of these devices may accrue are epilepsy⁴ and cardiology treatment and research.⁵ Photoplethysmography (PPG) is a relatively new technique in wearables. PPG is an optical technique to estimate HR by monitoring changes in blood volume beneath the skin. Because of the proximity to the skin, the smart watch can also be a source of physiological data derived directly from the wearer’s body.⁷ With the potential for widespread adoption in the healthcare sector, smart watches equipped with biosensors have the potential to provide important healthcare information to patients and their providers.

The most common application using smart watches in the healthcare sector focused on health monitoring or smart home environment for the elderly.⁸ An other important application concerns monitoring chronically ill patients needing medication and/or adherence monitoring.⁸ Among the elderly, fall detection has been playing an important role in the smart home environment, although the use of such wearable devices in the real-world settings demands further research and improvement in accuracy.⁹

However, there is a need to closely monitor the advancements in these smartwatches and closely analyse the data reported by these smartwatches. Watches with ECG app and irregular heart rhythm notification are important as they have saved plenty of lives. This short commentary was an effort to educate the readers of this journal regarding the same.

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Nanozyme Therapy in Dental Practice

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Nanozymes are multi-functional nanomaterials with enzyme like activity, which rapidly took place in biomedicine. Nanozymes overcome the disadvantages of other natural enzymes such as High production costs, poor environmental stability, difficulty in storage etc. In order to highlight the contribution of nanozymes facilitating dental health we review the overall research progress of multifunctional nanozymes in various oral related diseases, including treating oral ulcers, dental caries, dental pulp diseases and peri-implantitis.¹

Treating dental caries: An experimental technique incorporating two main components: a solution which is applied to the teeth and a rinse with hydrogen peroxide that is subsequently swished in the mouth then spat out. This solution is known as ferumoxytol containing iron-oxide nanoparticles that have enzyme-like properties and therefore referred to as nanozymes.

On applying ferumoxytol onto the teeth, these nanozymes bind to the receptors present on the cell membranes of cavity-causing bacteria. The iron oxide which is present in the hydrogen peroxide rinse function as a catalyst that converts the hydrogen peroxide into oxidants. These oxidants kill the bacteria by rupturing their cell membranes and cause easy removal of plaque biofilms.²

Treating dental pulp diseases: In the treatment of dental pulp diseases, root canal therapy is the most effective approach. First tested by Koo's research team bacterial nanomaterials enhancing the antibacterial activity on the surface of complex root canals and dentinal tubules were found to be effective after a short period of local treatment (5 minutes). These iron oxide nanozymes bind to the surface of infectious dentinal tubules, and leads to the activation of hydrogen peroxide which eliminates plaque biofilms present on the surface of root canal and dentinal tubules.

Treating oral ulcers: These are chronic inflammatory diseases of oral mucosa and there is no current treatment available with any specific drug. Thus, introducing vitamin B₂ modified Fe₃O₄ nanozyme improved the healing speed of oral ulcers via anti-inflammatory and antibacterial activity. It was found that this modification enhanced their own enzyme-like activity and significantly improved its superoxide dismutase (SOD)-like activity with reactive oxygen species (ROS) scavenging ability. Cellular antioxidation experiments proved that this nanozymes can protect cells from H₂O₂, having good biocompatibility and accelerated the healing of oral ulcers in a mouse model by decreasing the secretion of local inflammatory factors and eliminating reactive oxygen species. Hence, these antibacterial agents with enzyme like activity may become an effective treatment for oral ulcers.

Preventing plaque-build up: FDA approved iron oxide nano-particles, which is delivered in a mouth rinse, can conquer the growth of dental plaque and kill bacteria which causes tooth decay. Daily application of ferumoxytol twice a day, activates hydrogen peroxide incorporated in a follow-up rinse, significantly reducing the harmful dental plaque build-up and also had a targeted effect on the bacteria which is responsible for tooth decay.³

Preventing peri-implantitis: Periimplantitis is an inflammatory reaction of the oral tissue around the implant under the action of bacteria, which is the main cause for dental implant failure. To prevent periimplantitis, patient should be aware of oral hygiene, use of ideal dental implant materials and proper implant design by the doctors. Titanium (Ti) and its alloys, are extensively used as dental implant materials as it has good biocompatibility. However, the use of titanium without any antibacterial properties generates a surface on which dental plaque accumulates easily, which is difficult to remove. The



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Titanium implants with antibacterial modification includes different coating material is favorable in hampering the growth of bacteria around implants, encouraging osseointegration, and improving the success rate of surgery. The surface of Titanium implants is modified by using photo responsive chitosan/Ag/MoS₂ and their antibacterial effect can only be activated when exposed to specific light after peri-implantitis. Nanozyme coated implants have increasingly shown excellent anti-inflammatory and antibacterial properties, and may become a potential strategy for eliminating peri-implantitis.

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An Updated Review on Epidemiology, Pathophysiology, Diagnosis and Treatment aspects of COVID-19 Infection

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BIKRAM DHARA⁵ , DATTATREYA MUKHERJEE⁶

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In the current era, COVID-19 has become the most familiar term in the whole world. It is caused by the novel coronavirus SARS-CoV-2 which is a mutated congener of SARS COV and MERS COV. As per epidemiological studies, 83959 cases have been recorded only in China with 4637 deaths. More than 215 countries including Korea, Iran, Italy, Germany, Algeria, South Africa, Senegal, Nigeria etc have recorded over nine million deaths due to this pandemic. Diagnosis of COVID-19 can be carried out by several ways like identifying the increased level of lactate dehydrogenase, creatinine kinase, alanine and aspartate dehydrogenase in blood. IgG and IgM antibody detection is a key parameter in detection of SARS CoV-2. The real-time reverse transcriptase-polymerase chain reaction or RT-qPCR test is so far considered the most reliable diagnostic method. Recently, two current approaches get widely used in diagnosis for SARS CoV-2 namely “FELUDA” and “SHERLOCK” offering a cheap and less time taking procedure for the detection of SARS CoV-2. In FELUDA a protein called FnCas9 and a guide RNA (g RNA) helps in recognizing the viral gene which is contained by the sample whereas SHERLOCK is associated with Cas12 protein.

KEYWORDS: SARS CoV-2, RT- qPCR, +ssRNA, Resolution Computed Tomography

INTRODUCTION

The world had to face a novel dreadful disease known as COVID-19 first time in the year of 2020; the so called COVID-19 is caused by a specific virus-coronavirus which is considered as a mutated congener of SARS-COV & MERS-COV. Corona virus is +ss RNA of 26-32 kb with a 5'cap and 3' tail poly A tail possessing 14 putative open reading frames (ORF) that encode 27 proteins. The virion, however, consists of four types of proteins-S(spike), E(envelop), M(membrane) and N(nucleocapsid). Structural morphology shows that RNA genome is held by N protein whereas S, E and M altogether create viral capsid.¹ The subfamilies of coronavirus are- alpha, beta, gamma and delta.²

Several zoonotic coronaviruses cause severe infection in humans like HCoV 229E, HCoV NL63, HCoV HKU1 and HCoV-OC43.³ It is to note that SARS-CoV which originated from bat emerged in Guangdong outbreak with about 10% case fatality rate (CFR) whereas MERS CoV originated from dromedary camel (first reported in Saudi Arabia in June 2012 and later in 27 countries) having a CFR of about 34%.^{3,4} The virus closely related to SARS-CoV is RaTG13-2013 that was identified in a bat. On the other hand, the complete genome of severe acute respiratory syndrome coronavirus 2

isolated from Wuhan Hu-1 is available at (<https://www.ncbi.nlm.nih.gov/genbank/WHU-Hu-1>) and genetic epidemiology of HCoV-19 and submitted data are available from GIASID database (<https://www.giasid.org/>). The SARS-CoV consists of at least 11 ORFs with full length of 29,903 bp.^{5,6} Taking into consideration the severity and rising rates of infection, WHO confirmed COVID 19 as a pandemic on March 11, 2020 and fruitful steps were chalked out including quarantining the contaminated persons and their family members, maintenance of social distancing, closure of academic institutions etc.⁷

In late December 2019, patients were admitted to hospital with an initial diagnosis of pneumonia of an unknown etiology; those patients were epidemiologically linked to a sea food and wet animal market in Wuhan, Hubei province. Dr Jianguo Xu, an academican of the Chinese Academy of Engineering who led a research team, declared at a national conference that the outbreak was caused by a new type coronavirus, tentatively dubbed 2019new coronavirus (2019nCoV) by the World Health Organization.⁸

There are predominantly two groups that are at



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elevated risk of developing severe disease - geriatric patients and patients with diabetes mellitus, cardiorespiratory disorders, renal failure, hypertension, pregnancy and chronic liver disease.⁹

Epidemiology and Viral Transmission (Figure 1):

Previous reports documented that coronavirus is a zoonotic pathogen which arose from sea food in China and afterwards it spread in humans. As per reported data, 83,959 cases were observed in China along with 4637 deaths (2nd May, 2020). On the other hand, over 9 million deaths were recorded in more than 215 countries like Korea, Iran, Italy, Germany, South Africa, Nigeria and India.¹⁰

COVID-19 principally spreads via respiratory droplet transmission from person to person when a person is in close contact with somebody actively sneezing and coughing. Transmission may also occur through fomites used by or used on infected individual such as bed sheets, blankets, kitchen utensils, thermometer and stethoscope. The patients of COVID-19 belong mostly to the age group of 40-70 years and the incubation period is 5-6 days which can exceed up to 14 days.¹¹

Apart from SARS-COV, there are several types of coronaviruses that can infect humans namely HCoV 229E, HCoVNL63, HCoV-OC43, HCoV HKU1 etc.² The gene sequence of 2019-nCoV is 89 percent identical to bat SARS-like coronavirus ZXC21 (bat-SL-CoVZXC21, accession no. MG772934.1) and ZC45 (MG772933.1), and 82 percent identical to SARS-CoV Tor2 (JX163927), suggesting that 2019-nCoV belongs to betacoronavirus Lineage B.¹²

Diagnosis (Figure 2): Diagnosis can be carried out by a number of ways. Blood tests show increased levels of lactate dehydrogenase, an elevated neutrophil to lymphocyte ratio though overall WBC count is reduced. Coagulation abnormality is related with increase in prothrombin time and international normalize ratio.¹⁴ Apart from the serological test that detect IgG and Ig M antibodies against SARS CoV-2, RT- qPCR also play a crucial role in detecting nucleic acid of SARS CoV-2: the samples are collected from lower respiratory tract aspirate, nose, sputum, nasopharyngeal oropharyngeal swabs. Ultrasound and CT scan are also taken in consideration for diagnosis of COVID-19. These are essential modalities used in the treatment of Cardio respiratory failure in the Intensive Care Unit (ICU).¹⁵ High Resolution Computational Tomography (HCRT) is an extremely sensitive method of choice even in preliminary stage of the illness. In terms of laboratory tests, a normal or decreased total white blood cell count and a decreased lymphocyte count might be seen in the early stages of the disease. There are elevated levels of liver enzymes, LDH, muscle enzymes, and C-reactive protein. The procalcitonin level is normal. The D-dimer value is elevated in critical patients, blood lymphocytes are consistently lowered, and laboratory alterations of multiorgan imbalance (high amylase, coagulation disorders, etc.) are detected.¹⁴

A very newly found approach 'FELUDA' is a cheap and less time taking method. FELUDA is an acronym for FnCas9 Editor Limited Uniform Detection Assay and uses CRISPER-CAS technique specific for detection of the genes specific to SARS-COV₂ viruses – In this method, a protein called FnCas9 and a guide RNA

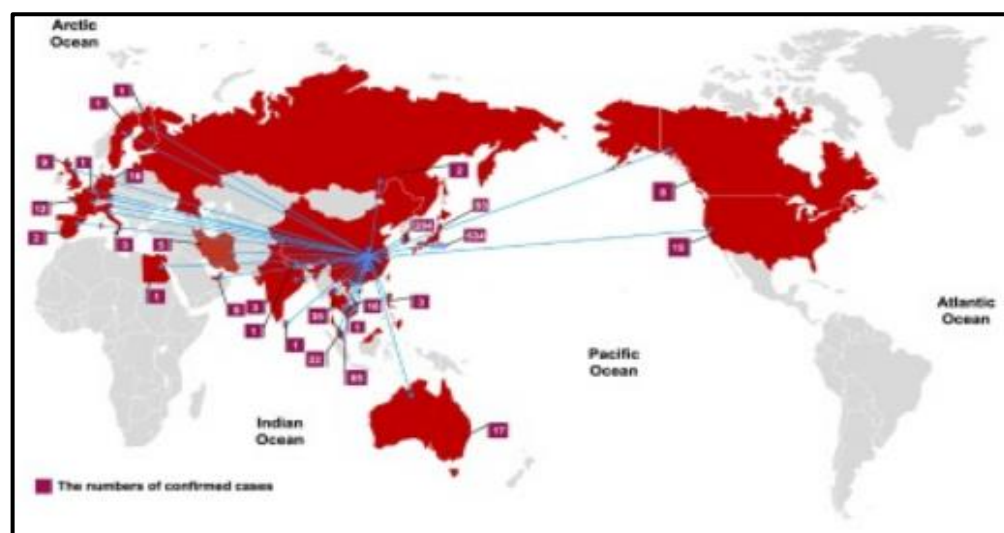


Figure 1. Epidemiological study of Covid-19.¹³

(gRNA) which helps in recognizing viral gene are used. If the sample contains gene, this gRNA-FnCas-9 complex binds to gene and their bond is visualized by paper strip. This aforementioned method is quite similar to SHERLOCK (Specific High Sensitivity Enzymatic Receptor Unlocking) which is associated with Cas 12 protein in place of Cas 9. Serological tests are used for detecting IgG and IgM antibodies against SERS COV 2 in the sputum, plasma and sometimes whole blood.¹⁶

Pathophysiology (Figure 3): Corona virus is a +ssRNA (29.9 kb) of size 50-200 nm diameter and characterizes as α , β , γ , δ . The RNA encodes 27 proteins. The virus, however consists of four types of proteins – E (epidermal), M (membrane), N (nucleocapsid) and S (spike). S protein is further subdivided into S₁ and S₂ subunit. S₁ is responsible for receptor bond and S₂ is considered as fusion subunit in order to carry out virion attachment and fuse with cell membrane. TMPRSS2 plays a vital role by cleaving the S protein from S₁/S₂ cleave site.¹³

ACE2 is regarded as functional receptor for SARS CoV-2. Although ACE2 can also be observed in other cells likes GIT, Liver and kidney vascular epithelium in a highly expressive mode.¹⁸ Newly formed nucleocapsids are enclosed in ER membrane and transported to lumen – Golgi vesicle – cell membrane – extracellular space (by mean of exocytosis).¹⁴ Immune response is cauterized by release of C-X-C motif chemokine ligand and interferons IFN α and IFN β from the virus infected cell.¹⁹ The invasion of

virus inside pulmonary myocytes and endothelial causes edema degeneration and necrotic changes. These changes are primarily connected to activation of pro inflammatory cytokines (IL6, IL10, TMF α), granulocyte colony stimulatory factor, monocyte chemo attractant protein 1, macrophage inflammatory protein 1 α , programmed cell death marker (PD1), T cell immunoglobulins and mucin domain (Tm-3) that are found to be increased.^{14,20} Patients infected with COVID 19 suffer from fever, malaise, dry cough, shortness of breath, loss of taste or smell, red or irritated eye etc.⁹

Treatment: Remdesivir is considered as an adantageous drug of choice in treatment of COVID-19. It blocks DNA polymerase. Apart from that protease inhibitors like Lopinavir and Ritonavir can also play a crucial role in the cure of corona patients. Chloroquine which is generally treated as an antiprotozoal drug prevents the glycosylation of the ACE-2 receptor, besides it terminates the penetration of SARS CoV-2 by increasing the pH of epidermal layer.²²

In addition, azithromycin is used in treatment of virus associated with bacterial infection.²³

Vaccines for COVID-19 include ZycovD (launched by Zydus Cadilla), Covaxin (launched by Bharat Biotech), Covishield (AstraZeneca in cooperation with Oxford university).²⁴

Prophylactic anticoagulation is performed by

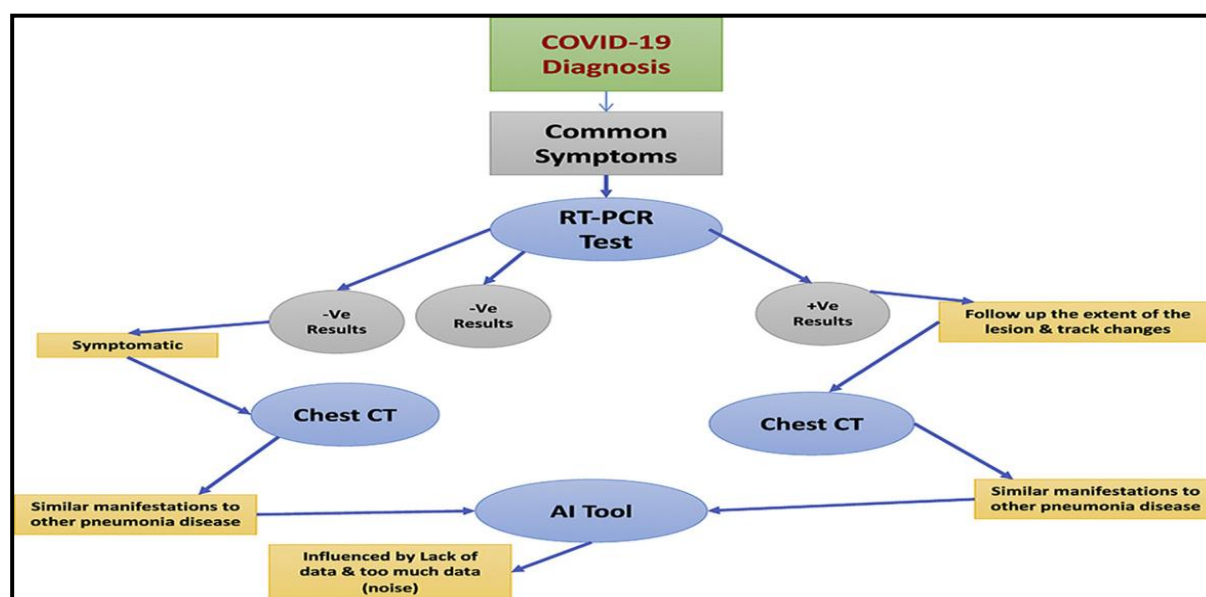


Figure 2. Diagnosis of Covid-19.¹⁷

enoxaparin. Moreover, high flow nasal oxygen therapy (HFNO) and Non-invasive ventilation are performed to deliver proper oxygen. Pulmonary epithelium inflammation is reduced by administering prednisone and prednisolone.²⁵

Some traditional medicines are also approved as a beneficial remedy in treatment of COVID 19 - for example decoction combination of Ma Xing Gan Shi and Da Yuan Yin, Yin Gao San, Tu Ping Feng, Shuang Huang Lian etc.²⁶

In treatment of rheumatoid arthritis, juvenile arthritis and giant cell arteritis Tocilizumab, a humanised IgG 1 monoclonal antibody (directed against IL-6 receptor) is administered. Active tuberculosis and neutropenia are contraindicated for Tocilizumab. Tocilizumab also comes under consideration in treatment of COVID-19.²⁷

CONCLUSION

COVID 19 today has become a notable threat to mankind. It has hampered the normal social workflow. Drugs and vaccines, however are not the only remedy of this pandemic. Moreover, due to some adverse effects, a number of drugs are avoided by patients. People, hence, should be aware of the Do's and Don'ts which they must apply in their everyday lifestyle such as sanitization, wearing masks, maintaining social distance or quarantine (if necessary). Consumption of a healthy balanced diet is very important to build immunity against this severely transmissible disease. Prevention is always better than cure.

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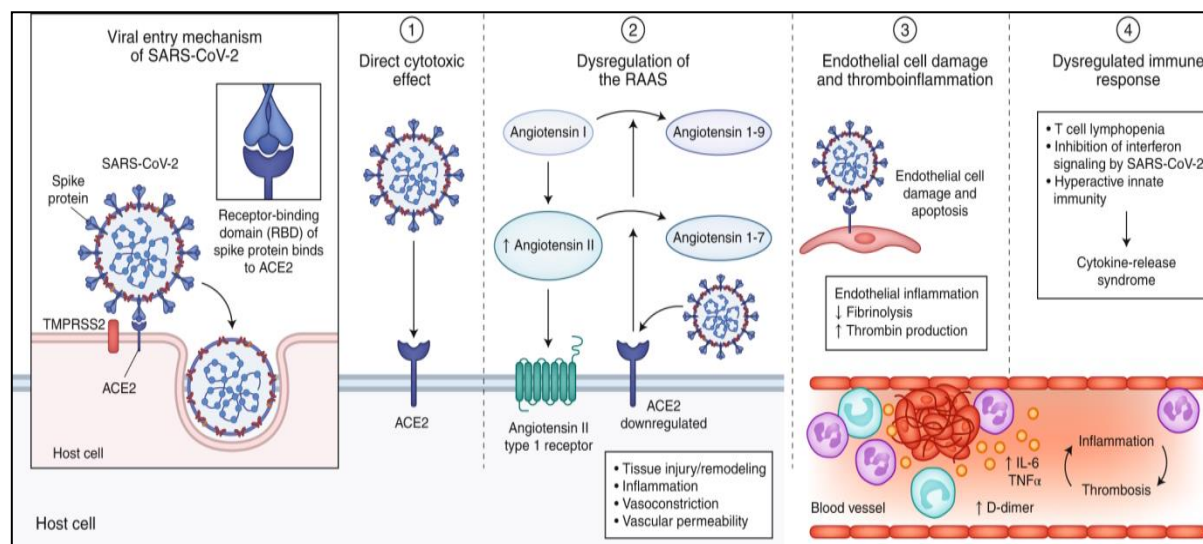


Figure 3. Pathophysiology of precipitation of Covid-19.²¹

December, 2021.]

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An Assessment of Knowledge & Perception among Undergraduate, Interns & Post graduate students of the Department of Prosthodontics and Crown & Bridge from different colleges of West Bengal Towards Disinfection of Impression, Cast & Prosthesis: A Cross-sectional Study

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BACKGROUND: Infection control in dental practice is one of the most important factor for the treatment to be successful. Almost all of the dental procedures involve dealing with the saliva, blood and oral fluids which may have sufficient pathogens and cause cross infection through contaminated instruments, materials and surfaces. Therefore, the dental health care workers must be aware of the possible contamination and should follow the measures to prevent it.

AIM: The aim of the study is to evaluate the knowledge, awareness and practice of the undergraduate students, interns and PGTs toward infection control measures during prosthodontic treatment with their future perception.

MATERIALS AND METHODS: A self-assessment questionnaire-based survey was carried out among undergraduate students, interns and post graduate students of Dept. of Prosthodontics and Crown & Bridge of various dental colleges of West Bengal to assess the knowledge and perception of infection control. Survey containing questions were randomly distributed to 250 students regarding knowledge of infection control and the methods actually followed in practice from impression making to delivery of the prosthesis in dental colleges. The questionnaire was sent to all by email to be filled electronically. Data was collected and analysed.

RESULTS: Out of 250 students 210 students (59.4% female and 40.6% male) responded to the questionnaire. Their awareness towards disinfecting the impression, cast or prosthesis was 100% and all the participated students are aware of the fact that corona virus may spread via saliva from patients to dental health care workers. Though most of the students (94.3 %) think it is mandatory to rinse the mouth before the impression making but they do not have proper knowledge about disinfectants i.e., glutaraldehyde, iodophor etc to be used for disinfecting the impression, cast and prosthesis. In regular practice in the clinics around 74.3% of them disinfect the cast before sending to the dental laboratory.

CONCLUSION: The knowledge about infection control during impression making is satisfactory among the students participated but there is a need to improve practice with disinfectants to minimize the cross contamination and the disease transmission and also reduce the associated morbidity for both patients and the dental practitioner. The attitude towards infection control measures is positive, but a greater practical approach is needed.

KEYWORDS: Knowledge, Attitude, Practice, Disinfection, Impression, Cast, Prosthesis

INTRODUCTION

Department of Prosthodontics of every dental colleges offers with the diagnosis, treatment planning, rehabilitation of the teeth in the oral cavity which is a good environment for the replication of multiple types of microbial agents for the transmission, inoculation and growth of a variety of agents which are both infectious and detrimental to others.

One millilitre of human saliva from a healthy individual contains about 100 million bacterial cells. With a normal salivary secretion of 750 ml per day, about 8×10^{10} bacteria are shed from the oral cavity of all of the humans per day, which indicates that dental practitioners are at risk of cross infection through the contact with the saliva, blood and other oral fluids.¹

In the clinics of Prosthodontics, the concern is well

established that during the clinical procedures if proper infection control protocols are not maintained then clinicians and their assistants are exposed to pathogens through materials and contaminated instruments.²

The Centres for Disease Control and prevention (CDC),³ in its infection control guideline, indicated that both the impression and the cast are the potential sources of contamination and should be properly handled which prevents exposure to the clinicians, patients and the environment.⁴ Therefore, the use of mechanical barriers such as gloves, masks, safety glasses, aprons as well as disinfection of surfaces and instruments sterilization are basic procedures for universal precaution. Henry N. Williams, did a study in which he identified the bacterial colony types



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recovered from pumice collected from four dental laboratories indicated that the predominant bacteria recovered were nonoral microorganisms, including members of the genera *Bacillus*, *Acinetobacter*, *Micrococcus*, *Pseudomonas*, *Moraxella*, and *Alcaligenes*. On the other hand Hiroshi E Gusa et al. Reported in his study the persistent presence of microorganisms on patient-derived dental impressions and gypsum casts and highlighted the important human pathogens.^{5,6} Thus, dental impressions can transmit serious diseases from patient to other staff or vice versa because they are in contact with saliva and blood from patient's mouth and can transfer microorganisms to stone casts. The survival rate of the microorganisms are very long even when they are outside the oral fluids, then this is a potential health risk.

Several epidemics (such as H₁N₁, H₅N₁, avian influenza, Ebola, SARS, Zika, and Nipah) have affected India and other countries in the past, which were successfully tackled with appropriate research. The emergence of novel human coronavirus initially referred to as the Wuhan coronavirus (CoV), currently designated as severe acute respiratory syndrome (SARS)-CoV-2, is responsible for the latest pandemic that is affecting human health and economy across the world.⁷

The procedures involving the use of aerosol generating high-speed handpiece which cause secretions of saliva increases the suspension of the virus into the surroundings and transmission can also occur through indirect contact by touching contaminated surfaces followed by self-delivery to the eyes, nose, or mouth[8]. In Prosthodontics clinics the clinicians are at high risk for exposure to the novel coronavirus through aerosols and possibly contaminated surfaces and indirect contact with dental laboratories and dental technicians through impressions, dental stone casts, and fixed and removable prosthetic appliances.

So, all the impressions should be sterilised or disinfected before being sent to the prosthetic laboratory or by the time they arrive there, to avoid the spread of cross infection. The disinfection of the dental impression must be done carefully. The selection of the disinfecting agent is very important, because it must have wide action spectrum without altering the physio chemical properties from the impression materials.⁹ Other factors, such as concentration, compatibility and also time of disinfection to each impression materials are also very important.¹⁰

Until 1991, impression rinsing under running water was the recommended practice[11] but with recent emergence of several disinfectants available reduce the count of microorganisms present on the surface of the impression by 99.99%.¹²

Current recommendations advocate the use of disinfecting solutions like formaldehyde diluted to a 2–8% solution to disinfect inanimate objects and to a 1–2% solution for disinfection by scrubbing, chlorine compounds, 1.12% of glutaraldehyde, 6–75ppm of iodophors and 1.93% of phenolic compounds.¹³

Awareness about the disinfection is imperative in order to protect clinicians and the patients.

AIM

The aim of the study was to determine the knowledge of undergraduates, interns and the post graduate students in the prosthodontics clinics regarding infection control and modes of infection control followed by them during impression making and fabrication of cast and the prosthesis.

MATERIALS AND METHOD

A questionnaire survey was conducted among dental students (Undergraduates, Interns and Post Graduate Students) of the Department of Prosthodontics and Crown & Bridge from several dental colleges of West Bengal in 2021. The questionnaire was formed by the Post Graduate Student and the Faculties of the Dept of Prosthodontics and Crown & Bridge, Haldia Institute of Dental Sciences, Haldia, Purba Medinipur, West Bengal. It was a self-administered questionnaire consisting of questions related to the assessment of the knowledge, and awareness towards infection control in prosthodontic department. The questionnaire was forwarded to students by emails to be filled, and informed consent was obtained from each student before commencing the questionnaire. Participants were given no time limit to fill the questionnaire (in days) so as to reduce induced error. Data were collected between May 2021 to September 2021.

RESULTS

The present study comprised of out of which 59.4% were the female participant and 40.6% were male participant who responded (figure 1).

100% of the total participants know that it is required to disinfect the impression, cast, or prosthesis as well as they are aware of the fact that corona virus may

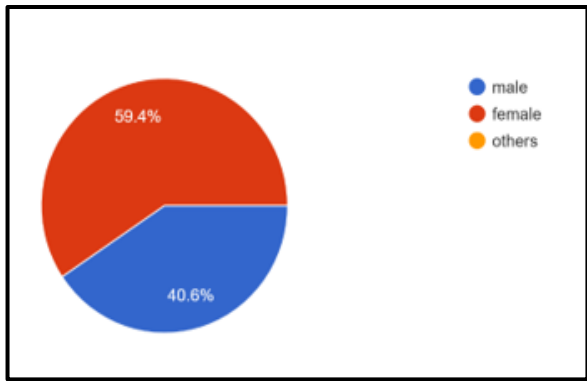


Figure 1. Gender of the Participants

spread via patient to dental health care workers either directly or indirectly. (figure 2 and figure 3) but according to their response 50% of them do not follow ICMR Protocol for disinfection in COVID-19 era and only 16.7 % follow the protocol whereas the rest do not know about it (figure 4). It is impressive that 94.3% of them thinks that it is necessary to rinse the patients mouth before making an impression (figure 5).

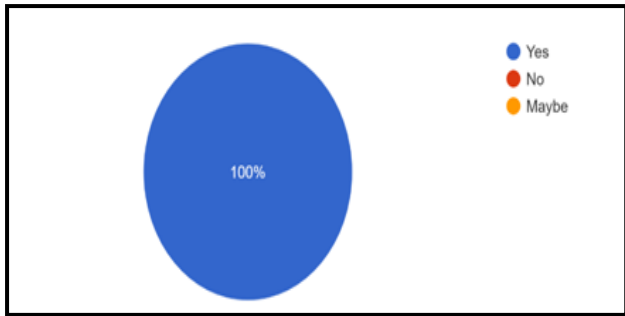


Figure 3. Response of Participants on the question “Corona Virus May Spread via Saliva From Patients to Dental Health Care Workers Either Directly or Indirectly”

Most of them are in favour of disinfecting the impression trays before making an impression but only 88.7% of them are in favour of disinfecting the adjunct instruments (figure 6) and 95.2% wash their impression after removing from the mouth by running tap water (figure 7).

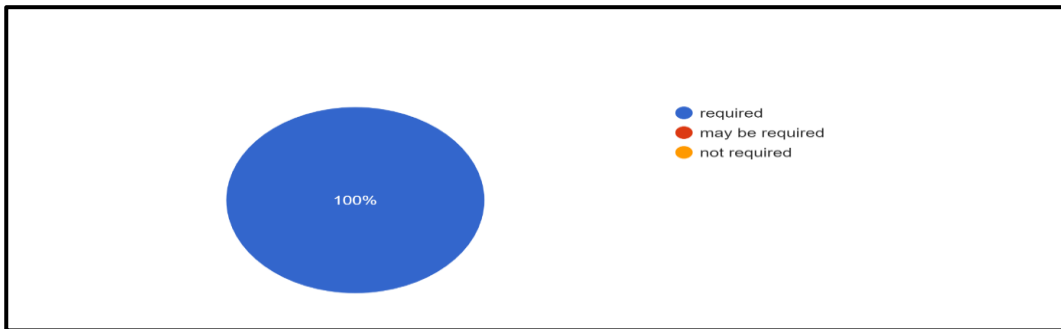


Figure 2. Response of Participants on Disinfection of the Cast, Impression or Prosthesis

Almost all of them (93.4%) are aware of the availability of various disinfectant and their use in particular fields are depicted in the table 1. The table depicts that Glutaraldehyde as a disinfectant of various impression is largely accepted.

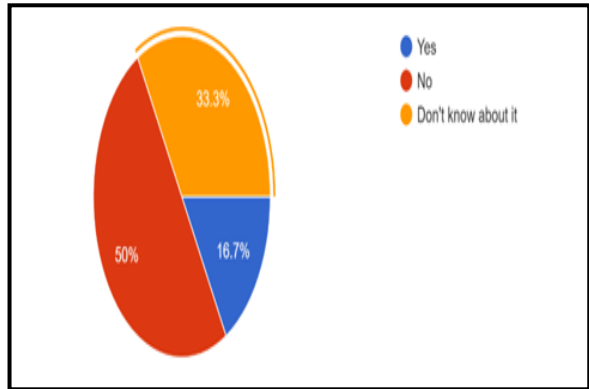


Figure 4. Response of Participants on the question “Do you follow ICMR Protocol for the disinfection in COVID 19 Era?”

The study results show that they have a misconception about alteration of minute details of the impression after disinfecting it (figure 8). This reveals that adequate knowledge regarding the chemical properties of the disinfectants and the impression material is lacking among the students.

According to this study there is a mixed response from the students as to which technique to be used as the disinfection technique for impression. 46.7% prefer immersion technique, 36.2% opted for spraying technique for the disinfection and 16.2% for washing technique (figure 9).

DISCUSSION

This cross sectional study reports the result of a survey conducted in the Dept of Prosthodontics of different colleges of West Bengal among the Undergraduate students , Interns and Post graduate students about the knowledge and perception about the disinfections of

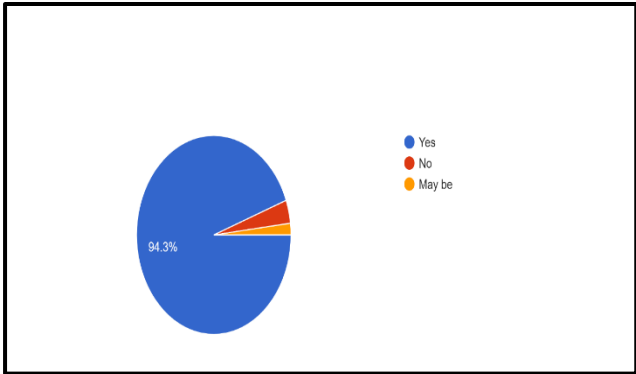


Figure 5. Response of Participants on the question “Do you Think it is Necessary to Rinse the Patient’s Mouth before Making an Impression?”

impression, cast and prosthesis. In Prosthodontic Practice in different colleges while working on the patient mouth, plenty of pathogenic microorganisms can be transferred from patient to the students and from the Prosthodontic clinic to the Laboratory and vice versa if proper infection control measures are not adopted.

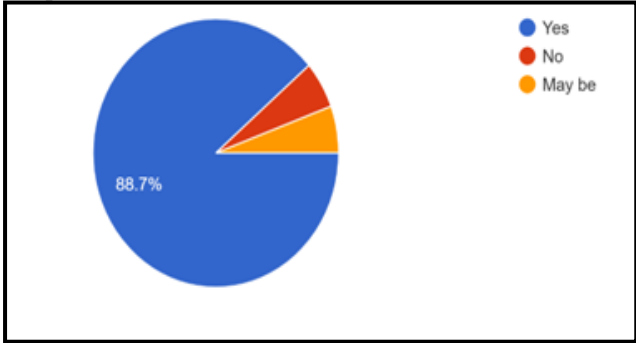


Figure 6. Response of Participants on the question “Do you Think it is Necessary to disinfect adjunct instruments (rubber bowl, mixing spatula etc)?”

Thus, the survey used in this study was to determine the knowledge and perception among the students to establish the actual methods used in disinfection of impressions prior to the pouring of the casts and also disinfection of the casts before sending it to the library. Literature suggests, that the prevalence of occupational hazard in dental health care workers is found to be

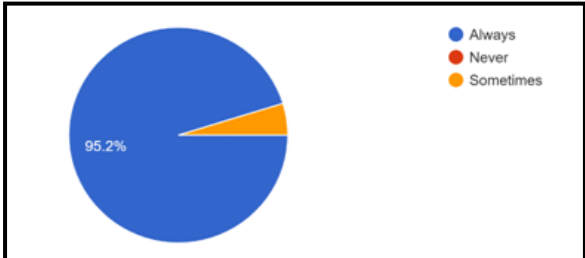


Figure 7. Response of Participants on the question “Do you Think it is Necessary to wash the impression after removing from Patient’s mouth?”

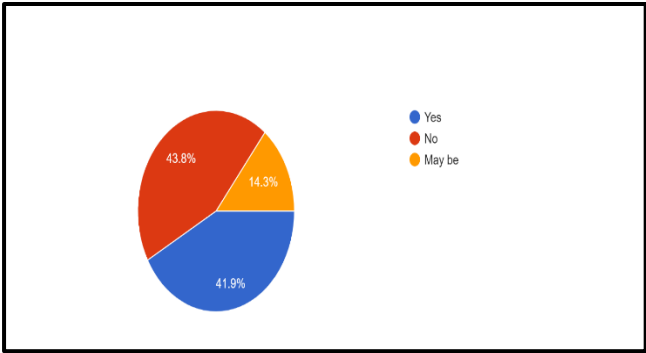


Figure 8. Response of Participants on the question “Will disinfecting the impression alter the minute details of the impression?”

15.4% and they are 3 times at more risk of acquiring Hepatitis B infection than the general population.¹⁴

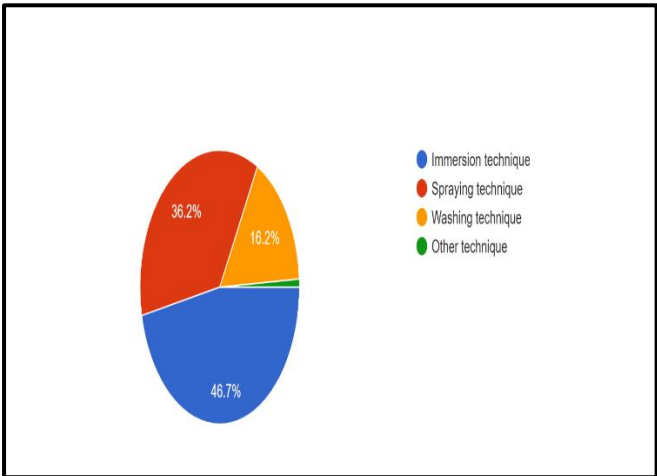


Figure 9. Response of Participants on the question “What is the Type of Disinfection Technique do you Prefer for Impression?”

Occupational exposure to blood borne pathogens can be from HIV, HBV, HCV, Mycobacterium tuberculosis, Herpes Simplex virus Type I and Type II, Staphylococci and other potentially infectious agents[15]. So, it is necessary that all the Clinicians along with students also be made aware about the infection control practice. The concept in dental infection control were developed early in the 1960s (due to Hepatitis B virus infection), but this practice gained priority and was implemented only after HIV infections became epidemic and further it was prioritized in the USA after patients treated by a dentist infected by HIV were found positive for the same.¹⁶

HBV and HIV viral particle have been isolated from saliva and the latter is one of the primary screening method for HIV infection according to the Evidence Based Study.

	Alcohol	Sodium Hypochlorite	Glutaraldehyde	Iodophor	Hydrogen peroxide
Hydrocolloid Impression	10.6%	33.7%	52.5%	3.3%	-
Silicone Impression	10.7%	9.7%	68%	11.7%	
Zinc Oxide Eugenol Impression	-	23.8%	55.4%	17.8%	3%
Cast	-	16.8%	67.3%	14.9%	1%
Prosthesis	15.7%	1.9%	81.4%		1%

Table 1. Comparison of Various Disinfecting Agents with the Disinfection of Impression, Cast and Prosthesis

It has been proved in a study that Impression materials absorb and retain viruses and viable organisms even for 48 hours after the impression is taken and the pathogens of tuberculosis remain dangerous for several weeks[17] with alginate impression transmitting more bacteria than silicone impression.¹⁶

HBV can survive on dry blood on surfaces for upto week according to other studies. Therefore, it is imperative to use protective measures and other disinfection of all the impressions to prevent cross-infection.

The Centre for Disease Control and Prevention recommends that all patients be treated as potentially infectious¹⁶ and the British Dental Association stated that “infection control is a core element of dental practice.”¹⁸

The Federation of Dentaire Internationale (FDI) states that all patients’ prosthesis should be cleaned and disinfected before delivery to the laboratory. Similarly, the American Dental Association (ADA) recommends chemical disinfection of all impression and prosthesis.^{19,20}

In our study 59.4% of the respondents were females and 40.6% were males (figure 1). This high percentage of female respondents was due to the large number of female undergraduate students, interns and postgraduate students compared to the males in the dental colleges. Also, because it was easier for the authors (being females) to access both female undergraduate and postgraduate students and interns to motivate them to respond to the questionnaire.

All the students participated in the survey (figure 2) have the knowledge that it is required to disinfect the impression, cast and the prosthesis and the students

are also aware in this COVID 19 ERA that corona virus may spread via saliva to health care workers either directly or indirectly (figure 3). It was also asked whether they follow the ICMR Protocol for the disinfection in COVID 19 Era which includes the following guidelines²¹ for maintaining certain precautions to avoid transmission of COVID 19 during treating patients in the clinics. In the survey only 16.7% follow the proper ICMR guidelines, 50% of the respondents do not follow and the rest 33.3% do not have any idea regarding the guidelines (figure 4). From this result of the survey it is absolutely mandatory for the students who are treating the patients need to adapt guidance regarding the protocols of ICMR in order to fully protect themselves as well as the patients from the cross contamination with SARS-CoV-2.

94.3% of the students in the study (figure 5) think that it is necessary to rinse the mouth of the patient before taking the impression to reduce the microbial load of the oral cavity and in order to reduce the cross infection. This result is quite impressive. It is revealed from the study that 88.7% of students are in favour of disinfecting the adjunct instrument that is rubber bowl, mixing spatula, facebow and its parts and various carvers and shade guide (figure 5), this awareness of disinfecting the adjunct instruments among the Students of Bengal is much more than in the study done by Alshiddi Ibrahim²² in the Prosthodontic Clinic in King Saud University in Saudi Arabia which revealed only 53.5% - 79.1% of the students were aware.

The Centers for Disease Control and Prevention Guideline for Infection Control in Dental Health-Care Settings in 2003 provided different strategies to control infection in the dental clinic and dental laboratory. Risk of infection of laboratory technicians by saliva or blood-borne infections such as HBV has been

documented. Therefore it is absolutely necessary to rinse the impression after taking it out from the mouth. In this study, 95.2% of the respondents rinse the impression sending it to the dental laboratory (figure 6). In the previous study by Alshidi Ibrahim²², 96.5% of the respondents rinse the impression and apply disinfectant before sending it to the dental laboratory. In Saudi Arabia Ahmad et al.²³ stated that 87% of the subjects disinfect impression before it was sent to the laboratory. Other studies reported less than that, 53.7% and 18.1%. On the other hand, around 62.8% - 68.65% of the study samples disinfect other dental prosthetic items (denture prosthesis, metal framework for removable or fixed prosthesis, bite registration or wax rim, and face bow and fork) before sending them to laboratory. These results suggested that additional education is required to promote routine disinfection of impressions. The study results show mixed response and indicate that they have a misconception among the students about alteration of minute details of the impression after disinfecting it in (figure 7). This result indicate that thorough knowledge regarding the chemical properties of the disinfection materials and the reaction of them with the impression material is lacking among the students. The result of this study regarding knowledge on infection control is similar to previous studies by Askarian et al.²⁴ and Abreu et al.²⁵ on dental students in Iran and Brazil, respectively.

There is a controversy in the disinfectant technique in between the Immersion technique (46.7%) and Spraying technique (36.2%) among the students according to (figure 8). Literature suggests both immersion and spraying have been recommended for disinfection of impressions.²⁶ Spraying technique for disinfection showed less dimensional variability compared with immersion technique and has shown similar anti-microbial activity compared to immersion method.²⁷ There is a variation in dimensional stability between materials which showed possibility of ZOE disinfected by immersion for 10 or 60 minutes not affecting the stability while alginate, only 10 minutes immersion not affecting the dimensional stability.²⁸

Whereas, among the elastomers no significant variation was found on dimensional stability by immersion.

Table 1 depicts complete analysis of students knowledge on what is best disinfection material for the standard infection protocol for the various type of impression and cast and prosthesis. Majority of the students consider glutaraldehyde as the widely

accepted disinfectant material for the disinfection of impression, cast and prosthesis. Sahar Al Zain.²⁹ in his recent study in 2019 that 0.5% glutaraldehyde improved the wettability of the impression.

Immersion with glutaraldehyde showed less expansion with the impression and more expansion was seen with use of sodium hypochlorite in the other studies.

McDonnel and Russel in his study revealed that glutaraldehyde has a broad spectrum activity against any bacteria and the supreme disinfectant material among other disinfectant materials.³⁰

So to eliminate possible contamination in the context of universal precaution, infection control programs must be recommended in the dental under graduate education and obligatory infection control courses and guidelines should be kept as a strategy to safe dental health care.

CONCLUSION

Within the limitation based on followed methodology and fact analysis, the present study show that there was lack of commitment to the standard infection control practice. Through most of them used personal protective means and knew about cross infection from oral pathogens, disinfection of impression was not followed by most of them which showed negative or core attitude towards the practice of infection control during impression making. Therefore, it is mandatory not only to ensure impression disinfection protocol. Routinely in our work place but also teach dental students and other auxiliary personnel proper technique and importance of following them. Subjects' responses showed deficiency of education to support infection control measures, and their self-assessment and satisfaction reflect their performance toward infection control policy.

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Nomophobia among Students of Healthcare Colleges and Institutions: A Cross-Sectional Study

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INTRODUCTION: The Covid-19 pandemic has made a student dependent on their phones as a result of which, these students were glued to their phones for various tasks.
AIM: To assess the level of mobile phone dependence (nomophobia) on students of healthcare colleges and institutions in and around a South Indian city.
MATERIALS AND METHOD: The study was cross-sectional in nature. Mobile phone dependence was obtained from Raines ML et al. and modified accordingly. Score obtained below 20, 20–24, and above 24 were labelled as participants not at risk, at risk, and nomophobia, respectively. Students aged 17 years or higher and using mobile phones on a regular basis (atleast for 4 months) for at least 1–2 hours per day we included and those reporting a history of alcohol or substance abuse and any psychiatric or sleep disorder were excluded. Data was entered into SPSS version 24.0 and statistical test used were the student's t-test and logistic regression and Pearson's correlation keeping p value significant at ≤ 0.5 .
RESULTS: Most of the students were males (53.9%) and most students were ≥ 20 years in age (43.5%). 46% of the students reported using their smartphone for more than 2 hours a day and 59.9% of them reported having a poor sleep quality index of >5 (59.9%). Most of the students (40%) reported a nomophobic score of >24 , With 53.2% and 51.3% females. Analysis of the logistic regression revealed a positive, linear and significant association with higher nomophobic scores and poor sleep quality index scores ($r=+0.69$, $p=0.02$ for nomophobic score >24).
CONCLUSION: The present study revealed a high on nomophobia prevalence among students of healthcare colleges and institutions, which needs urgent intervention as these students are becoming addicted to smartphone usage.

KEYWORDS: Nomophobia, Depression, Quality of Life

INTRODUCTION

It is now practically impossible for a person to stay away from their mobile phone as they have been handling various tasks for the person. Especially during the Covid-19 pandemic, smartphones made the student dependent on their phones. As a result of these lockdowns, these students were glued to their phones after attending their online classes for browsing social media, watching videos, playing games and many more tasks.

However, this has led has led to a new condition among such mobile phone users, which is termed as “nomophobia”. Literally put, it is the addition of the words “no”, “mobile” and “phobia”, that is a fear of not having mobile phones and psychological symptoms that arise due to fear of loneliness as virtual communication becomes indispensable part of our life.¹

A research in Mumbai reported that 58% of their respondents could not manage even one day without a mobile phone.² These nomophobics have also been reported to have mood swings and try to remain

connected hold on to a mobile; they have also been reported to have hallucinations of false mobile sounds and ring tones even while sleeping and this tends to affect performance in daily life.

The Indian market has been reported as the second-largest market after China for mobile phone handsets, this demand being driven by the booming population and an increase in mobile related apps and the need to stay connected as well as for safety reasons.^{3,4} Since the younger generation is technology savvy, and depends on their mobile phone for their day to day uses, the present study was conducted to assess the level of mobile phone dependence (nomophobia) on students of healthcare colleges and institutions.

MATERIALS AND METHOD

The present study was conducted over a period of two months and was cross-sectional in nature. The study participants included 432 students and interns belonging to various healthcare colleges and institutions in and around Nagercoil, Tamil Nadu using convenience sampling and after obtaining proper



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approval from the concerned authorities.

Students aged 17 years or higher and using mobile phones on a regular basis (atleast for 4 months) for at least 1–2 hours per day we included. Students reporting a history of alcohol or substance abuse and any psychiatric or sleep disorder requested to decline answering the questionnaire. Data was collected using a pre-tested and a pre-validated questionnaire and was distributed via online medium. To maintain data confidentiality, no personal data was collected from the students. The language of the questionnaire was English and all the questions were objective and multiple-choice type. The questionnaire included demographic details including age, gender, socioeconomic status, and residence; mobile phone, Sleep Quality Index (PSQI) details.

Mobile phone dependence was obtained from Raines ML et al. and modified accordingly. Every question was compulsory and consisted of three responses depicting maximum to minimum mobile phone association. Scoring was done on the basis of response to each of the question. Score obtained below 20, 20–24, and above 24 were labelled as participants not at risk, at risk, and nomophobia, respectively.

Data was entered into SPSS version 24.0 and statistical test used were the student's t-test and logistic regression and Pearson's correlation keeping p value significant at ≤ 0.05 .

RESULTS

The demographic details as well as the smartphone usage, sleep quality index and the nomophobic scores are described in table 1. It was observed that most of the students were males (53.9%) and most students were ≥ 20 years in age (43.5%). 46% of the students reported using their smartphone for more than 2 hours a day and 59.9% of them reported having a poor sleep quality index of >5 (59.9%). Most of the students (40%) reported a nomophobic score of >24 .

The gender wise distribution with respect to the nomophobic score and the year of study is depicted in table 2. The highest percentage of males (53.2%) as well as females (51.3%) reported having a nomophobic score of >24 and the difference was found to be statistically significant (0.02) along with a positive correlation ($r=+0.76$). Most males (43.3%) belonged to the 2nd year of their study while most females (43.3%) were

CHARACTERISTICS	N,%
Gender	
Male	233 (53.9)
Female	199 (46.1)
Age (in years)	
≤ 17	105 (24.3)
18	86 (19.9)
19	53 (12.3)
≥ 20	188 (43.5)
Smartphone use duration (except calling)	
>1 hour/day	85 (19.7)
$>1-2$ hours/day	148 (34.3)
>2 hours/day	199 (46)
Sleep Quality Index	
<5 (Normal)	177 (40.1)
>5 (Poor)	255 (59.9)
Nomophobic score	
<20 (No Risk)	145 (33.6)
20–24 (At Risk)	114 (26.4)
>24 (Nomphobia)	173 (40)

Table 1. Demographic details as well as the smartphone usage, sleep quality index and the nomophobic scores

studying in courses having more than 3 years of study/were interns.

Analysis of the logistic regression revealed a positive, linear and significant association with higher nomophobic scores and poor sleep quality index scores ($r=+0.69$, $p=0.02$ for nomophobic score >24).

DISCUSSION

The present study revealed a high on nomophobia prevalence among students of healthcare colleges and institutions, which needs urgent intervention as these students are becoming addicted to smartphone usage. This addiction can lead to serious health consequences along them and affect their quality of life as it may lead to serious psychiatric(5) and psychological problems among them.⁵

It was observed that 46% of the students reported using their smartphone for more than 2 hours a day. These findings are similar to Mallya et al. who, among medical students reported that 33.8% of students frequently used smartphone while at work, and 57.9% expressed anger over not being able to use the smartphone when desired.⁶

Nomophobia among students was reported to be 53.2% among males and 51.3% among females (score of >24). This is higher as compared to the results of Mengi A et

	Males	Females	p value	r value
Nomophobic score				
<20 (No Risk)	43(18.5)	55(27.6)	0.07	+0.76
20-24 (At Risk)	66(28.3)	42(21.1)	0.45	
>24 (Nomphobia)	124(53.2)	102(51.3)	0.02*	
Year of Study				
1 st year	57 (24.5)	13(6.5)	-	-
2 nd Year	101 (43.3)	32(16.1)		
3 rd year	36(15.5)	68(34.1)		
> 3 rd Year/Internship	39(16.7)	86(43.3)		

Table 2. Gender wise distribution with respect to the nomophobic score and the year of study of the students

al.(40%)⁷, Choudhury et al. (14.6%)⁸ and lower in comparison to the 75% reported by Dasgupta et al.⁹ A difference in methodological approach due to the use of different questionnaires used for assessment of nomophobia precludes an accurate comparison with the results of our present study.

In the present study, a direct, significant relationship (($r=+0.69$, $p=0.02$ for nomophobic score >24) between nomophobia score and sleep quality index (PSQI) was observed. It is well documented that disturbed sleep patterns has the potential to have serious impacts on health, which can cause waking time tiredness has been observed with mobile phone overuse and a tendency toward addiction was also reported in the studies.^{7,10}

Since this study was exploratory in nature, further studies are warranted to either support or refute our findings. However, keeping the limitations in mind (small sample size and city based sample), it can be safely stated that the results of the present study can be generalized for all healthcare college and university going students.

CONCLUSION

Based on the results, urgent health interventions and proper screening of nomophobes in a college setting is required to reduce the incidence of this disease. In a

post-pandemic world, colleges are advised to resume with extra-co-curricular activities no involving the use of smartphones as well as encouraging students to take up physical activities to stay from their smartphones as much as possible.

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Sleep Quality Score				
	<5	>5	p value	r value
Nomophobic score				
<20 (No Risk)	39	54	0.88	+0.69
20-24 (At Risk)	38	63	0.72	
>24 (Nomphobia)	100	138	0.02*	

Table 3. Logistic Regression and Correlation analysis if Sleep Quality Scores and Nomophobia among students

details.

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