KNOWLEDGE AND AWARENESS ON POROSITY IN DENTURE BASE RESINS AMONG DENTAL STUDENTS

Ashinie. C[1], Dr. Revathi Duraisamy*[2]

[1]Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Science, Saveetha University, 162, Poonamalle high road, Velappanchavadi, Chennai-600077

[2]Reader, Department of Prosthodontics, Saveetha Dental College and Hospitals, Saveetha institute of Medical and Technical Science, Saveetha University, 162, Poonamalle high road, Velappanchavadi, Chennai-600077

ABSTRACT

Introduction : Dimensional stability, porosity, and mechanical strength of denture base resins all can play a role in the clinical performance of full dentures and removable partial prostheses. Porosity mainly depends on the polymerisation of acrylic resin and different specimen shapes. Knowing about the porosity in denture base resins aid us to analyse about the mechanical strength of the denture base resins. This analyses the longevity or survival of the denture base resins.

Aim : The aim of the study is to analyse the knowledge and awareness on porosity in denture base resin among dental students.

Materials and Methods: A descriptive cross sectional survey was conducted in the month of february 2021 among 100 undergraduate dental students through a self administered questionnaire. The responses were collected, tabulated in excel sheets and analysed using SPSS software. Chi square test was used to analyze the age of the participants with preference of toothpaste or tooth powder among the general population in south India with statistical significance of $P< 0.05$.

Results and Discussion: The study included 60% 2nd year students and 40% 3rd year students. When they were asked whether they knew that denture base is a part of denture that rests on foundation tissues everyone replied that they were aware.When they were questioned about the reason for porosity in denture base resins 17% of the students said as insufficient amount of resin, 4% replied as air inclusions and 3% replied as inhomogeneity of resin mass while 76% of them replied as all the reasons are responsible for porosity.

Conclusion: From this study it can be concluded that the students were aware of the porosity in the denture base resins. They had a good knowledge about the resin and also about the denture base resins that will help them in the future.

Keywords : Porosity; Denture base; Awareness

INTRODUCTION

Dimensional stability, porosity, and mechanical strength of denture base resins all can play a role in the clinical performance of full dentures and removable partial prostheses. Resin distortion, for

instance, causes poor internal adaptation of denture bases, which leads to a loss of retention and stability, as well as the production of hyperplasia(1). Denture base resins are often made by combining monomer and polymer in a particular ratio, then packing and pressing the resulting dough mass into a flask for polymerization in a hot water bath or using microwave energy(2). The release of internal stresses caused during these pressing and polymerization procedures can cause resin distortion (3)).Denture base porosity is one of the unfavorable properties of polymethylmethacrylate in resin, which can cause staining(4). Internal tension and susceptibility to distortion and warpage may also be caused by the presence of pores (5).

Pore formation in denture base resin has been due to a range of factors, including the presence of residual monomer during the polymerisation cycle, air entrapment during mixing, monomer vaporization, mold packaging, and inadequate compression on the flask(6). Porosity mainly depends on the polymerisation of acrylic resin and different specimen shapes(7). Some studies have also reported that insufficient mixing of monomer and polymerisation at high temperatures, packing of mould and incomplete compression of flask can also cause porosity in denture base resins(8). In dentistry, acrylic resins are the most commonly used materials. It is one of the oldest materials used in the manufacture of denture bases. Polymethyl methacrylate is also commonly used to fabricate denture bases (4). Microorganism development, a decrease in base power, and unappealing aesthetics are all linked to porosity (9). Knowing about the material for denture base resins is important as the porosity depends on the type of acrylic resin and the processing technique.

Knowing about the porosity in denture base resins aid us to analyse about the mechanical strength of the denture base resins. This analyses the longevity or survival of the denture base resins. This also assists us for further polymerisation of denture base resin. The aim of the study is to analyse the knowledge and awareness of porosity in denture base resins among dental students.

MATERIALS AND METHODS

Study design : A cross sectional study was conducted in the month of february 2020 among undergraduate students.The study was conducted in Saveetha dental college and Hospitals.

Study subjects : A simple random sampling was used to select the study participants**.**

Inclusion criteria : All the students who were willing to participate were included in the study

Ethical consideration : Returning the filled questionnaire was considered as implicit consent as a part of the survey. Ethical approval for the study was obtained from the institutional review board (IRB)

Study method : The self administered questionnaire of 10 closed ended questions was prepared and it was distributed among dental students through Online survey forms “GOOGLE FORMS”. The collected data were checked regularly for clarity, competence, consistency, accuracy and validity. The questionnaire also contained demographic data.

Statistical analysis : Data was analysed with SPSS version to 22.0. Descriptive statistics as a percent were calculated to summarise qualitative data. Chi Square test was used to analyse and

compare the education level of parents and their knowledge and awareness on orthodontic treatment.The confidence level was 95% and of statistical significance $P < 0.05$. Finally the results were presented as bar charts and frequency charts.

RESULTS

The study analysed the awareness and knowledge of porosity in denture base resins among dental students. The study included 60% 2nd year students and 40% 3rd year students. When they were asked whether they knew that denture base is a part of denture that rests on foundation tissues everyone replied that they were aware and when they were asked what is attached to the denture base about 96% replied as teeth and others do not have any idea about it. When the dental students were asked on what is a resin 82% replied appropriately as a natural or synthetic substance that forms plastic material after polymerisation(figure 1) and everyone was aware that porosity is a processing error in resins(figure 2). When the dental students were asked about the type of porosity 96% were aware that contraction porosity occurs due to polymerisation shrinkage(figure 3), gaseous porosity occurs due to insufficient material or pressure(figure 4) and localised porosity occurs due to improper mixing of components(figure 5). When they were questioned about the reason for porosity in denture base resins 17% of the students said as insufficient amount of resin, 4% replied as air inclusions and 3% replied as inhomogeneity of resin mass while 76% of them replied as all the reasons are responsible for porosity(figure 6).

Porosity in denture base resins remains to be a long standing problem and nearly 11% porosity was observed which depends on various processing conditions(10).The association between knowledge of dental students on porosity in denture base resins and their year of study was compared. In the association between the dental students' knowledge of attachment in denture base resin, the majority of 96% were aware that teeth are attached to denture base resin, among them 59% were 2nd year students and 37% were 3rd year students . The association showed p value of 0.118 which was statistically insignificant(figure 7). In the association between the dental students' knowledge on what is a resin. Majority of 82% were aware that resin is a natural or synthetic substance that forms plastic materials after polymerisation, among them 51% were 2nd year students and 31% were 3rd year students and the association showed p value of 0.110 which was statistically insignificant(figure 8) and in the association between the dental students' knowledge on the reason for porosity in denture base resins. Majority of 76% were aware that all the reasons like air inclusion, inhomogeneity of resin mass and insufficient amount of resin are responsible for porosity among them 39% were 2nd year students and 37% were 3rd year students. The association showed a p-value of 0.00 which was statistically significant (figure 9).

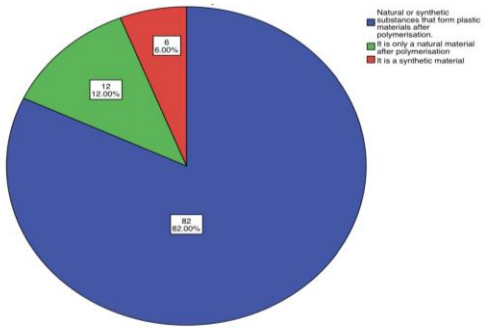

FIGURE 1 : Represents the frequency of students who know what is a resin, where blue represents 'Natural or synthetic substance that form plastic materials after polymerisation' and green represents 'It is only a natural material after polymerisation' and red represents 'It is a synthetic material'. Majority of about 82% of the dental students know that resin is a natural or synthetic substance that forms plastic materials after polymerisation while 12% say that it is only a natural material after polymerisation.

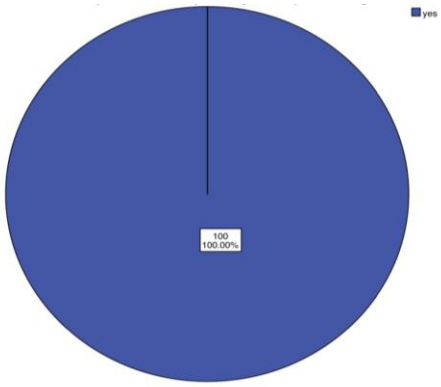

FIGURE 2 : Represents the frequency of students who know that porosity is the processing error in resins where blue represents 'Yes' and red represents 'No'. Majority of about 100% of the dental students know that porosity is a processing error in resin.

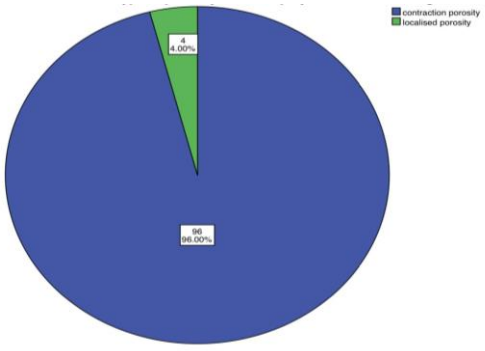

FIGURE 3 : Represents the frequency of students who know the type of porosity caused due to polymerisation shrinkage, where blue represents 'Contraction porosity' and green represents 'Localised porosity'. Majority of about 96% of the dental students replied as contraction porosity and 4% replied as localised porosity.

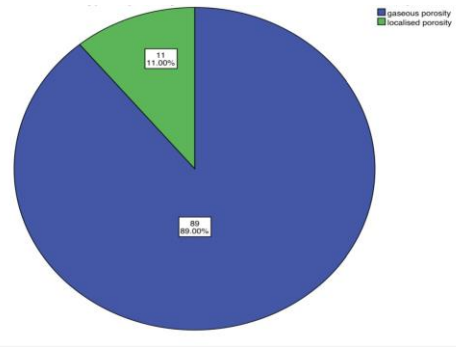

FIGURE 4 : Represents the frequency of students who know the type of porosity caused due to insufficient material or pressure, where blue represents 'Gaseous porosity' and green represents 'Localised porosity'. Majority of about 89% of the dental students replied as gaseous porosity and 11% replied as localised porosity.

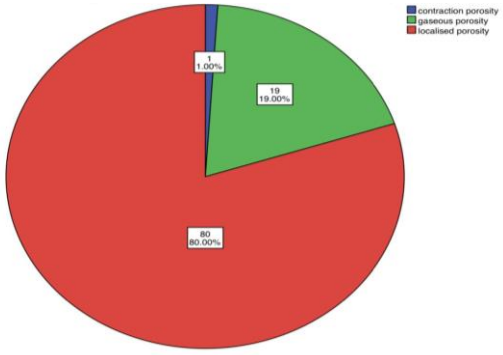

FIGURE 5 : Represents the frequency of students who know the type of porosity caused due to improper mixing of components, where blue represents 'Contraction porosity', green represents 'Gaseous porosity' and red represents 'Localised porosity', Majority of about 80% of the dental students replied as localised porosity, 19% replied as gaseous porosity and 1% replied as contraction porosity.

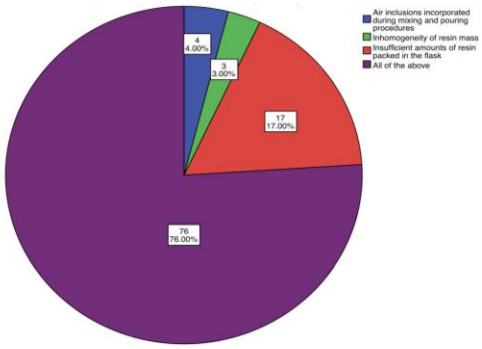

FIGURE 6 : Represents the frequency of students who were aware of the reason for porosity in denture base resins, where blue represents 'Air inclusion incorporated during mixing and pouring procedure', green represents 'inhomogeneity of resin mass' and red represents 'insufficient amounts of resin packed in the flask' and purple represents 'All the reasons', Majority of about

76% of the dental students replied as all the reasons, 17% replied as insufficient amounts of resin packed in the flask and 4% replied as air inclusion incorporated during mixing and pouring procedure.

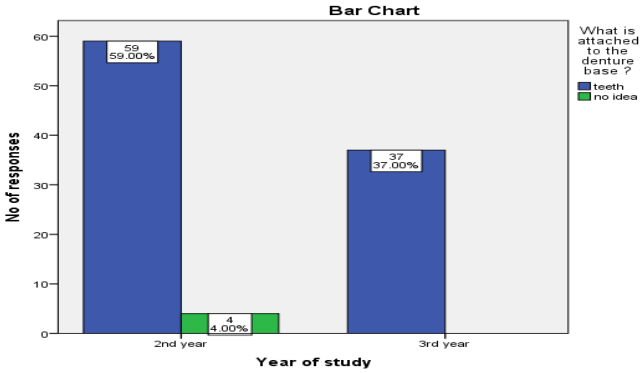

FIGURE 7 : Represents the association between the dental students' knowledge of attachment in denture base resin, where X axis represents the 'year of study' and the Y axis represents the 'number of responses'. Green represents 'No idea' and blue represents 'teeth'. Majority of 96% were aware that teeth are attached to denture base resin, among them 59% were 2nd year students and 37% were 3rd year students . Chi square test was done, p value of 0.118(>0.05), hence statistically insignificant.

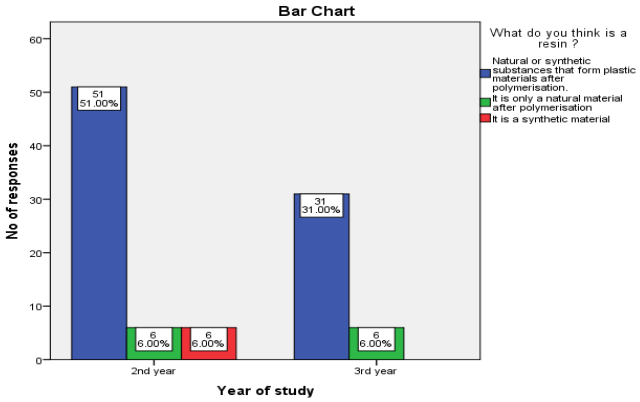

FIGURE 8 : Represents the association between the dental students' knowledge on what is a resin, where X axis represents the 'year of study' and the Y axis represents the 'number of responses'.Blue represents 'Natural or synthetic substance that form plastic materials after polymerisation' and green represents 'It is only a natural material after polymerisation' and red represents 'It is a synthetic material' Majority of 82% were aware that resin is a natural or synthetic substance that forms plastic materials after polymerisation, among them 51% were 2nd year students and 31% were 3rd year students. Chi square test was done, p value of 0.110(>0.05), hence statistically insignificant.

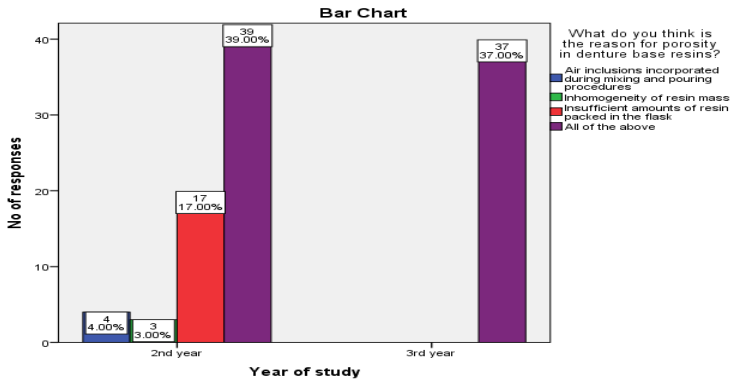

FIGURE 9 : Represents the association between the dental students' knowledge on the reason for porosity in denture base resins, where X axis represents the 'year of study' and the Y axis represents the 'number of responses'. Blue represents 'Air inclusion incorporated during mixing and pouring procedure', green represents 'inhomogeneity of resin mass' and red represents 'insufficient amounts of resin packed in the flask' and purple represents 'All the reasons'. Majority of 76% were aware that all the reasons like air inclusion, inhomogeneity of resin mass and insufficient amount of resin are responsible for porosity among them 39% were 2nd year students and 37% were 3rd year students. Chi square test was done, p-value of 0.00(<0.05), hence statistically significant.

DISCUSSION

Based on previous studies the two major causes of porosity were Volatilization of the monomer, termed gaseous porosity, and polymerization shrinkage, termed contraction porosity(11). Staining, calculus buildup, and adhering particles can all harm a porous denture. In order to be hygienically acceptable, a denture must be nonporous(12).One of the unfavorable properties of polymethylmethacrylate is porosity in denture base resin, which can lead to staining and substance adherence. Additionally, the existence of pores may result in elevated internal tension and susceptibility to warpage and deformation (6). Porosity depends, in part, on the material and polymerization method used, studies also demonstrated that pore formation is not only dependent on the polymerizing cycle(13). The studies also showed that The use of microwave processing is a feasible option for denture processing, and the use of zeolites did not result in substantial porosity(14).

Acrylic resins have their own shortcomings such as dimensional instability, residual monomer content, weak strength, water absorption, and color instability(15). Porosity in heat processed denture base resins is one of the undesirable characteristics of PMMA. It can compromise physical, esthetic and hygienic properties of processed denture base(16). Studies have also stated that occurrence of porosity is dependent on the concentration of the initiator, generally benzoyl peroxide in the polymer (7)

This study was done only among 100 dental students and it does not include a varied population. Further studies can be done on a large sample size and among varied populations like dental

technicians to know whether everyone is aware of porosity in denture base resins and their disadvantages.

CONCLUSION

The students were highly aware of the effects and nature of porosity in denture base resins. They were also aware of the different types of porosities and their causes. From this study it is concluded that the dental students are aware of the porosity in denture base resins. Further studies should be done to know the different reasons for porosity in denture base resins and its effect on the final dentures

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