International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 9 Issue 07, July-2020

Low Level Laser Therapy for Non-Invasive Dental applications: A Review

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Abstract— **Laser therapy has an excellent track record in medical applications, and it has made its unmatched position by treating several dental problems. Laser devices has successfully improved healthcare in medical field by providing non-invasive and painless ways of treatment. In this paper the systematic review has been conducted for the comparative study of Laser technology using Low Level Laser Therapy in dental applications. For this the database is looked through utilizing Pubmed, IEEE, Science Direct utilizing foreordained inquiry term Low Level Laser Therapy and Laser treatment in dental treatment for the most part centered around laser diode dental treatment. Our clinical comparative study shows that Laser therapy is a painless treatment which may help fast healing in less time as compare to traditional treatment.**

Keywords—LLLT, Dental, Laser application, Laser Parameters, soft tissue laser.

I. INTRODUCTION

Word "laser" is an abbreviation for Light Amplification by the Stimulated Emission of Radiation. The primary low-level remedial laser was created in 1962. Before the finish of the 1960's, Endre Mester in Hungary was announcing an improved recuperating of wounds through low-level laser radiation. From that point forward, researchers and specialists around the globe have been utilizing laser light to treat conditions which can influence all age gatherings [1, 2].

Low Level Laser therapy is the use of coherent beams of laser light is used to diagnose or treat medical conditions. Lasers have four main parts: the active medium, the excitation mechanism, the feedback mechanism, which is usually a reflective mirror, and the output coupler. Laser light is created by controlled emissions which allows a doctor to target a specific tissue, as the light is focused and can be turned on and off easily. Lasers are treated in two ways, contact and non-contact mode. Contact lasers work by sending a light through a fiber tip or sapphire tip. The tip absorbs energy and becomes hot. When the hot tip touches any live tissue in the body, the target cells are vaporized, which is the removal of tissue through the conversion of a solid to a gas. Noncontact lasers do not touch the tissue [3]. They operate by transferring laser light as radiant energy in a single beam to the tissue. Heat is generated after the laser's radiant energy is absorbed by the targeted tissue. The light vitality created by a laser can have four distinct communications with an objective tissue: Reflection, Transmission, Scattering, and Absorption. At the point when a laser is retained, it lifts the temperature and produces photochemical impacts relying upon the water substance of the tissues. At the point when a temperature of 100°C is reached, vaporization of the water inside the tissue happens, a procedure called removal. At temperatures underneath 100°C, yet above around 60°C, proteins start to denature, without vaporization of the hidden tissue. On the other hand, at temperatures above 200°C, the tissue is got dried out and afterward consumed, bringing about an unfortunate impact called carbonization.

Low Level Laser Therapy (LLLT) is an application of light over the injuries or lesions to improve the healing and it can regenerate damage cell tissue or it can destroy unwanted cells like a cancerous cell. At the point when the right force and treatment times are utilized, laser light can lessen oxidative pressure and builds the Adenosine Tri-Phosphate which improves cell's digestion and expands its wellbeing [6]. LLLT gadgets incorporate the gallium arsenide (GaAs), gallium aluminum arsenide infrared semiconductor (GaAlAs), and helium neon (HeNe) lasers. Our focus is on Diode laser because of its wavelength spectrum (810–1064 nm) is very much consumed by melanin, hemoglobin, and different chromophores that are normally present in periodontal tissues [7, 8]. In diode laser the laser energy can be transmitted through a fiber as small as 600µ, 400µ and 200µ Diameter Size so that it can undoubtedly infiltrate profound periodontal pockets to convey its restorative impacts [8]. Along with these features, it also has the added advantages such as portability, convenience and cost efficiency. Hence it can be easily incorporated into the dental practice [8]. Diodes dynamic vehicle of aluminum, gallium and arsenide, strong semiconductor working at 810–980 nm. frequencies ingest exceptionally pigmented tissues containing hemoglobin, melanin and collagen chromospheres. This clarifies particular activity of diode lasers on the delicate tissue tasks, for example, cut, vaporization, blood coagulation, curettage and hemostasis than dental hard tissues [9]. Currently most commonly used wavelengths for dental treatment are 810 and 980nm [10]. Where 810 nm frequency is explicit for hemoglobin retention; the 940nm frequency gives a decent proportion between the light illuminated into the tissue and the assimilation by hemoglobin and water; the 980nm frequency is with the end goal that it is explicit for hemoglobin and water. [11, 12]. The laser technology for LLLT treatment are mostly used with proper setting of parameters and may be used for the treatment of wound healing, soft tissue injury and relief of pain. Study shows that there may be strong results and weak results of treatment, generally weak results are because of incorrect parameters setting and strong results shows treatment efficacy on healing.

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In This paper the Literature is divided into five section in first section brief introduction has been explained with background of topic. In next section detailed review has conducted from good publications such as Pubmed, Springer, IEEE searched on google search engine. A comparison of clinical study table is designed of Laser diode and its parameters effect on clinical outcomes. Section three shows the applications of laser treatment used for dental treatment. Section four describe various laser diode parameters and their mathematical calculation formulas followed by the conclusion.

TABLE 1: COMPARISON TABLE FOR VARIOUS TYPE OF LASERS USED IN MEDICAL APPLICATIONS.

S. No.	Laser	Type	Wavelength (nm)/ Power (mW)	Delivery System	Chromophore	Applications
1.	Argon	Gas	488-515nm. (200-250) mW	Optical Fiber	Water, Hydroxyapatite	Soft tissue only. Pocket debridement and deepithelialization for GTR.
2.	He-Ne	Gas	632nm. (Upto 200mW)	Optical Fiber	Water, Hydroxyapatite	Dentine Hypersensitivity, Analgesia
3.	Diode InGaAs (655nm) GaAl (840nm) GaAlAs (808 nm.)	Solid	810-980nm. / (Upto500) mW.	Optical Fiber	Melanin, Hemoglobin	Primarily soft tissue applications- all minor surgical procedures, melanin pigment removal, sulcular debridement.
4.	Nd-YAG	Solid	1064 nm.	Optical Fiber	Melanin, Hemoglobin	Primarily soft tissue applications- all minor surgical procedures. Effective for soft and Hard tissue, Hemostasis, treatment of aphthous ulcers, or pulpal analgesia
5.	Ho-YAG	Solid	2120 nm.	Optical Fiber	Water, Hydroxyapatite	Cleaning and shaping of the canal after biochemical preparation
6.	Erbium family Er-Yag (2940 nm) Er Cr Ysgg (2780 nm)	Solid	2790-2940 nm.	Optical Fiber Waveguide	Water, Hydroxyapatite	Dentin hypersensitivity, modification of enamel and dentine surface, aphthous ulcer treatment, soft tissue surgery
7.	CO_2	Gas	9300, 9600, 10600 nm.,	Articulated Arm, Waveguide	Water, Hydroxyapatite	Intra Oral implant soft tissue surgery, aphthous ulcer.

II. LITERATURE REVIEW

Study of literature review has been conducted from some scientific research articles and journals available on web science PubMed, Springer, science direct and IEEE. 250 Articles are searched out of which some latest research articles are selected for comparison mainly focused on LLLT using GaAlAs Laser Diode. Figure-1 shows a flow study of review started from search or identification then screening is done on the basis of applications and type of laser used after that full articles are shortlisted for full paper study and only those articles are included in which clinical study is done and results are analyzed with hypothesis testing and compared.

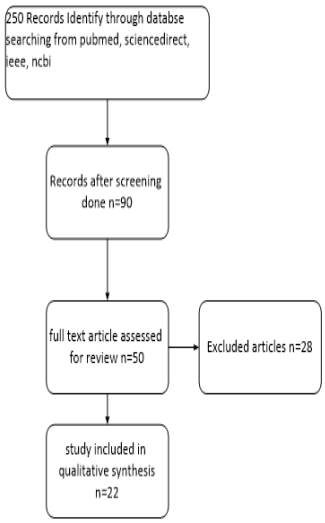

Figure 1: Review Analysis Flow diagram.

Table-2 shows the methods of clinical trials with laser parameters are compared and results shows with proper setting of parameters LLLT provides better results in reducing pain and analgesic effects. This review study shows that Low Level Laser therapy is a wide field of study; many research works has been done on different applications areas with the help of different parameters and wavelengths and much more study needs to be done for different parameter setting at different wavelengths.

TABLE 2: LITERATURE REVIEW TABLE

S. No.	Author (Year)	Methods	Parameters	Outcomes
13.	Guilherme Jose et. al., 2020	In this paper the examination was done to assess the osseointegration of inserts set in regions united with various osteoconductive bone substitutes lighted with infrared low-level laser treatment (LLLT). Examination of 56-rodents were haphazardly designated into 4 gatherings. The joined territories were	GaAlAs Diode: 808nm. Power: 100mW. Mode: CW Laser irradiated with laser tip 10 sec. per point totaling 40 sec. per session Energy: 1 J per point total 4J per session	LLLT performed in areas grafted with osteoconductive bone substitutes prior to implant placement improves osseointegration shows that laser diode device in IR wavelength has better results as compare to Red light laser.

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		treated with LLLT in 7 meetings with 48 h between the illuminations.		
14.	Chong ren et. al., 2019	A randomized controlled preliminary assessment was done with split-mouth configuration was directed in 27 grown-ups with rewarded and controlled incessant periodontitis more than a half year.	GaAlAs Laser Diode: 940nm. Output Power: 800mW. Energy Density: 8.6 J/cm2	Agony is estimated on Visual Analog Scale with score of 0 at the left finish of the scale designated 'no torment', and 100 at the correct end specified 'the most extreme torment'. No Adverse impact is noted during the investigation procedure. The fake treatment bunch had a more prominent amassing of plaque at the gingival edge than the laser gathering, and measurable hugeness was appeared at the 1-month ($P < 0.01$) and 3-month development ($P = 0.03$) visits.
15.	Song Wu et. al., (2018)	In this paper the creator assesses the impact of LLLT on torment and somatosensory sharpening prompted by orthodontic treatment. 40 people isolated into Laser gathering and fake treatment gathering.	GaAlAs 810nm. Laser Diode Mode: CW Power: 400mw With 2 J/cm2	The NRS torment scores were fundamentally lower in the LG gathering ($P = 0.01$). The CDTs, CPTs, WDTs, HPTs, and PPTs at the gingiva and the PPTs at the canine tooth were altogether less touchy on the treatment side of the LG contrasted and that of the PG ($P < 0.033$).
16	M. M. A. Alsayeed Hassan, 2017.	In this paper the evaluation of LLLT on Analgesic effects in orthodontics has been done. 26 patients of orthodontic treatment enrolled and randomly	GaAlAs Laser Diode 830nm. Mode: CW Power: 150mW. Energy: 2 J Dose: 2.25 J/cm2 ON time: 15 seconds/point Irradiation	Principle result measure was the level of agony scored during rumination for each mandibular first molar after 1, 6, 12, 24, 48, and 72 hours of both laser and
		treated with 4J, 16J Laser energy group	dose: 9 J/cm2 with exposure time 60 seconds/point	fake treatment medicines application. A poll with a 100-mm Visual Analog Scale (VAS) was utilized for torment appraisal. Information is examined by SPSS. T-test was utilized to analyze the mean torment scores among laser and fake treatment medicines.
17.	May Ayad Hamid, 2017.	In this paper the aim of study is to evaluate intraoral LLLT on postoperative pain after mandibular third molar extraction on 30 Patients underwent for surgical extractions.	GaAlAs Laser Diode 810nm. Power: 0.1W Mode: CW Exposure time 30sec. Energy: 9J	Introral 810nm GaAlAs laser diode is viable in lessening postoperative agony with portion of 32.86 J/cm2. Information is recorded on visual simple scale for 7 progressive days with $p<=0.05$ significance level.
18.	M. Honarmand et. al, 2017.	Randomized preliminary is led to assess the viability of laser diode for the treatment of repetitive herpes, for clinical trial 60 patients are chosen in isolated into three gatherings in which 20 patients rewarded with laser diode and 20 patients rewarded with acyclovir cream rest 20 rewarded with placebo.	GaAlAs Laser Diode 870nm. Power: 80W Frequency: 600 Hz. Energy Density: 4.5 J/cm2	Torment is estimated on Visual simple scale where 0 is no agony and 10 is most serious torment. This relative examination shows that there is no factually huge distinction seen between these three gatherings. laser diode lessens the injury size with no torment.
19.	MAI M. E. ALMALLAH et. al, 2016.	In this paper a clinical preliminary appraisal is performed on 36 patients somewhere in the range of 12 and 36 years old. All patients taught to rate their agony level on a Visual Analog Scale (VAS). A	GaAlAs Laser Diode: 830nm. Power: 100mW Energy Density: 4J/cm2. Spot Diameter: 7mm. Irradiation time: 28 Seconds per each 4J/cm2	LLLT is successful in reducing post separation pain when experiment is compared with the placebo experiment and data is analyzed on VAS parameter, t-test and ANOVA is measured for statistical

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		line of 100mm length was utilized with the left side speaking to no torment (i.e., score=0) and right side speaking to the most noticeably terrible agony (i.e., score=100).		analysis of data with significance level p<0.05
20.	Antonio Crispino et. al, 2015.	In this paper the clinical experiment is conducted to assess the adequacy of 940nm. Laser Diode on periodontal treatment scaling and root arranging. 68 adult patients are divided onto two groups, 34 patients are treated with scaling and root plant treatment alone another 34 patients treated with laser.	GaAlAs Laser Diode 940nm. Average power: 1W Pulse Frequency: 15 Hz. Mode: Pulse type On -time: 10 ms. Off-time: 20 ms. Optical diameter of fiber: 300-400 µ	Clinical trials data statistically measured with two tail t-test. Both groups shown significant differences compared with p-value. This study shows that gingival index, plaque index and probing death decreases in mean value with laser treatment.

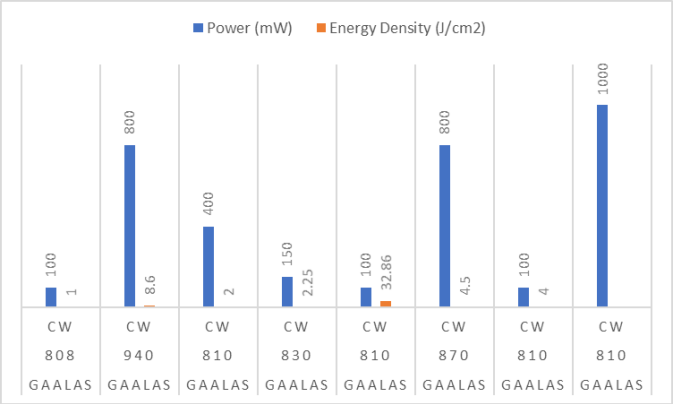

Figure 2: Laser Diode Wavelemgth and Power/Energy chart

III. APPLICATIONS OF LOW LEVEL LASER THERAPY IN DENTISTRY

LLLT has a scope of dental, clinical, physiotherapy applications. Low-level laser applications in dentistry remember the advancement of twisted recuperating for a scope of tissues. They are processed in two formats one is for Soft tissue based and others for hard tissue applications. In dental lasers, the laser light is conveyed from the laser to the objective tissue by means of a fiber-optic link, empty waveguide, or explained arm, centering focal points, a cooling framework, and different controls total the framework. The frequency and different properties of the laser are resolved principally by the organization of a functioning medium, which can be a gas, a gem, or a strong state semiconductor.

A. Soft tissue applications

a) *Aphthous ulcers:* Low level laser therapy can help to increase the fibroblast proliferation by stimulating the laser light into the wound and ulcers. it can transform the fibroblasts into myofibroblasts which may help in rapid healing of ulcers [21].

Vishal et. al. [22] investigated the use of GaAlAs Laser diode of wavelength 940nm. With parameters setting 0.6 W, CW for 30-45 Seconds for first treatment then 0.7 W, CW for 30-45 seconds for second time treatment, 0.8 W, CW for 30-45 Seconds for third time treatment after each pass The recordings were made just before the treatment, immediately after treatment, and every 2 days thereafter for a period of 2 weeks. The patients reported that ulcers started healing earlier than in previous attacks; there was also early reduction in pain.

Hershal et. al. [23] investigated the use of a laser device of 500mW. With wavelength 810nm. On recurrent aphthous ulcer of 30 patients separated in to two different aphthous ulcers treated with one day, two days, and three days follow up concluded that pain and lesion size reduces with complete healing.

b) *Herpes simplex contaminations*: herpes simplex contamination is an infected virus which primarily effects the lips area. Laser treatment may help in reducing the herpes infected area by changing the cells and tissue function also decreases healing time.

Priscila et. al. [24] investigated the treatment of LLLT using GaAlAs Laser Diode device of wavelength 780nm. And 78mW Power treated for 80 seconds at four points on the herpes with total dose of 20 J/Cm^2 and concluded that Laser therapy can help in reducing herpes with less pain.

Marina Stella Bello-silva et. al. [25] investigated that the treatment of herpes simplex virus 1 with low and high intensity laser (indium gallium aluminum phosphide, 660 nm, 3.8 J/cm2 , 10 mW.), (erbium-doped yttrium aluminum garnet, 2.94 µm, 80 mJ/pulse, 2–4 Hz) concluded that laser can completely heal herpes within 10 days of the treatment.

c) *Oral lichen planus:* Oral lichen Planus is a chronic disease into the mouth symptoms shows white patches on the inside of cheeks.

O. Mahdavi et. al. [26], investigated that laser therapy with red diode laser of 630 nm, 10 mill watt Power, 1.5 J/cm^2 Dose treated 150 seconds per session every three days during one month concluded effective with decrease in pain and soreness without any side effects.

d) *Xerostomia:* Xerostomia is not a disease but it causes dryness in mouth reduces saliva may be due to damage of saliva gland. Use of infrared laser shows a noteworthy increment in salivary stream in instances of xerostomia.

Alyne et. al. [27] Investigated that diode laser with parameters (780 nm, 3.8 J/cm2, 15 mW) used to treat xerostomia of 60-year-old woman patient with dry mouth symptoms and Sjögren's syndrome has treated effectively without any side effects.

Bozana et. al. [28] investigated that laser light of pulse Ga-As laser diode with parameters 904nm. Wavelength 246 mW/cm2, 120 Sec. per treatment time during 10 days concluded study that laser is effective on salivary glands.

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e) *Mucositis:* Mucositis is regular finding in the patients who were presented to chemotherapy and radiotherapy for the treatment of threat may Couse ulcer, pain, tissue swelling in the mouth.

T. Zanin et. al. [29] investigated that Laser therapy was performed in combination with radiotherapy and chemotherapy twice a week using a diode laser (660 nm, power 30 mW., spot size 2 mm, energy 2 J per point) on 36 patient of laser group with head and neck cancer concluded that laser therapy is effective in mucositis of patient under the treatment of cancer.

Shoheir Shehata et. al. [30] investigated that 3B Laser device produces pulsed infrared GaAs laser with wavelength of 904 nm, peak power of 25 W, pulse duration of 200 ns, and energy density of 1 J/cm2. Laser therapy was applied on each point for 1 minute with energy density of 3 J/cm2 and treated 80 Patients 6 days/week results concluded Improvement on mucositis for Chemotherapy-induced oral Mucositis (COM).

f) *Paresthesia:* Paresthesia is a Symptoms of abnormal sensation like pin and needles tingling or burning, prickling sensation in the body. In dentistry paresthesia is one of the complexities of careful treatment, most ordinarily observed after the careful extraction of third molars.

Reneta et. al. [31] Investigated that low power laser of wavelength 808nm. Effect the recovery of nerve sensitivity after oral surgery.

Icaro Girao et. al. [32] Investigated that laser of wavelength 660nm. visible red light with parameters 100mW. Power, 140 J/cm2 Energy density, 4 J of energy application per point 0.028 cm2 of spot area used for the treatment of paresthesia into inferior alveolar nerve in first session then 810nm wavelength laser applied concluded that it helps patient in pain with 9 visual analog score.

g) *Periodontitis:* Periodontitis is a gum disease that may causes damaging of soft tissues and it can also damage the bone of teeth if not treated on time.

Tanya M. L. et. al. [33] Investigated that a laser diode of wavelength 940nm. unit (having a maximum power output of 7 W) was used with a 7 mm long, 300-micron diameter, and disposable fiber-optic tip for energy delivery system is applied on 30 patients having chronic to severe periodontitis and concluded that it can help in tissue healing and shows improvement in gingival inflammation.

Lohar Nilam Baburao et. al. [34] Investigated that diode laser of wavelength 980nm power 2W with treatment time per session of 30 sec. in non-contact mode for the treatment of scaling and root planning in periodontitis concluded that root surface slightly altered in the form of cracks.

B. Hard tissue applications

Dentinal hypersensitivity is a tooth sensitivity when sharp pain arises from exposed of dentine surface in response to thermal, chemical, electrical, osmotic, chemical evaporative stimuli. Marwan el Mobadder et. al. [35] conducted a clinical study to investigate dentinal hypersensitivity using 980nm laser diode of 1W Power in continuous mode. Graphite is applied on dentine before treatment and total irradiation time depends on removal of this graphite concluded that dentine hypersensitivity reduces safely in a long-term effectiveness.

Temporomandibular disorders are related to the joints of jaw with teeth. Joints are connected with the mandible bone to the temporal bone. Disorder may Couse pain or tenderness around the ear, jaw joint, face and muscles of the jaw.

Ayyildiz S. et. al. [36] Investigated that laser diode of 685 nm. Wavelength 25 mW. Power 0.02 Frequency with Energy density of 6.2 J/cm^2 three times a week for one month with exposure time of 30 seconds concluded that 685 nm. Laser is effective in reducing pain with limited mouth opening of patient.

IV. LASER DIODE AND ITS PARAMETERS

LLLT right now being followed in all the fortes including orthodontics, wherein it has brought about a superior and patient fulfillment work on, including diminished treatment timings and better outcomes alongside torment decrease methods. It helps in drawing, molding of the delicate tissue, relieving, laser holography and laser welding hemoglobin and it is used in soft tissue applications. Research has shown that the diode laser wavelength (800-980 nm) is ideally suited for numerous soft tissue procedures due to their high absorption in hemoglobin. This fact gives diode laser the ability to precisely and efficiently cut, coagulate, ablate or vaporize the target tissues. The emitted laser energy is scattered in the target tissues and later converted to heat. Conversely, the energy is poorly absorbed by the hydroxyapatite and by water present in the enamel. Specific procedures appropriate to their use include aesthetic gingival re-contouring, soft tissue crown lengthening, and removal of inflamed and hypertrophic tissue.

Wavelength: Frequency is the most significant determinant in how light influences tissue. It is the separation between two progressive peaks of the wave. Each sort of laser has a specific frequency (or frequencies) as indicated by the idea of the dynamic medium. Laser frequencies are ordinarily estimated in units of length: nanometers (nm) or micrometers (μm), contingent upon whether they are in UV, noticeable or IR scope of the electromagnetic range. Essentially expressed, the frequency decides the quality or kind of cooperation between the laser and the tissue. Frequency is a property of photon vitality which is communicated in electron volts (eV). Red photon has ~2eV vitality and blue photon has ~3eV vitality.

Mode: Laser may be applying in CW (continuous wave) mode or in Pulse mode. The CW mode is commonly the quickest method to remove tissues however warmth can develop and make blow-back the objective and neighboring tissues. In Pulse mode beat width is estimated in a given period and the quantity of heartbeats every second, this identifies with the pace of discharge of laser light with time and the prime advantage of a beat mode will be the limit of the objective tissue to cool between progressive heartbeats. Heartbeat wave mode is reliant on the current force setting and Duty Cycle setting.

Pulse duration: Pulse duration is a one of the basic boundaries of laser radiation on tissue or living cells. Heartbeat span is estimated in units of time (milliseconds, microseconds, nanoseconds, picoseconds or femtoseconds). When beat mode is utilized the normal force conveyed will diminish relative to the beat recurrence that is chosen. Setting the beat recurrence

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
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decide the quantity of laser beats conveyed every second during a beat LLLT treatment. Heartbeat recurrence is estimated in Hertz (Hz). At the point when a low heartbeat recurrence is chosen the interruption between laser beats is more noteworthy so less force is conveyed. At the point when high heartbeat frequencies are chosen there is to a lesser degree a respite between laser beats for example it is nearer to constant yield. The term normal (or mean) power is utilized to depict the net force conveyed in the wake of calculating for both the on and off time of the shaft.Power and power density: Radiant power is the amount of radiant energy. The average power of the laser is equal to the output energy over the exposure time as shown in equation (1):

$$\text{Average power} = \frac{\text{Energy}}{\text{time}} \quad (1)$$

In Pulsed Laser:

$$\text{Average power} = \frac{\text{Energyofthe pulse}}{\text{Pulse duration}} \quad (2)$$

Average power of the pulsed laser or mean power of the chopped laser is equal to the energy of the pulse multiplied by the repetition rate.

For a CW laser the power density is the average output power in watts divided by the irradiated area in square centimeters:

$$\text{Power Density} = \frac{\text{Average Power}}{\text{Area}} \quad (3)$$

Peak power of the pulsed laser divided by the irradiated area gives the power density of the pulsed laser:

$$\text{Power Density} = \frac{\text{Peak Power}}{\text{Area}} \quad (4)$$

Irradiance: Irradiance is the radiometry term for the power per unit area of electromagnetic radiation incident on a surface. It is radiant energy flux (or power) incident on an element of the surface, divided by the area of the surface.

The power P that irradiates a surface area A is called the Irradiance E:

$$E = \frac{P}{A}\ \text{W/cm}^2 \quad (5)$$

Coherence: Coherence length depends on spectral Bandwidth and coherent light produces speckle are two types of coherence of laser light longitudinal and transverse. The longitudinal type of coherence represents time coherence along the longitudinal beam, whereas transverse coherence refers to coherence across the laser beam.

Polarization: Laser light can be linearly polarized or circularly polarized

Energy and Energy Density: Energy Density is a dose applied for the treatment and it is measured in J/cm^2.

Laser Energy Density is defined as the energy which is delivered per region or active area in J/cm^2:

$$E(Joule) = P(Watt) * Time(Sec.) \quad (6)$$

$$Energy\ Density = \frac{P(w)*T(sec.)}{Spot\ size} \quad (7)$$

Spot Size or Irradiation Area: spot size of a laser delivery system implies its littlest measurement at the central plane when centered by a focal point or width and spot diameter across is the diameter of irradiation on the objective surface. The spot distance across is viewed as equivalent to the bar breadth when the focal points are not be utilized. The units of the spot distance across are as a rule in centimeters.

Illumination time: it is the time of exposure to the target tissue.

IV. CONCLUSIONS

Lasers are unquestionably the future for dentistry as it makes it exceptionally simple to expel the rot. It is useful when arriving at regions that were difficult to treat with customary medicines. There is generally safe of contaminations in and around the treatment region. Low level laser therapy is safe, effective and painless treatment. Many wavelengths of laser diode have been analyzed in Continuous wave mode and in pulse wave mode with irradiation time on dental applications.

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International Journal of Engineering Research & Technology (IJERT)
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Vol. 9 Issue 07, July-2020

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