Type of Manuscript : Survey

Awareness about Common Disinfection Procedures among Undergraduate Students in Clinics

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Abstract

Dentists, dental patients and dental technicians are tasked with various dental procedures which are extremely prone to cross contamination of various infections from various pathogens usually found in blood and dental offices. A lot of attention has been directed towards proper medical care, sterilization and instrument care.

Online survey containing the questionnaire was sent to 100 undergraduate dental students. Results were tabulated and analysed. The questionnaire was based on the knowledge they gained during their student days. Among them 53% are aware of general principles of disinfection , 85% level of disinfection determines quality of clinical practice. Within the limits of the study , the awareness about common disinfection procedures among undergraduate dental students in clinics was evaluated . Upon evaluation it was found that the student dentist had a moderate level of knowledge about disinfection in clinics, which can be improved by extensive teaching about disinfection practices and improving knowledge.

Keywords: *Cross Contamination, Disinfection, Formaldehyde, Glueraldehyde*

Introduction

Disinfection is a process, which eliminates all pathogenic microorganisms on a surface. There are various types of Disinfection- namely Chemical, Radiation, Gaseous etc. Chemical disinfection is the most commonly practiced, owing to the cost effectiveness of the technique and ease of handling. Some of the more commonly used Disinfectants include Hydrogen Peroxide, Glutaraldehyde, Formaldehyde and ethanol .

Hydrogen Peroxide is an organic compound. Hydrogen peroxide is inflammable. At low temperatures it becomes solid. The amount of hydrogen peroxide in the solution is expressed in weight percentage. 35-50 % concentration is used for water treatment. It is an unstable compound in the presence of a base or a catalyst, and is typically stored with a stabiliser in a weak acidic solution. It kills pathogenic microorganisms by the action of oxidation, where it releases electrons or free oxygen, which oxidises the bacterial cell wall. Louis Jacques Thenard produced Hydrogen peroxide for the first time in 1818 by. Subsequently, the synthesis of hydrogen peroxide was improved with hydrochloric acid and sulfuric acid. This process was used from the end of the nineteenth century until the middle of the twentieth century. Pure hydrogen peroxide was first obtained through the process of vacuum distillation in 1894. The correct molecular formula for hydrogen peroxide was first described in the late nineteenth century.

Glutaraldehyde is an organic compound. It is the only aldehyde exhibiting excellent sporicidal activity. It is mildly acidic, in need of buffering. Vegetative bacteria are readily susceptible to the action of Glutaraldehyde. It is reported to be ten times more effective than formaldehyde, and less toxic. It can cause skin sensitisation when mishandled. Glutaraldehyde is commonly diluted during usage. There is a decline in its effectiveness in instruments over time. The decline is due to improper protocol and not drying the instruments properly. This raises the emphasis and the need to

ensure that semicritical equipment is disinfected with an acceptable concentration of glutaraldehyde. Studies suggest that 1.0%–1.5% glutaraldehyde is the minimum effective concentration and >2% glutaraldehyde solutions are when used as a high-level disinfectant.

Formaldehyde has a broad spectrum biocidal activity and is capable of both surface and space decontamination. Its biocidal action is through alkylation of carboxyl, hydroxyl and sulfhydryl groups on proteins and the ring nitrogen atoms of purine bases. It has various safety concerns, including its carcinogenic property. Even though Formaldehyde is a very strong disinfectant, the clinical use of formaldehyde is limited by its irritating fumes and its pungent odor even at very low levels (<1 ppm). For these reasons and others—such as its role as a suspected human carcinogen linked to nasal cancer and lung cancer. When it is used, direct exposure to employees generally is limited; however, excessive exposures to formaldehyde have been documented for employees of renal transplant units and students in a gross anatomy laboratory. Paraformaldehyde, a solid polymer of formaldehyde, can be vaporized by heat for the gaseous decontamination of laminar flow biological safety cabinets when maintenance work or filter changes require access to the sealed portion of the cabinet.

Ethanol is an alcoholic compound, containing two carbon atoms. Alcohols work through the disruption of cellular membranes, solubilization of lipids, and denaturation of proteins by acting directly on S-H functional groups. Ethyl and isopropyl alcohols are the two most widely used alcohols for their biocidal activity. These alcohols are effective against lipid-containing viruses and a broad spectrum of bacterial species, but ineffective against spore-forming bacteria. They evaporate rapidly, which makes extended contact times difficult to achieve unless the items are immersed. The optimum bactericidal concentration for ethanol and isopropanol is in the range of 60% to 90% by volume. Their cidal activity drops sharply when diluted below 50% concentration. Absolute alcohol is also not very effective. These alcohols are rapidly bactericidal rather than bacteriostatic against vegetative forms of bacteria; they also are tuberculocidal, fungicidal, and virucidal but do not destroy bacterial spores. Their cidal activity drops sharply when diluted below 50% concentration, and the optimum bactericidal concentration is 60%–90% solutions in water (volume/volume)

According to the Indian Dental Association, the following items should be sterilized or disinfected in a dental clinic:

- Instruments that penetrate oral soft tissue-Critical items like surgical instruments, periodontal knives and scaling instruments
- Instruments that are not intended to penetrate oral soft tissues or bone -Semi critical items like amalgam condensers, dental handpieces, mouth mirrors.
- Non-critical patient-care items that come in contact with unbroken skin (e.g. radiograph head/cone, blood pressure cuff, facebow, pulse oximeter)
- plastic impression trays, amalgam carriers, plastic instruments etc.

Dentists, dental patients and dental technicians are tasked with various dental procedures which are extremely prone to cross contamination of various infections from various pathogens usually found in blood and dental offices [1,2]. A lot of attention has been directed towards proper medical care, sterilization and instruments [3,4]. Receiving the right education through the right approach is the major way to enhance and develop professional skills [5,6]. The use of many dental equipment especially instruments such as cheek retractors, impression trays when such instruments are improperly disinfected can cause formation and contamination of various microorganisms and lead to spread of various diseases [7,8,9]. These instruments which are often used in the patient's mouth are immersed in disinfectant solutions [8,10,11]. Disinfection and sterilization techniques can also be used to free the instruments from various microorganisms [12,13] .Hepatitis virus poses a very large and common risk factor for dental practitioners. The commonly used disinfectants worldwide are formaldehyde and glutaraldehyde [14,15]. Disinfectants are substances mainly used in chemical form to destroy the microorganism and kill it [3,16,17]. The present research is done in order to create awareness among dental practitioners in undergraduate dental college among students about the benefits and necessity of sterilization and disinfection in clinics .

Materials and Methods

A cross sectional study based on a self administered online questionnaire was distributed through a link shared to about 100 dental students. 100 students participated and the results were tabulated in excel sheet and was analysed using SPSS windows version 2.0. The questionnaire was mainly divided into two parts , the first part contained general biological data whereas the second part of the questionnaire was about the main topic that is disinfection and its definition the various disinfectants used and the various different techniques practiced.

Results and Discussion

From the survey conducted the results obtained are as follows, about 53% of the students are aware about the general principles of disinfection practiced in dentistry .On the question based on awareness about various techniques of disinfection practiced , 52% are aware about the various techniques . The responses on the knowledge about commonly used disinfectants were 35% for formaldehyde 30% for glutaraldehyde , 24% for ethanol and 16% for hydrogen peroxide. When asked about the standards in the frequency of disinfection 51% people answered they disinfect their clinics daily , 20% said twice a week and 29% said once a week.

When asked about the better option for hand instrument 80% answered saying sterilization is the better technique. 50% of the students know the reason behind frequent disinfection practices is to reduce cross contamination.

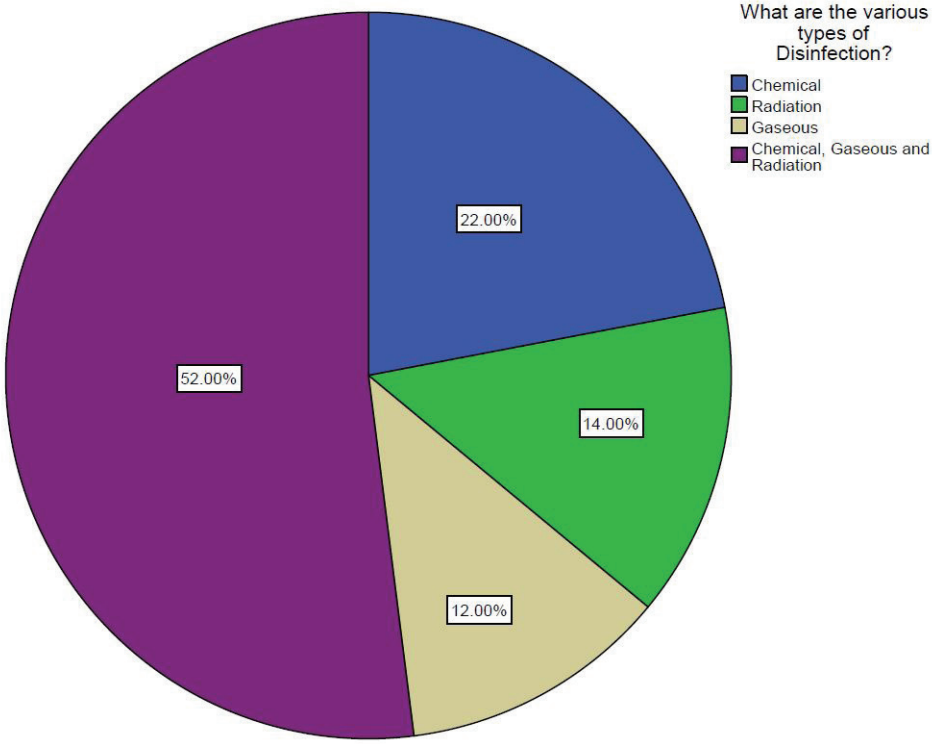

Fig. 1: Pie chart depicting the responses to the question, "What are the various types of disinfection?". In which 52% show all three chemical, radiation and gaseous types of disinfection. 12% answered gaseous only, 14% answered radiation only and 22% answered chemical only .

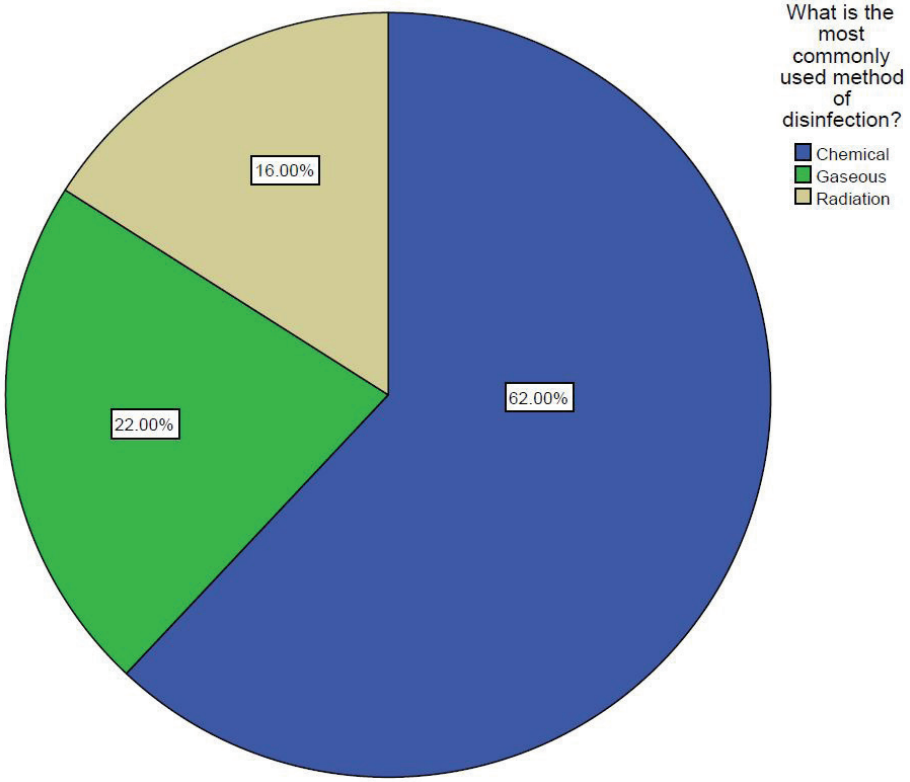

Fig. 2: Pie chart depicting the responses to the question "What is the most commonly used method of disinfection in normal practice?". About 62% students chose the chemical method to be the most common method of disinfection, followed by 22% students who chose gaseous and remaining 16% for Radiation .

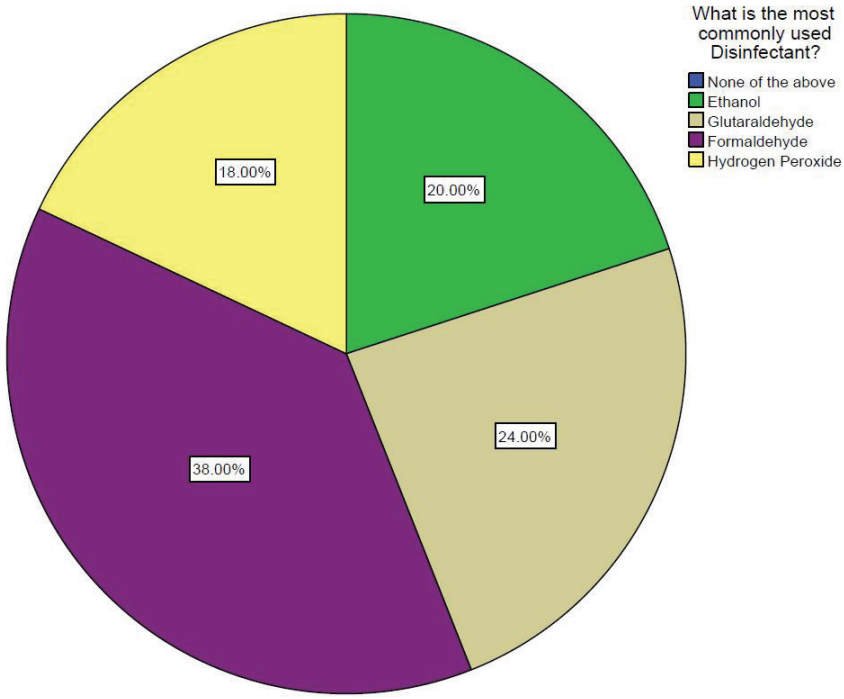

Fig. 3: Pie chart depicting the response to "Which is the most commonly used disinfectant?"

38% answered formaldehyde as the most used chemical disinfectant, followed by 24% glutaraldehyde, 20% answered as ethanol and 18% responded with Hydrogen peroxide.

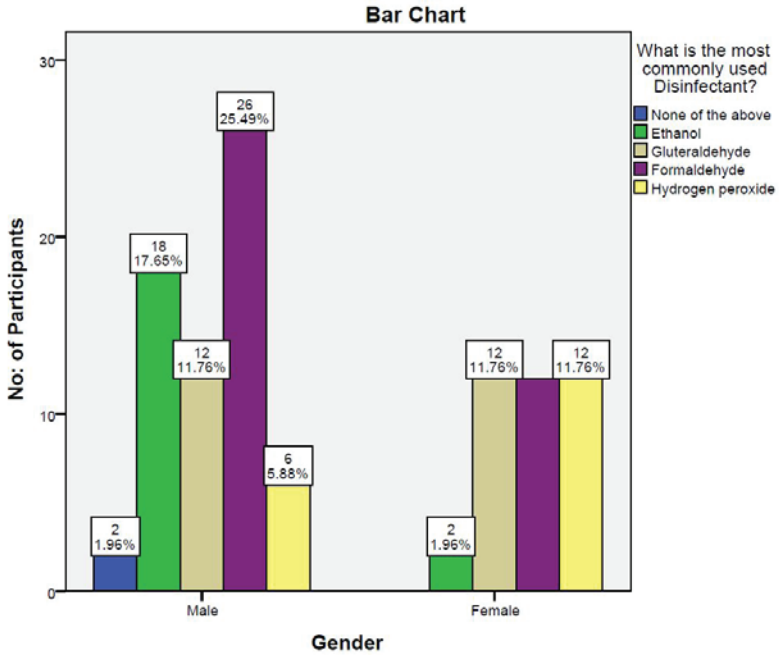

Fig. 4 : A bar chart showing the association between gender and the responses to the question

"What is the most commonly used disinfectant?". X axis represents the different types of disinfectants chosen by male and female students and Y axis denotes the number of candidates . In the male population, the highest response given was 25% as Formaldehyde. In the female population, there is no distinctive difference in the responses recorded. Hence, there is a significant difference between the responses given by the males and females. The Pearson Chi square value was found to be 16.396, and the p value was found to be 0.003 which is statistically significant.

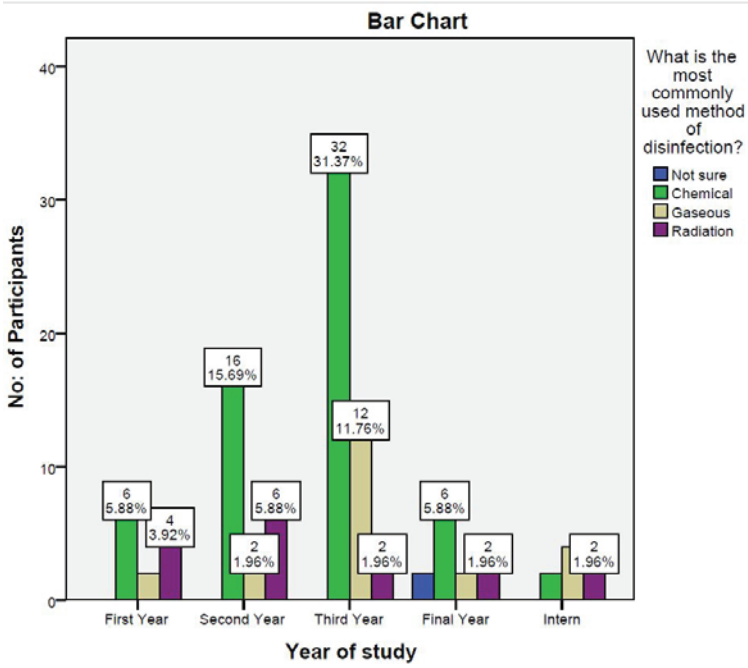

Fig. 5: A Bar chart showing the association between Year of study and the responses to the question " What is the most common method of disinfection ?". The X axis denotes the Year of Study and the Y axis denotes the number of responses. Most of the participants of the survey were Third years, and the major response was a chemical method of disinfection. The Pearson Chi square value was found to be 31.444, and the p value was found to be 0.002 which is statistically significant. There is a significant difference between the responses and the year of study.

On the question about the commonly used disinfectants in dental clinics 65-84% of them are not familiar about the four commonly used disinfectants. This lack of knowledge about the appropriate use of disinfectants during various procedures will lead to failure of complications in the patients. Based on the present study it was evident for formalin was used as a disinfectant this point consensus with the another research, in their study 10% formalin is used as immersion disinfectant [18,19,20].This tells us that formalin is an excellent disinfectant used to fumigate operation theatres [21,22]. Based on our study instruments like impression materials are mostly sterilised or if not they are immersed in disinfectant solutions [23,24].Thus one such study is an acceptance of our present study as most impression materials are most commonly either autoclaved or disinfectant spray is used [25,26]. Another case is that sterilisation is more preferred over disinfection of hand instruments; this fact is also in acceptance with our current study.The limitations of the present study is the limited sample size and unwillingness to answer certain questions. The future scope of such a study is however to improve teaching and knowledge about sterilisation and disinfection protocols in clinics.

Conclusion

Only around 50% of the participants were aware of the disinfection protocol. Only 50% of them practice the protocol. This is the reason for the iatrogenic infection in the hospital. It has been proved that success of any treatment is dependent on following sterile aseptic procedures. Students community should be trained in their learning days to get a hand on practice in such protocol, then the most important thing is the procedure and the protocol should be available to everyone, everywhere.It can be displayed at the practice area and also available as a handbook. This will improve the quality of treatment and also increase the success rate more than that it will decrease the cost of the treatment and duration of the treatment course. Similar studies on this topic (Alok Kumar Sethi et al) showed satisfactory results. However there remain few shortcomings about different teaching methodologies leading to few lapses in the adequate sterilization and ethical disposal of instruments. Hence, a disciplined training and teaching methodology in this field is the need of the hour and would go a long way in protecting themselves while learning and also would cause minimal harm to the environment

Acknowledgement: The authors would like to acknowledge the support rendered by the Department of Periodontics and Information Technology of Saveetha Dental College and Hospitals and the management for their constant assistance with the research.

Conflict of Interest: None declared.

Source of Funding: Self.

Ethical Clearance: It is taken from "Saveetha Institute Human Ethical Committee" (Ethical Approval Number- SDC/SIHEC/2020/DIASDATA/0619-0320)

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