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Literature Review Article

Occupational Hazards in Prosthetic Dentistry: A Literature Review

Sauptik Ray[1*], Dhanasekar Balakrishnan[2] Aparna Raghu[3], Gauri S[4], Irene Mathew[5]

1,4,5 Post Graduate; Department of Prosthodontics and Crown and Bridge, Manipal College of Dental Sciences Manipal, Karnataka, India

2,3 Professor; Department of Prosthodontics and Crown and Bridge, Manipal College of Dental Sciences Manipal, Karnataka, India

***Correspondence to**: Dr Sauptik Ray; Department of Prosthodontics and Crown and Bridge, Manipal College of Dental Sciences Manipal, Karnataka, India.

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ABSTRACT

Occupational health, according to the World Health Organization, has a sturdy emphasis on avoidance of hazards and trades with all facets of wellbeing at work. Occupational health has progressively developed to a multi-disciplinary and comprehensive methodology from a mono-disciplinary risk-oriented pursuit that considers an individual's general health, personal development and also physical, mental and social wellbeing. Prosthodontic clinics exposes the workers to risk of inhalation of fumes, irritant chemicals, dust elements, wound caused by high-speed rotatory appliances and ignitable resources. Bunsen burners, furnaces and autoclaves frequently causes thermal wounds. This article highlights the hazards each prosthetic dentist faces and means to protect oneself from the hazardous effects

Introduction

Health, according to the World Health Organization presages a way of functioning within one's environment (work, recreation and living). It means freedom from pain or disease as well as the freedom to maintain and cultivate one's functional capacities. Health is established and sustained through collaboration between the genotype and the total environment. The work environment embraces an important segment of man's total environment, so to a large extent health is affected by working situations.[1]

Occupational health, according to the World Health Organization, has a sturdy emphasis on avoidance of hazards and trades with all facets of wellbeing at work. Occupational health has progressively developed to a multi-disciplinary and comprehensive methodology from a mono-disciplinary risk-oriented pursuit that considers an individual's general health, personal development and also physical, mental and social wellbeing. It enables an individual to undertake their occupation in an approach causing minimum detriment to health. In manifold ways, professional vigor is at the center of sustainable development. It includes prevention of occupational accidents, diseases, injuries, physical and psychological strain, implying appropriate use of resources, use of safe and low-toxic emission technology, avoiding unnecessary loss of energy, material, resources, inclusion of a healthy, productive, well-motivated workforce leading to a high-quality, well-organized, healthy and productive work environment.[2]

An occupational hazard is defined as the risk, usually arising out of employment to the health of a person. It also denotes labor, material, procedure or state that influences or instigates catastrophes at the workplace. 'Father of Occupational Medicine', Bernardino Ramazzini acknowledged the role that occupation plays in the dynamics of health and diseases.[3]

Profession related hazards are not scarce. Professional health complications have progressively amplified in type and magnitude and have steered or intensified diseases which was caused due to exposure to elements which are hazardous. Example includes chronic obstructive pulmonary disease which is mainly caused by smoking but may be caused or aggravated by irritant gases or dust in the workplace. Rheumatic disorders, scoliosis and incorrect posture at work are risk factors for Low back pain syndrome.[2]

Dentistry in twenty first century may be cited as one of the least hazardous of all occupations, but the status of this occupation is still challenged by many risks.[3] Dentistry related professional hazards are on a continuous upswing having substantial influence on day-to-day living.[4] Dental personnel exposed to various hazards like stress, anaphylaxis, higher noise levels, percutaneous exposure, radiation and musculoskeletal disorders. Dental health care workers are also exposed to a variety of micro-organisms like Cytomegalovirus, Hepatitis virus B and C, Herpes simplex virus, Mycobacterium tuberculosis, HIV and other viruses and bacteria through blood, oral or respiratory secretions.[5]

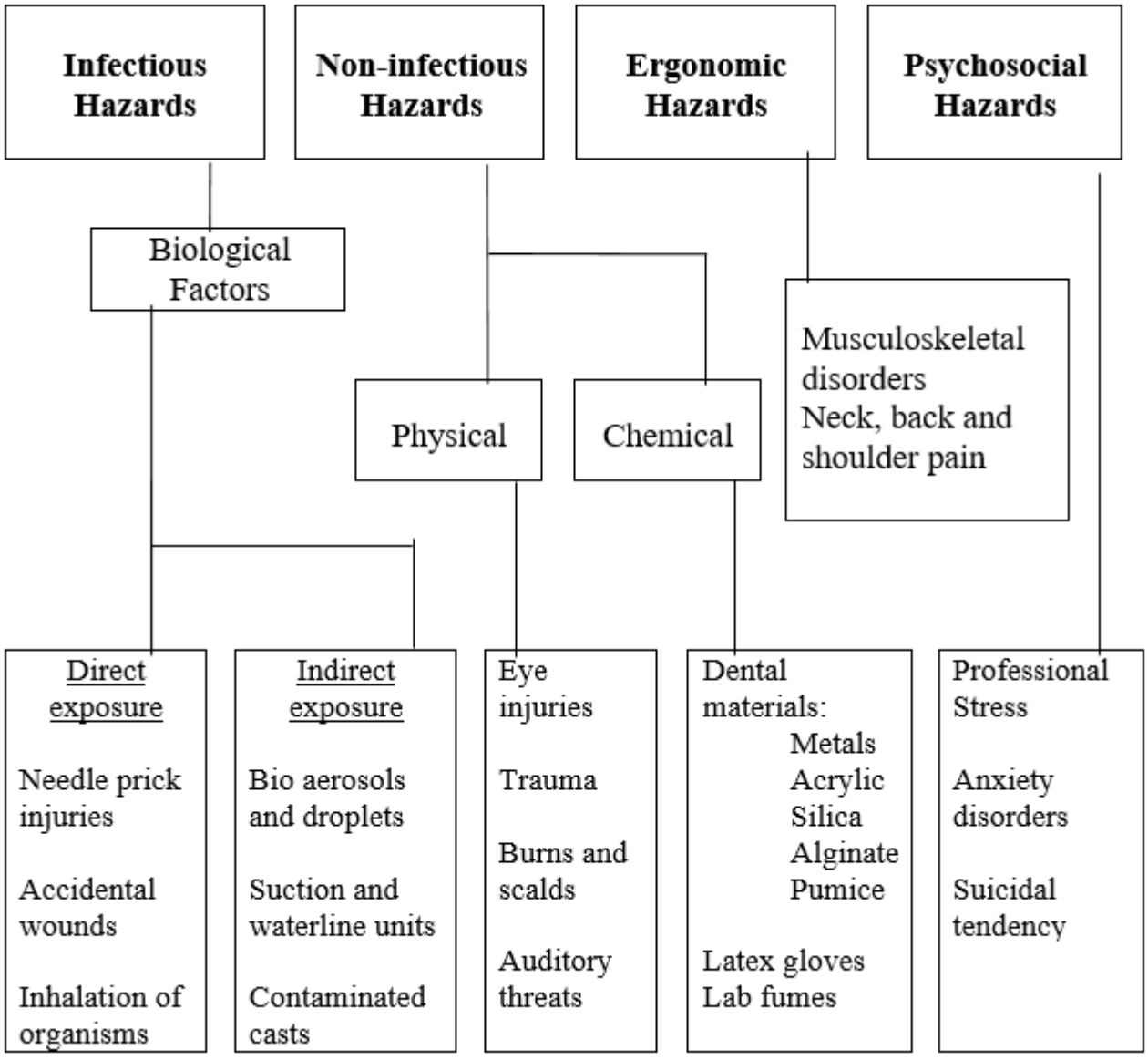
Prosthodontic clinics exposes the workers to risk of inhalation of fumes, irritant chemicals, dust elements, wound caused by high-speed rotatory appliances and ignitable resources. Bunsen burners, furnaces and autoclaves frequently causes thermal wounds. Other prospective allergens causing urticaria and asthma in vulnerable personages are methacrylate, rubber gloves, latex proteins and glutaraldehyde. Prosthodontic practice requires contact with dental materials of widely different composition such as metals, resin based synthetic polymers, cements, impression materials, composites and dental ceramics. Leakage and transfer of potentially allergic components from such materials carry the risk of hypersensitive reactions.[6]

Prosthodontists are also at an added risk of disease transmission because of the infection spreading through the contaminated impressions, instruments, percutaneous exposure incidents, aerosol production etc.[7] Within the Prosthodontic laboratory, there is a risk of disease transmission in the receiving area, while the impressions, wax bites and soiled prostheses sent from the clinics are received. In the production area risk factors exist

while pouring the impressions, handling the wax bites, repair of soiled prostheses, metal fumes or acrylic particles produced, traumatic injuries or infections acquired while finishing and polishing of prostheses.[8]

Prosthodontists, residents, technicians and others staff members in the clinics and laboratories should be aware of the potential hazardous aspects and take actions to avert and overcome them.[9]

CLASSIFICATION OF OCCUPATIONAL HAZARDS



Infectious Hazards

Routinely dental consideration experts are at an expanded danger of cross infection while treating patients. This work related potential for malady transmission turns out to be apparent at first when one understands that most human microbial pathogens have been separated from oral secretions [10]

Ailment transmission to the dental specialist and staff while procedure is viewed as "occupational exposure" to a certain pathogen. To comprehend the way to avoid the transmission of illness it is critical to comprehend the system of transmission of contamination. The micro-organisms responsible for disease are bacteria, virus, fungi and protozoa. To cause infection these potentially organisms must be acquired by the host. They must survive, reproduce and eventually cause some injury, dysfunction or destruction of the host.

Basic methods of sickness transmission in order of seriousness:[11]

(i) Percutaneous (high risk)

(ii) Contact (high risk

(iii) Aerosol inhalation (moderate risk)

(iv) Indirect contact through fomites (low risk)

Microorganisms transmissible in dentistry by **James A. Cottone** in 1996[12] classified based on the level of risk to the dental care worker as following:

Class I – No risk to properly vaccinated Dental care worker

Diseases – Measles, mumps, rubella, tetanus, diphtheria, poliomyelitis, influenza, and fungal infections fall into this category.

Class II – Small risk to Dental care worker

Diseases - Gonorrhea, syphilis, granuloma inguinale, lympho granuloma venerum, candidiasis, staphylococcus aureus, group A streptococcus fall into this category.

Class III – Some risk to Dental care worker

Diseases – Varicella, herpes simplex, cytomegalovirus, EBV fall into this category.

Class IV – High risk to Dental care worker

Diseases – HBV, HCV, HDV, and HIV fall into this category.

Class V – High risk to Dental care worker

Diseases – Tuberculosis falls into this category.

Following are the oral pathogens of concern, their source and their estimated survival time at a temperature of 21° C: [11]

Microorganisms	Body source	Estimated survival time at 21° C
Respiratory viruses	Secretion of saliva	Hours
Varicella Zoster virus	Saliva and vesicles	Hours
Mumps	Saliva and secretions	Hours
HSV I and II	Saliva and vesicles	Minutes
Hepatitis A	Saliva, faeces and blood	Weeks to months
Hepatitis B	Saliva and vesicles	Weeks
Hepatitis C	Saliva and vesicles	Weeks
EBV	Saliva	Seconds
Cytomegalovirus	Saliva and blood	Seconds- minutes
HIV I	Saliva and sputum	Days-weeks
Mycobacterium tuberculosis	Saliva and sputum	Days-weeks
Staphylococcus aureus	Exudates, skin, saliva	Days-weeks
Streptococcus pyogens	Saliva and secretions	Hours to days
Mycobacterium pneumonia	Saliva and secretions	Seconds to minutes
Treponema pallidum	Lesion contact	Seconds
Neisseria gonorrhea	Exudate contact	Seconds to minutes

Spaulding's classification:

The primary level of decontamination is called 'sanitization', a procedure of comprehensive physical cleaning to diminish the quantity of microbes and bioburden. "Sanitization or thorough cleaning is carried out prior to disinfection or sterilization". This can be attained by carefully cleaning the surfaces with soap and water or primarily with disinfectants.

Adaptation of Spaulding's classification:

Category/ level – Critical

Disease risks – High

Control methods – Sterilization by Autoclave, Chemical, Dry heat, Immersion in full strength glutaraldehyde

(8 hours for sterilization and rinsed with sterile water), or Sterile single-use disposables

Category/ Level – Semi critical

Disease risks – High

Control methods – Sterilization by Autoclave, Chemical, Dry heat, Immersion in full strength glutaraldehyde (8 hours for sterilization and rinsed with sterile water), or Sterile single-use disposables, Clean but non-sterile single disposable supplies.

Category / Level – Noncritical

Disease risks – Moderate to low

Control methods – Surface disinfection with intermediate level hospital disinfectants eg. Phenols, Iodophors, Quaternary ammonia compounds or disposable barriers

Category/level – Environmental

Disease risks – Low

Control methods – Disinfection with intermediate to low level disinfectant eg. Phenols, Iodophors, Quaternary ammonia compounds, scrub with soap and water

Impression Handling

The dental impression is a potential source of infection in prosthodontic practice. Saliva, blood and plaque contaminated impressions may harbour pathogenic microorganisms. Infectious agents may pass from patients to dental personnel who handle the impression or subsequent casts. A routine method of surface decontamination of impressions must be adopted by the profession to protect against the hazards of cross-contamination from unknown carriers and those suffering from subclinical infections. The physical and chemical properties of many dental materials must remain unaltered during decontamination procedures to achieve accuracy of the final prosthesis. It would not be acceptable if a disinfectant treatment affected the dimensional accuracy and surface texture of impression. The sterilization of impressions with dry or moist heat is therefore not only unsuitable but is considered unnecessary because contact is usually limited to the skin. To reduce the potential of cross contamination between prosthodontic clinic and laboratory, cold disinfection must be used. Disinfectants can be used to decontaminate impressions, occlusion rims, diagnostic casts, and trial and final prostheses (including immediate replacement dentures, partial denture frameworks, acrylic resin dentures, and obturators).

The efficacy of a disinfectant usually depends on immersion for a long period of time, and activity may be

substantially reduced by the presence of organic matter. A disadvantage of cold disinfection is that there is no conclusive laboratory culture method that permits direct in vitro testing of disinfectant agents. To ensure the destruction of microorganisms such as hepatitis B and human immunodeficiency virus (HIV) it is best to select a disinfectant solution that is clearly labelled as having activity against hydrophilic and lipophilic viruses. The most acceptable disinfectant is generally regarded to be 2 % buffered glutaraldehyde solution. However some individuals may exhibit sensitivity to glutaraldehyde, resulting in eye, nose, lung and skin irritation; headaches, dizziness, and allowed reactions. However, most substitutes are less effective sterilizing agents, many of which also cause occupational asthma, rhinitis or dermatitis. Therefore as glutaraldehyde leads to better decontamination than the other agents, the best solution is to reduce exposure by improving working conditions and practices. To achieve nasal and respiratory protection, glutaraldehyde solutions should be stored in a covered container and used in a cool, well ventilated area. Personal protection should include the use of eye goggles, impervious aprons, and PVC gloves. The manufacturers recommend a minimum immersion time of 10 minutes. However, for the destruction of Mycobacterium tuberculosis an immersion time of 1 hour is required, which is a serious disadvantage, because the immigration of carriers of M tuberculosis and the susceptibility of AIDS sufferers, the number of patients having active tuberculosis is increasing. Tuberculosis is transferred by sputum and is consequently a high risk in a prosthodontic practice. This is especially true when treating older patients, who are particularly vulnerable to infection. To protect against the transmission of M. tuberculosis, a routine disinfection of 1 hour in glutaraldehyde solution would be necessary.

Zinc oxide eugenol impressions can be successfully disinfected with the use of glutaraldehyde, formaldehyde and chlorhexidine chloramine. Impression compound impressions reportedly can be disinfected via immersion in a 1:10 sodium hypochlorite solution or with an iodophor. The suitability of a particular impression material and disinfectant solution should always be established to minimize the possibility of adverse effects. Many materials are particularly unsuitable for immersion in certain disinfectant solutions. Polyethers and irreversible hydrocolloids have been particularly well documented. Irreversible hydrocolloid impressions are known to imbibe water when exposed to aqueous solutions. Thus, when an irreversible hydrocolloid impression material is immersed in a disinfectant for a period necessary to destroy pathogens, the dimensional stability is sacrificed and its configuration changed. Investigations have concluded that if the disinfectant treatment necessitates immersion of impression for 1 hour or more, irreversible hydrocolloid materials should not be used. A rubber-based impression material, which is better able to withstand a longer period of disinfectant immersion should be used.

Commonly used chemical disinfectants and sterilization methods in Dentistry

Infection control in dental treatment facilities requires utilization of disinfectants in several forms: surface disinfectants, immersion disinfectants and immersion sterilants. Each category is distinguished by separate needs, and care must be exercised to separate different categories. At present, the group of chemical agents used for immersion disinfection and sterilization continues to be 2% alkaline glutaraldehyde Following is the list of different immersion disinfectants and sterilising agents:

Immersion type disinfectants

2% Acidic glutaraldehyde

2% Alkaline glutaraldehyde

5% Phenyl chlorophenol and 1 % phenylphenol

Surface disinfectants

79% ethanol and 0.1% phenylphenol

0.216% phenylphenol, 66% ethanol and 0.054% t-amylphenol

0.28% phenylphenol

0.03% benzyl chlorophenol

Immersion/Surface type disinfectants

1.75% titrable iodine

9 % phenylphenol and 1% benzyl chlorophenol

4.28% phenylphenol

Sterilizers

Steam autoclave	Uses steam under pressure to sterilize at 250^{o} F to 273^{o} F (time varies depending on size of load and autoclave). Good penetration of heat into packages Causes corrosion Requires drying time
Oven-type dry heat sterilizer	Uses dry heat at 320^{o} F for 1-2 hours

	No corrosion
Rapid heat transfer-type dry heat sterilizer	Uses circulated dry heat 375^{o} F for 6-20 minutes
Unsaturated chemical vapor Sterilizer	Uses unsaturated chemical vapors from formaldehyde and alcohol. 273^{o} F for 20 minutes No corrosion

Chemical Indicators

Indicators for steam	Chemical indicators that change color or form after certain steam sterilizer conditions (temperature, time presence of steam)
Process indicator	Chemical indicator that changes color very soon after exposure to a certain temperature

Biological Monitoring

Spore testing system	Tests adequacy of sterilization cycle. Test contains spore strips, culture tubes and proper incubator system

Any disinfectant should be handled with care by persons wearing complete personal protective attire (coat, eye protection, mask, and gloves). Utility gloves are generally recommended when cleaning and disinfecting laboratory surfaces and equipment and when preparing disinfectant solutions. Usually a cleaner is sprayed onto a surface and wiped to remove residual contaminants. The surface is then sprayed with a disinfectant, which is allowed to dry on the surface. Many water-based disinfectants may be used for both cleaning and disinfection.

NON-INFECTIOUS HAZARDS

Physical Hazards

Heat injuries, direct physical trauma and fire wounds to eyes, scalp and face are common physical traumas that are encountered in prosthetic dentistry. Direct physical injuries incorporate unintentional skin cuts and

abrasion because of the utilization of broken/blunt instruments and high speed projectile during finishing prosthesis. Such injuries can go about as gateway of passage for contaminations. Spirit lamps, bunsen burners and blow torches are used in prosthodontic set ups. The most usual injuries include burns from burners followed by injury to eyes from sharp objects and projectiles. High frequency grinding tools used in clinics can cause direct trauma to upper extremities and face. Vibration white finger or vibration syndrome occurs as side effects of vibrating tools along with narrowing of arteries in hands, fingers and nerve damage. Decreased sensitivity of fingers to pain, tremor, touch, temperature, decreased flow of blood in fingers and blanching of finger tips are the early symptoms.

a.Eye injuries

Awful wounds to eyes in prosthetic practice are increasingly normal because of the utilization of high-speed rotating instruments which can create projectiles of 9 m/s which are frequently infected, hot and sharp. Pain, lacrimation, corneal abrasion, conjunctivitis and blurring of vision may occur. Pumice or Methyl methacrylate monomer if accidentally sprinkled into eyes elicit painful reactions and abrasions.

Curing lights which are frequently used for polymerizing restorative resins release intense blue light (400-500 nm). As per a report, more incident of ocular risk happened around 440 nm. At the point when the blue light strikes the retina, they hinder formation of Cytochrome-C-oxidase, which is responsible for transport of oxygen to photoreceptors and retinal cells. Retina degenerates deprived of Cytochrome-C-oxidase. Direct exposure to light source causes acute effects while cumulative exposure occurs from back reflectance of blue light from reflective surfaces like teeth. 10 - 30% of curing light reflects back to the operator generally.

Possible consequences on eyesight

Most important facet of biological injury due to radiation from curing lights is adversative effects on eyesight. High intensity radiation of visible light reaching specific photoreceptors in retina may cause photochemical injury. Solar retinitis (retinal injury following ecliptic sunlight exposure) is comparable to retinal injury caused by blue light. Effects may appear several days later, lasting for weeks. Aging and degenerative processes in eye is increased by exposure to blue light. Permanent retinal injury is seen in severe cases creating a blind spot on focus of visual field.

Ultra violet radiations do not typically reach retina and is absorbed by cornea and ocular lens except in small

children and in patients with lens removed before new ones in cataract surgery. However, in case of UV radiation exposure adversative corneal reactions are seen. UV radiation exposure of 180–400 nm range causes photo keratitis and transient injury to cornea with likelihood of permanent damage following repetitive exposures. Accretion of endogenous irradiation absorbers and reduced production of antioxidants increases the susceptibility of eyes to irradiation after middle age. Radiation absorbing substance like dietary supplement, drug or a diagnostic dye bound to ocular tissue and exposed to irradiations absorbed by these induces photosensitivity in eye. Usage of certain antimalarial drugs causes such photo toxicity of eye.

b.Ear injuries

Dentists are at risk for noise-induced hearing loss. Although hearing loss may not be symptomatic, the first complication and the reason for seeking a hearing evaluation may be tinnitus. Noise is always present during the work of dental staff divided into distracting noise and destructive noise. This division results from the variety of parameters determining sound hazards and their influence on the human organism. The sources of dental sounds inducing hearing loss that can be diminished are turbine handpieces with high speed, low-speed handpieces, high-vacuum suction, ultrasonic cleaners, mixing devices, model trimmers and vibrators.[14]

Noise levels beyond permissible limits lead to tinnitus and loss of hearing. According to OSHA, Exposure action value (85 dB noise exposure) more than eight hours a day, can cause permanent loss of hearing. Equipment in labs can produce noise ranging from 66-91 dB which is very close to limit of loss of hearing (85 dB).

Management strategies

Face shields or shatter-resistant eyeglasses with side shields should be used by the clinician.

Spectacles with side shields filtering blue light provide protection against scatter and reflection. Usage of an orange shield with curing apparatus sufficiently filters blue light in range of 350-500nm.[9]

Guidelines for Selecting Safer LED Headlights and Using Them Safely

Eyes have protective mechanisms against wavelengths under 400 nm and bright light with strong green wavelengths, but eyes are virtually defenseless against blue-light (400 nm to 500 nm). Protecting one's eyes is extremely important. If a light is too bright, eyes are no longer able to reduce pupil size and protect retina. Too much light is harmful for eyes and also reduces visual acuity. "In order to minimize potential risks from

the use of LED headlights, the guidelines listed below:

1. Avoid any LED headlight which has too strong of a blue-light component. Lights with too strong of a blue-light component are bluish and distort the color of objects, creating a yellowish cast to the white color.
2. Avoid any LED headlight which disperses colors.
3. Avoid any LED headlight with strong glare which may damage the patient's, operators, or assistant's eyes.
4. Set the brightness of the overhead operatory light at an optimum/ minimum brightness level which allows you to see detail.
5. Set the LED headlight at an optimum/minimum bright level which will allow you to see detail. The lens of the eye can be replaced with artificial lenses, but no artificial retinas are yet available. Dentists must be proactive in preventing potential risks to the eyes when using LED illumination.

Chemical Hazards

Natural and synthetic chemicals including alloys, acrylic resins, eugenol containing materials, cements, ceramics, waxes, etchants, sealers, hypochlorite and impression materials are commonly used in prosthetic practice. PMMA resins containing amines, di-butyl phthalate, butyl-methacrylate, hydroquinone and coloring agents don’t cause any problem to patients but is toxic to technicians during fabrication of prosthesis. Lab personnel are exposed to grinding dust and metal fumes during cast restoration fabrication.

Beryllium is added to some base metal alloys for facilitating its castability by increasing porcelain to metal bond strength while reducing melting temperature and surface tension. Chronic beryllium disease (CBD) a chronic granulomatous disease of lung and also contact dermatitis is caused by exposure to beryllium particles or vapors.

Conceivable threats to beryllium results during melting and finishing procedure. The utmost risk involves casting in absence of satisfactory filtration and exhaust system. OSHA stated CBD among dental lab staffs advising provisions to minimalize beryllium dust exposure. Osteosarcoma and lung carcinoma have been associated with beryllium.

Dust particles from ceramics during working presents a latent problem for dental personnel. Silicosis results due to inhalation of dust containing silicon dioxide particles or free.

Alginate containing around 60% diatomaceous earth when shaken, particles lesser than 3 micrometer diameter and greater than 20 micrometers length may be inhaled and may be carcinogenic. Polyether was found to be more cytotoxic than vinyl poly siloxanes.

Latex gloves are dusted with corn starch powder. These are allergenic and presents immediate hypersensitive reactions. Latex protein allergens along with starch particles is absorbed by skin or inhaled being airborne. Various degrees of cytotoxicity were shown by various types of gloves whereas new silicone, powder free gloves carry lesser risk.[9]

Management Strategies

1. Local exhaust ventilation systems
2. Adequate fume extraction system
3. Aerosol/dust evacuation hood in the dental laboratory
4. Appropriate Personal Protective Equipment
5. Use of alternate materials in case of sensitivity or allergy

Healthy and safe work procedures should be designed to:

1. Limit worker's exposure time
2. Reduce contact with substance through any route of exposure to worker
3. Ensure safe disposal of substances and disposable equipment that comes into contact with harmful substances
4. Ensure safe handling and decontamination of reusable equipment

ERGONOMIC HAZARDS

Dentistry faces a serious threat because of the poor ergonomic practices. Occupational health hazards among dental professionals are on a continuous rise. Owing to a discrepancy between physical capability of human body and physical necessities of the job, work-related musculoskeletal disorders (MSDs) are now increasingly common.

When applied to dentistry, ergonomics pursues to lessen mental and physical stress, avert professional illnesses and increase productivity with better quality and comfort for patient and dentists.

Present Scenario

In dentistry the concept of ergonomics can be traced back in 1950s when the first journal articles pertaining to dental ergonomics was published. Since then, various studies have tried to refine the concept.

It has been observed among dentists worldwide that low back problems are the most common, followed by problems of the hand and wrist, neck and shoulders with more than one-third requiring medical care for musculoskeletal disorders and also requiring extended leave from their practice. Moreover, hand paraesthesia is now becoming increasingly common.

Significantly more females have been reporting neck symptoms whereas older and more experienced dentists reported higher rates of upper back symptoms.

Higher incidences for shoulder and neck pain across the globe causing both discomfort and difficulty with daily functional activities, signifies a higher severity.

The prevalence of chronic MSD is reported to be high among students. Female students report higher level of pain and also the shoulders and neck as most disturbed regions, whereas back complaints are more commonly reported in male students. Pain is generally related both to fatigue and stress.

Ergonomic risk is a physical influence in environment that damages musculoskeletal system. Dentists are particularly effected with musculoskeletal ailments. The likely indications comprise numerous MSDs of peripheral nervous system. Musculoskeletal disorders are portrayed by the existence of disability, distress or obstinate pain in the muscles, joints, tendons and other parts. Prolonged awkward postures, forced postures and repeated movements are the common risk factors.[4]

Spine degeneration leads to back pain syndromes which are reported frequently in dental personnel. Cervico-acromial and cervical pain is caused due to neck discopathy. The posture a dentist generally assumes at work with the neck bent, an arm abducted, repetitive and precise movements of the hand, is a frequent cause of pain within the shoulder, neck and upper extremities.

Pain in loins and lower back radiating to the lower extremities, usually right side than left is due to lumbosacral and lumbar discopathy. A greater stress is experienced on the right side body when the doctor works in a sitting position. Mechanical vibrations produced by some dental equipment like handpieces are transmitted to hands and arms. In addition, the extensive use of hand tools in dentistry can cause a chronic extrinsic compression of the nerves in the hand and therefore may cause an entrapment of digital nerves. Whatever the cause of the symptoms, neurological disturbances are potentially serious in an occupation in which precise

hand movements are necessary.

Median nerve and cubital nerve defects are seen in a number of dental doctors. Acroparasthesia shows an early defect of median nerve. A consequence of the defected median nerve in the carpal nerve is the so-called tunnel syndrome. Its early phase is dominated by paroxysmal paraesthesia of index finger and thumb, which occurs mostly at night and accompanied by sensory motor disorders.

Prosthodontic students experience more distress of wrist symptoms while lesser in other body parts. This discrepancy is due to nature of prosthetic work. Students assign somewhat lesser time for intraoral operations but long-term obstinate posture in chair-side operation. Frequent use of vibrating instruments subjects them to greater menace of wrist disorders.[3]

Prevention strategies

Prevention is the best attitude to accomplish a genuine target of health and safety at work. MSDs can be controlled by proper positioning of dental worker, routine breaks, general good health and exercises intended to stabilise the risk elements in dentistry. Based on the available literature, a few Prevention Guidelines can be summed up:

1. An adaptable, rotating ergonomic stool with arm and lumbar support and competency to rotate.
2. Dentists' feet should be flat on floor and thighs parallel to floor while assistants sit 4-6" higher using a footrest on stool
3. Patients should be reclined with mouth at dentist's elbow height for maxillary arch procedures and dropped with a 20° incline for mandibular procedures.
4. Proper lighting and indirect mirror viewing.
5. Using magnification system can help lessen forward posture, including below 20° forward flexion of neck.
6. Resting from static postures mainly for forearm muscles and trapezius and from repetitive hand motions (at least 6 mins/hr and 10-15 min/2-3 hr).
7. Exercises like relaxing arms at side and shaking or moving muscles and limbs in reverse direction of postures between patients.
8. Alternate standing/sitting and using proper armrests reducing shoulder fatigue and more steady positioning of instruments.
9. Chin tuck exercises and shoulder blade repositioning for neck pain is recommended.

10. Choosing ergonomic dental instruments that are of lighter weight.
11. Using dental instruments with appropriate design and with better handle sizes and shapes, to reduce the hand force
12. Overall, wellbeing by promoting daily exercises, proper diet and nutrition.
13. There are Yoga Poses which can help to attain toned neck and back muscles, making them less predisposed to injuries. These poses also aid in the rehabilitation of chronic neck and upper back pain. Few of such poses include easy pose (Sukhasana), single leg raises, shoulder stretches, sun salutation (Surya Namaskar), half spinal twist (Ardha Matsyendrasana), wind relieving pose (Pavanmuktasana), relaxation pose (Savasana), Setu Bandhasana, Salabhasana, Bhujangasana, Adho Mukha Svanasana, and Bidalasana.

PSYCHOSOCIAL HAZARDS

Occupational diseases may result from many contributing factors such as aggravating social and economic conditions, changes in legislation and/or labour market, implementation of new technologies and changes in the workforce, service and administrative sectors. Although incidence of physical occupational diseases decreased after implementation of medical preventive measures, such as vaccinations covering professions serving high-risk groups, acquisition of modern equipment and better understanding of ergonomics, mental impairments still dominate among occupational disorders.

Professional stress for example adapting to troublesome or uncooperative patients, excess workload, persistent determination for technical excellence, discontent in treatment is common among dentists. Most widely recognized elements adding to anxiety at work were patient demands (75%), practice administration/staff concerns (56%), fear of lawsuit (54%) and non-clinical paperwork (54%). The level of hazard may rely upon a few components including age, personal vulnerability, daily exposure, exposure over years and medicines. It is the obligation of experts and specialists to comprehend the particular hazard aspects and detail a successful preventive administration protocol.[9]

Potential Psychological Hazards and Effects of Workplace Stressors and their management

1. Abuse by clients or members of the public
2. Abuse by co-workers
3. Hazards related to working alone, threat of violence, medical emergencies when alone.
4. Stress related to critical incidents

5. "Technostress" related to the introduction of new technology
6. Substance abuse as a response to excessive workplace stress
7. Depression, anxiety, sleep disorders, other mental illness as a response to excessive workplace stressors
8. Hazards related to impacts of aging on workers
9. Hazards related to shift work, excessive workload and hours of work
10. Stress related to work-life conflict
11. Exposure to nuisance or irritating noise levels that may induce stress
12. Exposure to poor indoor air quality that may induce stress

Control strategy –

a) Alarm systems and panic buttons, video surveillance.

b) Management policies and procedures related to no tolerance of violence or abuse, worker education in violence awareness, avoidance and de-escalation procedures, liaison and response protocols with local police, working alone policies, reporting procedures for incidents and near misses.

c) Assertiveness training, use of mediation and/or counselling services.

d) Communication devices, vehicle design considerations, panic alarms, bright lighting, and surveillance cameras

e) Development of support systems to assist in dealing with stress. Use of counselling services.

f) Time management strategies. Open communication about stress related to change. Healthy lifestyles. Setting realistic goals. Limiting the need to multi-task. Technology "time outs".

g) Increase awareness of substance abuse signs and symptoms. Communication with counsellors. Report to family physician. Participate in treatment programs and return to work programs.

Conclusion

Despite recent advancements in the technologies and materials available, many professional health perils are still prevalent. In clinic, infectious health risks prevail while dealing with patients, more so with infectious diseases, contact with patient's saliva or a lesion, contaminated impressions, instruments, aerosols produced while treating the patient. While transfer of dental impressions, instruments and prostheses from the clinic to the laboratory there is a risk of infectious health hazards if not properly disinfected and packaged before transfer. In the dental laboratory, a technician might be exposed to potentially infectious micro-organisms while handling or pouring the impressions or using instruments that have been in contact with a patient and

have not been adequately disinfected or sterilized. A technician might also be exposed to harmful metal fumes while finishing metal prostheses if adequate protective measures are not taken and can get exposed to various micro-organisms while polishing acrylic prostheses with pumice that has not been changed regularly. Contact with various dental materials that can cause allergic reactions, burns etc. can expose the clinician or technician to non-infectious hazards. Stressful working conditions can affect the psychological health and incorrect posture; instrument designs can lead to various musculoskeletal disorders. Adequate measures should be taken to avoid all these health hazards. Safe working conditions, barrier techniques, use of a proper zoning technique should be applied in order to prevent any exposure to harmful micro-organisms. A thorough patient history is a must before continuing with the treatment in order to be aware of any serious or infectious disease the patient might be suffering from. Vaccination of numerous contagious diseases like HCV, HBV, Influenza, Mumps etc. is extremely fundamental. Various precautionary measures should be taken and wherever possible alternate materials should be used to prevent allergic reactions, burns etc. Face shields, masks, personal protective clothing should be worn while working in potentially hazardous conditions. Concerning ergonomics, it is extremely vital to sustain a satisfactory work posture and the appliances and furniture have suitable working characteristics to prevent musculoskeletal disorders. Working hours and pace of work should be controlled so that these do not affect psychological wellbeing. Approaches for refining mental fitness and diminishing effects of job-related hazards should be established and executed. Severe infections due to percutaneous exposure episodes can be prevented by usage of proper barrier techniques and high level sterilization. Prosthodontists and technicians should be acquainted with the chief signs and symptoms of hypersensitive reactions, including anaphylaxis. Assorted dental education programs, workshops should also be systematized to increase the comprehension of newer approaches and expansions.

References

1. Early detection of health impairment in occupational exposure to health hazards. Report of a WHO Study Group. Geneva, World Health Organization, 1975 (WHO Technical Report Series No.571)

2. Occupational health: A manual for primary health care workers by World Health Organization 2001.

3.Gambhir RS, Singh G, Sharma S, Brar R, Kakar H. Occupational Health Hazards in Current Dental Profession – A Review. The Open Occupational Health & Safety Journal 2011; 3: 57-64.

4. Gupta A, Ankola VA, Hebbal M. Optimizing human factors in dentistry. Dent Res J 2013 Mar-Apr; 10(2): 254-259.

5. Mohammed NS, Shaik MA. Occupational hazards in modern dentistry. Int J Experiment Dent Sci 2013;

2(1): 33-40.

6. Padmaja S. Biohazards associated with materials used in prosthodontics. Nigerian Journal of Clinical Practice; Apr-Jun 2013; Vol 16; Issue 2: 139-144.

7. Rampal N, Pawah S, Kaushik P. Infection control in Prosthodontics. J Oral Health Comm Dent 2010; 4 (1): 7-11.

8. Bhat VS, Shetty MS, Shenoy KK. Infection control in the prosthodontic laboratory.The Journal of Indian Prosthodontic Society. June 2007; Vol7; Issue 2: 62-65.

9. Sivakumar I, Arunachalam KS, Solomon E. Occupational health hazards in a prosthodontic practice: Review of risk factors and management strategies. J Adv Prosthodont 2012 Nov; 4 (4): 259-265.

10. Nagpal A, Chaudhary V. Infection control in Prosthodontics. Indian Journal of Dental Sciences. January 2010; Volume 2; Issue 1: 5-10.

11. Rampal N, Pawah S, Kaushil P. Infection control in Prosthodontics. J Oral Health Comm Dent 2010; 4(1): 7-11.

12. Infection control in dentistry. Dental Clinics of North America 1996; 40(2):114-18.

13.Garcia AFG, Rocha ES, Sousa RV, Martins VM, Massoni ACLT, Paiva SM. Knowledge of occupational diseases and immunizations among healthcare students. Rev Odonto Cienc 2011; 26(3): 215-221.

14.Ayatollahi J, Ayatollahi F, Ardekani AM, Bahrololoomi R, Ayatollahi J, Ayatollahi A. Occupational hazards to dental staff. Dental Research Journal January 2012; Volume 9; Issue 1: 2-7.

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