

Trends in Usage of Dental Lasers and its Perception Amongst Dental Surgeons of Northwest India - A Cross Sectional Survey

Bhavika Gupta¹
 Arpit Sikri²
 Urvi Marwaha³
 Tarun Kalra⁴
 Aryan Wadehra⁵

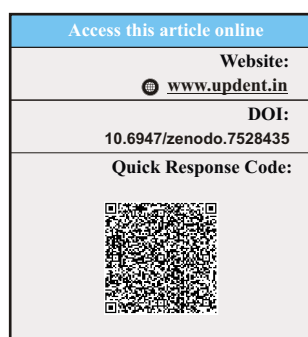
Intern¹
 Dr. Harvansh Singh Judge Institute
 of Dental Sciences & Hospital,
 Chandigarh;

Associate Professor & Post Graduate Teacher²
 Dept. of Prosthodontics & Crown & Bridge,
 Bhojia Dental College and Hospital,
 Baddi, Himachal Pradesh

Post Graduate Student (3rd Year)³
 Dept. of Prosthodontics & Crown & Bridge
 Bhojia Dental College and Hospital,
 Baddi, Himachal Pradesh

Principal, Professor & Head⁴
 Dept. of Prosthodontics & Crown & Bridge
 Bhojia Dental College and Hospital,
 Baddi, Himachal Pradesh

Intern⁵
 Dept. of Prosthodontics & Crown & Bridge
 Bhojia Dental College and Hospital,
 Baddi, Himachal Pradesh



Abstract

Background: Despite being around since 1960s in the field of medicine, the acceptance of Lasers is still limited in dental practices. This study is to evaluate the prevalence of Lasers, its practice for periodontal procedures in dental clinics of Delhi NCR and Chandigarh Tricity (North-West India region) and to assess the perception of dental surgeons towards training, patient acceptance, and possible trend in usage in a post COVID 19 era.

Methods: An online, validated questionnaire of 25 questions was distributed amongst 200 dental surgeons in Delhi NCR and Chandigarh Tricity region. The survey was divided into 6 sections; first section contained questions regarding demography of respondents, second section was for those who use Lasers in their practice, third section was for those who don't use dental Lasers, and the next three sections were for all the respondents, evaluating perception of dental surgeons on training needs, acceptance of patients to Lasers and the probable trend in LASER usage in a post pandemic world.

Result: A response rate of 61.5% was achieved with 123 dental surgeons responding to the survey. 42.3% dental surgeons reported to use Lasers in their practice with a majority of 74.5% using diode Lasers. Most dental surgeons reported that they used Lasers for soft tissue surgical procedures like gingivectomy, gingivoplasty, frenectomy, soft tissue crown lengthening followed by bacterial reduction therapy like periodontal pocket disinfection and Laser assisted periodontal therapy (LAPT). The major barriers preventing dental surgeons from adopting Laser dentistry include lack of guided training and high initial investment costs. 29% dental surgeons using a Laser received training during formal graduation or post-graduation training and 27% received training through continuing dental education programs (CDEs) and hands on courses. Majority dental surgeons agree that there is good patient acceptance to Lasers and that Lasers add a brand value to their clinical practice. Most dental surgeons (64%) will be willing to invest in Lasers if they are made cheaper and are unsure if Laser usage is safe or will improve in the near future of a post COVID world.

Conclusion: Diode Lasers are the most commonly used type of Lasers in dental clinics of Northwest India. Integrating theoretical and practical training in formal curriculum can play a key role in better acceptance of dental Lasers amongst dental surgeons.

Introduction

Laser stands for Light Amplification by Stimulated Emission of Radiation. In 1960, Maiman built the first working LASER gadget utilizing a synthetic pink ruby crystal as the active LASER medium.⁽¹⁾ Since then, Laser technology has taken the medical field by storm with the various new Laser systems being created and improved for better application in medicine and dentistry.

Lasing occurs via the spontaneous emission of a photon by an atom, stimulating the release of another photon and so on: generating a coherent (photons emitted vibrate in phase agreement in space and time), monochromatic (waves emitted have same

wavelength and energy), and collimated (constant size and shape of the beam emitted) beam of light.^(2,4)

This light is produced by energizing a certain substance (called gain medium, Laser systems are usually named after its ingredients) within a resonating chamber.⁽³⁾

Light energy produced can have 4 interactions within the tissue - reflection, scattering, absorption, and transmission. The wavelength of the LASER has a profound effect on the type of interaction that takes place. For biological tissues, higher absorption occurs in wavelengths with greater absorbance in water. Absorbing of the Laser increases the temperature, producing photochemical effects.⁽⁴⁾

When the temperature touches 100 degrees celsius, water vaporizes within the tissues and is called ablation. At temperatures above 60 degrees celsius and below 100 degrees Celsius, denaturation of proteins occurs without vaporization of the tissue beneath. At temperatures above 200 degrees celsius, carbonization occurs wherein the tissue is burned after becoming dehydrated.⁽⁵⁾

Dental Lasers have many applications in various specialities of dentistry. One of the specialties where they are used commonly is Periodontics, for both surgical as well as non-surgical treatments. Various types of dental Lasers and their common applications in periodontics have been highlighted in table 1.⁽⁶⁾

Materials and Methods

An electronic questionnaire was prepared using Google Form. The questionnaire contained 6 sections. Section 1 contained questions on personal information, demographic information, professional information, and if the dental surgeon used a Laser or not. Section 2 was limited to those dental surgeons who used a Laser and contained questions related to their practice and usage of Lasers. Section 3 was limited to those dental surgeons who didn't use a Laser and contained questions based on their perception of Lasers. Section 4, 5, and 6 were for all respondents and contained questions that would help estimate the dental surgeon's perception on training needs for Lasers, general patient acceptance to Lasers, and the possible trend in Laser usage in a post COVID 19 world.

The questionnaire was first sent to 5 post graduate students to record their answers and validate the survey. After validation, the questionnaire was circulated amongst dental surgeons through Whatsapp, i.e.a messaging platform. The responses were recorded in an automatically generated Google Sheet document. From all the responses, the duplicate responses were removed. Ultimately, from among 200 dental surgeons to whom the form was sent personally, 123 dental surgeons filled the form: providing us with a 61.5% response rate. The sample size hence was of 123 dental surgeons practicing in the regions of Delhi NCR or Chandigarh Tri City Area (two major cities in Northwest India).

A descriptive analysis was performed on the acquired data using Microsoft Excel to study basic trends of distribution, prevalence, and common perception of dental Lasers amongst dental surgeons of Northwest India.

Results

The survey was circulated amongst 200 dental surgeons of Chandigarh and Delhi NCR, out of which 123 responded: providing a response rate of 61.5%. The result and analysis from the survey has been condensed to 6 distinct sub sections; each of which has been elaborated below.

Demographic profile of sample size:

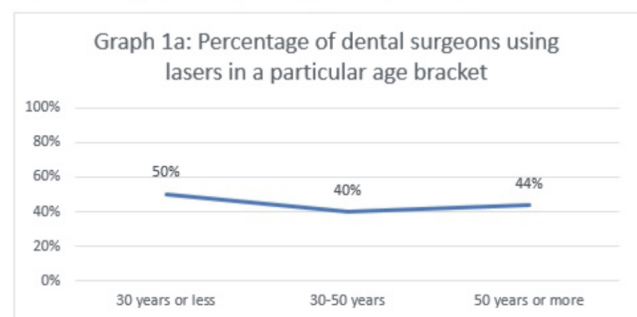
As summarized in Table 2, survey respondents were nearly equally distributed amongst the two cities involved in the study. Majority respondents were male and fell in the 30-50 years age bracket.

Respondents were also asked about the number of years they had been practicing dentistry, i.e. their dental tenure. Most had a tenure of 10-20 years, followed by a tenure of 20-30 years; indicating a sample size of seasoned dental surgeons.

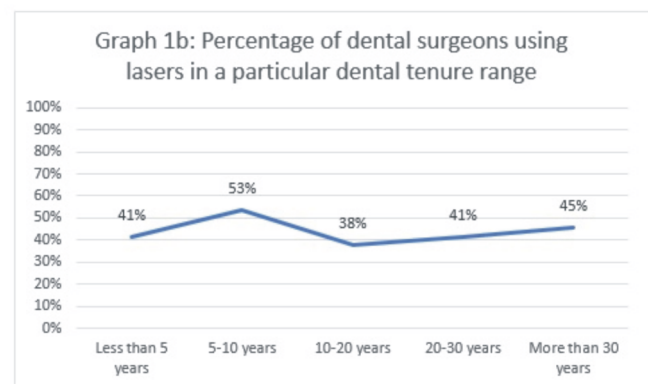
Maximum respondents owned a private practice of their own and worked in a clinic with a smaller to medium OPD size of less than 300 patients per month. Half of the sample size included general dental surgeons, followed by endodontists, periodontists, and orthodontists.

As depicted in **Graph 1a**, Laser usage is almost evenly distributed amongst all the age groups but is slightly higher in the younger age bracket. While Laser usage is relatively evenly distributed amongst all dental tenures, **Graph 1b** indicates that Laser usage is high amongst early tenure dental surgeons, especially amongst dental surgeons with 5-10 years of experience. **Graph 1c** indicates that while the absolute count of dental surgeons using Lasers is high amongst private practice owners, relatively the proportion of dental surgeons in a government college/hospital setup are more likely to use Lasers. Similarly, in **Graph 1d**, as the practice size increases, the proportion of dental surgeons more likely to use Lasers also increases while the absolute count may be much less. Dental surgeons with a post graduate qualification are more likely to use Lasers than dental surgeons with an undergraduate qualification according to **Graph 1e**.

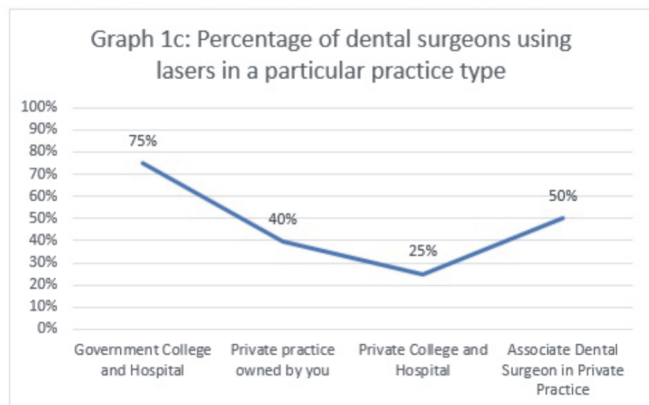
Graph 1a: Percentage of dental surgeons using lasers in a particular age bracket



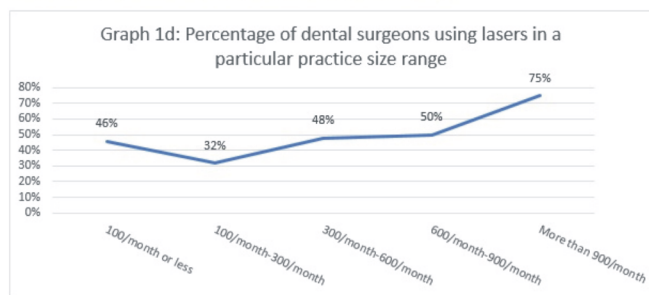
Graph 1b: Percentage of dental surgeons using lasers in a particular dental tenure range



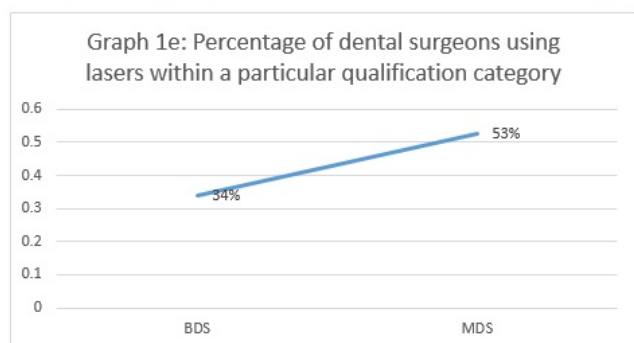
Graph 1c: Percentage of dental surgeons using lasers in a particular practice type



Graph 1d: Percentage of dental surgeons using lasers in a particular practice size range



Graph 1e: Percentage of dental surgeons using lasers within a particular qualification category



Trends amongst Laser users

As shown in Table 3, diode is the most used Laser amongst the respondents by a huge proportion. It is followed by other soft tissue Lasers like CO₂ and Argon Lasers. Only 5.1% of the respondents who used Lasers used hard tissue Lasers. Within periodontics, respondents liked to use Laser mostly for soft tissue periodontal surgeries. 15.5% dental surgeons used it for soft tissue surgical procedures like gingivectomy, gingivoplasty, frenectomy, and 14.4% used it for soft tissue crown lengthening. After soft tissue surgeries, it is commonly used for periodontal therapy procedures like periodontal pocket disinfection (13.0%), Laser assisted periodontal therapy (10.0%), treatment of peri-implantitis (8.9%), etc. Most respondents (53.8%) who used dental Lasers used them as frequently as once a week. Only 9.6%

used it daily. Out of the dental surgeons who used dental Lasers, most (95.5%) kept themselves updated about Lasers and its technology. Most dental surgeons reported confidence in using a dental Laser, 38.5% said that they sometimes feel anxiety while operating a Laser.

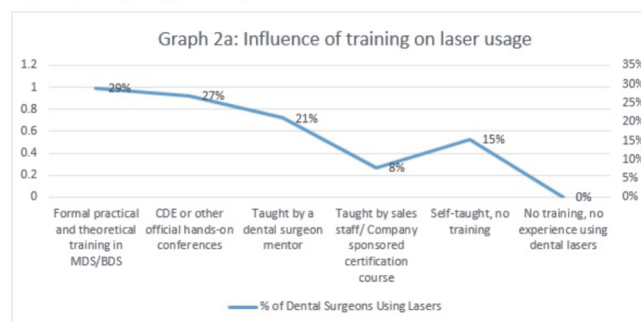
Trends amongst non-Laser users

According to table 4, 21.6% of the dental surgeons who weren't using dental Lasers in their daily practice were planning to invest in a Laser soon. As stated in the table, most (38.1%) were planning to invest in a diode Laser further emphasizing its high acceptance amongst dental surgeons. 19% were planning to invest in Er, Cr: YSGG. Amongst dental surgeons who were not using Lasers, majority did not think any measure can get them to start using dental Lasers while the response from the rest highlighted the two main barriers dental Lasers face, i.e. lack of training and high purchase cost.

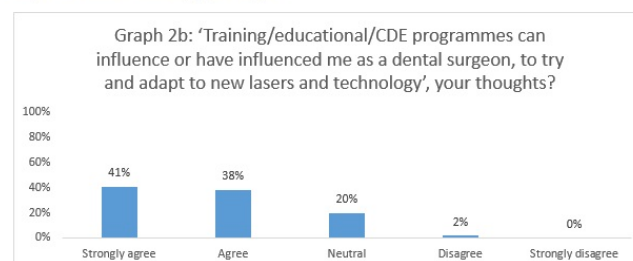
Perception on training and knowledge of Lasers

According to **Graph 2a**, most dental surgeons who used Lasers received training on Lasers through their graduation or post-graduation curriculum. Without any training or experience, no dental surgeon had used Lasers. Majority dental surgeons strongly agreed that CDE programs did influence them to adopt Laser dentistry as shown in **Graph 2b**. As shown in **Graph 2c**, dental surgeons unanimously responded that more information about Laser dentistry should be provided in the formal curriculum of graduation and post-graduation studies in dentistry. Only 6% were on the fence about it and 1% disagreed, with no one strongly disagreeing.

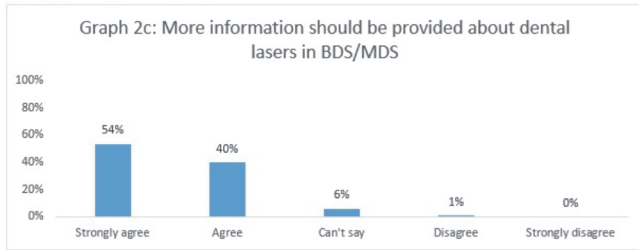
Graph 2a: Influence of training on laser usage



Graph 2b: 'Training/educational/CDE programmes can influence or have influenced me as a dental surgeon, to try and adapt to new lasers and technology', your thoughts?



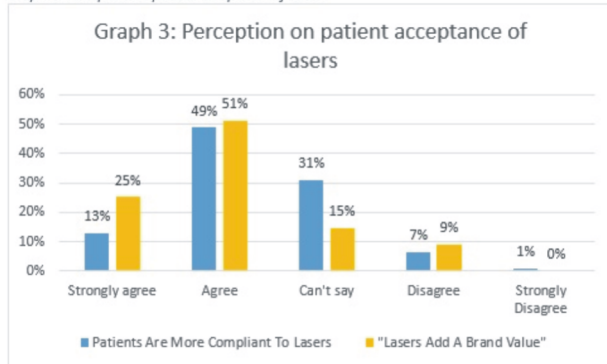
Graph 2c: More information should be provided about dental lasers in BDS/MDS



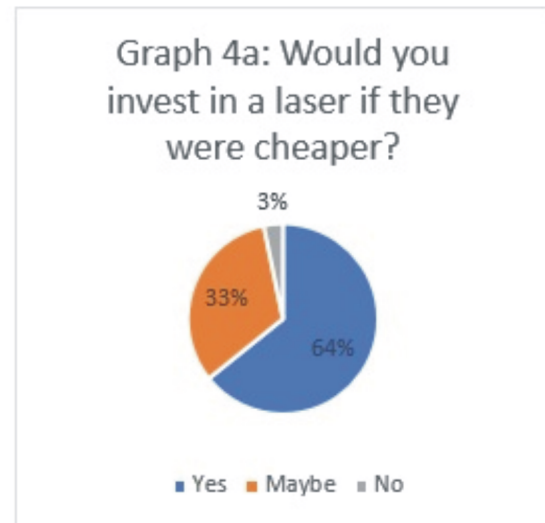
Perception on patient acceptance of Lasers

Graph 3 shows that according to most dental surgeons, patients were more compliant to procedures performed with a Laser rather than those performed with a scalpel or rotary instrument. Out of the 9 dental surgeons who disagreed or strongly disagreed to the statement discussed above, 4 dental surgeons said that patients generally had a negative perception of it being too expensive, 4 dental surgeons said that patients had no negative perceptions or apprehensions, and 1 dental surgeon said that patients found it too intimidating. Most dental surgeons also agreed that dental Lasers added a brand value to their practice. 76% dental surgeons fell on the agreeable side while only 9% fell on the disagreeable side and 15% stayed undecided.

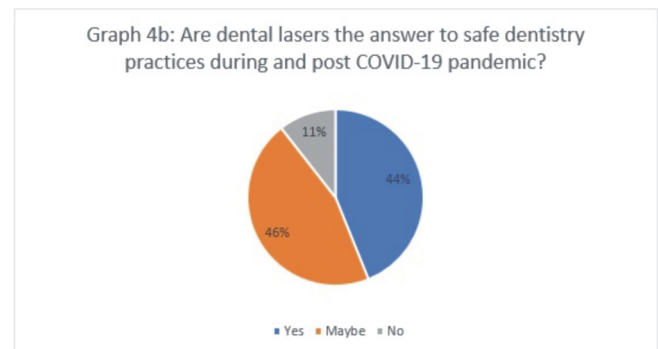
Graph 3: Perception on patient acceptance of lasers



Graph 4a: Would you invest in a laser if they were cheaper?



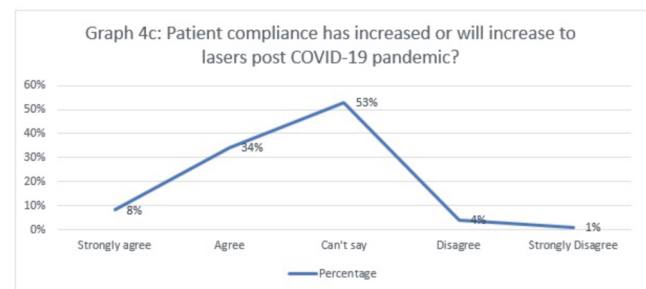
Graph 4b: Are dental lasers the answer to safe dental practices during and post COVID-19 pandemic?



Perception On Laser Usage Post Covid 19

Most dental surgeons (63%) responded that they would invest and adopt dental Lasers into their practice if they were made cheaper (Graph 4a). According to Graph 4b, most dental surgeons were still unsure about how safe it was to use dental Lasers during the COVID 19 pandemic. Majority (46%) dental surgeons remained undecided on the safety of using dental Lasers while 44% thought it would be safer as compared to scalpel and rotary instruments. As shown in Graph 4c, most dental surgeons (53%) responded that they could not for sure decide if patient compliance for Lasers had increased during COVID. But still 34% dental surgeons, said that patient compliance had or would increase, which was considerably a higher number than 5% who either disagreed or strongly disagreed to the statement discussed.

Graph 4c: Patient compliance has increased or will increase to lasers post COVID-19 pandemic?



Discussion

There is a significant indication to how popular diode Lasers are amongst dental surgeons which can be explained by the various advantages it has over the other Laser systems including: their portable size, more economical price range, and varied applications in multiple dental soft tissue procedures. Diode has a near infrared (NIR) wavelength of 810nm which provides it with the ability to perform various functions like ablation, coagulation, disinfection, haemostasis, reducing post operative edema, decreased scarring, and improved healing with photo biomodulation.⁽⁷⁾

Hard tissue Lasers like Er:YAG and Er, Cr: YSGG lack representation in dental clinics which could be explained by a lack of awareness and high costs as compared to soft tissue Lasers. **Dhayanidhi et al.⁽⁸⁾**, conducted a study in Coimbatore, India, in which they concluded that while majority dental surgeons are aware of the application of dental Lasers on soft tissues, many are unaware of the hard tissue applications – indirectly indicating the lack of awareness about the hard tissue Lasers.

Along the same lines, Lasers are commonly used for soft tissue procedures due to more awareness about soft tissue application of Lasers and the popularity of diode Lasers amongst the dental surgeons. In the current survey study, it was observed that within periodontics, Lasers are mostly being used for gingivectomy, gingivoplasty, frenectomy, soft tissue crown lengthening, periodontal pocket disinfection, Laser assisted periodontal therapy, peri-implantitis treatment, gingival depigmentation, second stage implant surgery, and more.

Yadav et al.⁽⁹⁾ conducted a survey in 2016 assessing the awareness and practice of Lasers amongst dental surgeons in India and found that out of those dental surgeons who used Lasers, majority used it once a month or less. In our study, we found that majority use it weekly. However, keeping biases in mind, a trend can't be accurately established.

Most dental surgeons believed that the biggest hurdle in adopting Laser technology in their practice is high initial purchase cost and the resultant patient un acceptance to pay a higher fee for the treatment.⁽¹⁰⁾ However, **Wigdor et al.⁽¹¹⁾**, concluded that overall patients had a positive perception of Laser dentistry; majority would be willing to pay more, and thought that it would be less painful and faster. With high patient acceptance, Lasers can add more brand value to the dental practice.

Another hurdle in acceptance of Lasers by dental surgeons is the inadequate knowledge amongst dental surgeons. Al-Jobair et al.⁽¹²⁾ reported that the majority (76%) of final year dental students in a University of Riyadh, Saudi Arabia, had inadequate knowledge of Lasers and its uses in dentistry. **Yadav et al.⁽⁹⁾** summarised that for many students their undergraduate knowledge and experience formed the foundation of their future practice. Hence, inclusion of theoretical and practical training on LaserRs within the undergraduate curriculum might increase its acceptance with time.

During the COVID 19 pandemic, disinfection and sanitation of operative rooms had taken a front seat to minimize transmission of the virus. While dental Lasers don't produce aerosols like conventional rotary instruments, they do produce Laser plume or smoke which contains 95% water and 5% other materials⁽¹³⁾. Viral DNA of HPV has been found in Laserplume.⁽¹⁴⁾ Hence, Laser might not be a safer alternative to conventional rotary instruments. Lack of awareness about this can create a major problem in the future and therefore awareness about safety measures with respect to Lasers should be made a priority by curriculum deciders and course organizers.

Conclusion

Diode type of Lasers are distinctly the most commonly used type of Lasers in dental clinics of Northwest India. Lasers are commonly used for the soft tissue dental procedures rather than the hard tissue procedures. Dental surgeons with a post doctoratedegree working in a government aided dental setup are more likely to be using Lasers in their clinical practice. Dental surgeons using dental Lasers are more likely to keep themselves updated about Lasers and experience no anxiety in operating one. The two major barriers stopping dental surgeons from adopting dental Lasers are lack of training and high costs of Lasers. Dental surgeons unanimously agree that training in the use of dental Lasers should be included in graduation or post graduation studies. Majority dental surgeons agree that dental Lasers add a brand value to their clinical practice and that the patient compliance is higher to Lasers as compared to scalpel or rotary instruments. Dental Lasers produce infectious aerosols in the form of Laser plume and knowledge about it being unsafe is lacking amongst the dental surgeons.

Acknowledgement

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Dental Management of Children With Cerebral Palsy, Mental Retardation, Autism & Epilepsy : A Review

Dr. Deepika Sharma¹
 Dr. Ashish Saxena²
 Dr. Vishal Khandelwal³
 Dr. Neha Verma⁴

II Year Resident¹
 MDS
 Dept. of Pediatric & Preventive Dentistry,
 Govt. College of Dentistry, Indore

Professor & Head²
 MDS
 Dept. of Pediatric & Preventive Dentistry,
 Govt. College of Dentistry, Indore

Assistant Professor³
 MDS
 Dept. of Pediatric & Preventive Dentistry,
 Govt. College of Dentistry, Indore

Lecturer⁴
 MDS
 Dept. of Prosthodontics, Crown & Bridge
 Govt. College of Dentistry, Indore

Abstract

Children are our future society and assuring their healthy growth and development must be the most important consideration for all. Children with special health care needs (SHCN) have compromised oral health condition as it may be directly or indirectly associated to their disabilities. There is an increased prevalence of gingival diseases and dental caries among Children with SHCN due to poor oral hygiene. Sadly, the significance of dental care for these children has often been missed by the health care workers. The more compromised their general health conditions, the more dental care needs they have. During earlier days, providing basic dental care was the prime concern, but in recent years, the dental profession has emphasized more on complete oral health care to the special health care needs children. Pediatric Dentistry is a specialized branch that provides primary, comprehensive, preventive and therapeutic oral health care to children with Special Health Care Needs.

Children with Special Health Care Needs may experience challenges in many ways such as intellectual disability, physical disability, medical disability, Genetic disability and learning disability. The document addresses intellectually challenged patients including Cerebral Palsy, Mental Retardation, Epilepsy and Autism.

Co-ordination and Consultation with medical and other dental professionals may be required for cautious delivery of oral health care and to enhance long term good results for such patients.

Keywords:

Special Health Care Needs Children, Intellectually challenged, Dental Management of Special Children, Behaviour Management, Oral hygiene.

Introduction

The birth of a child is an occasion of great happiness and joy and is always eagerly awaited by the family members, but when it becomes evident that something is inappropriate with their neonate, their entire world is made into pieces from a whole. The parents of such children start suffering from anger and denial. The child may be nurtured with great love and affection as he grows but, at times, the parents may express their anger on the child who suffers without his own fault. It is difficult to maintain general and oral health of such children and their dentition may be damaged by caries and periodontal diseases. Hence the management of these "God's forgotten children" is a task which needs special effort on the part of the dental surgeon and pediatric dentist^[1].

Children with special health care needs are those who have certain disability that restricts them in performing daily life activities. They experience higher health care utilization and

expenditures than the average paediatric population. Individuals with special health care needs may be at an increased risk for oral diseases, that can have a direct and devastating impact on the general health of special children^[2]. In India about 6-10% of children are born disabled and one-third of the total disabled population is comprised of children^[3]. Conditions like Attention Deficit Hyperactivity Disorder(ADHD), Autism, Down's Syndrome, Congenital Heart Disease, Cerebral Palsy, Mental Retardation and Systemic Diseases become a great challenge for the Special health care needs children affecting their overall quality of life so their requirements are also distinctive, and need specialized, multidisciplinary approach for their oral health care^[4-6].

The American Academy of Paediatric Dentistry (AAPD) accepted that delivering primary, comprehensive, preventive and therapeutic oral health care to children with special health care needs is a crucial part in the

