

## Knowledge, Attitude And Practice Of Tissue Conditioner Among Undergraduate Dental Students - A Questionnaire Study

Research Article

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### Abstract

**Introduction:** Tissue conditioners (TCs) are short-term soft liners made from amorphous polymers, formed in situ from a mixture of a polymer powder and a liquid plasticizer. They are routinely used to improve the fit and function of an ill-fitting denture prior to replacement. They can also be used to treat abused mucosal tissues underlying ill-fitting acrylic dentures as temporary expedients.

**Materials and Methods:** This is a questionnaire based survey which consisted of 15 questions and distributed among 120 dental students. This study was conducted to study the use of tissue conditioner.

**Results:** Results obtained was analysed through pie-charts and bar graphs. Major four responses was taken in to consideration which was of high importance in the study and by analysis the awareness of tissue conditioner among undergraduate dental students was found to be good.

**Conclusion:** With our pilot study we suggest programs to improve the awareness about the use of tissue conditioner. Further research work with more number of dental practitioner is recommended.

**Keywords:** Tissue Conditioner; Denture Stomatitis; Denture Base; Resilient Liners; PEMA.

### Introduction

Tissue conditioners (TCs) are short-term soft liners made from amorphous polymers, formed in situ from a mixture of a polymer powder and a liquid plasticizer [1, 2]. They are routinely used to improve the fit and function of an ill-fitting denture prior to replacement. They can also be used to treat abused mucosal tissues underlying ill-fitting acrylic dentures as temporary expedients. Additionally, these materials are recommended for making functional impressions [3-5]. The following preparations are among the wide range of available commercial products: Visco-gel (De Trey),

Coe-Comfort (GC America), FITT (Kerr), GC Soft-Liner (GC Europe NV), SR-Ivoseal (Ivoclar), Tissue Conditioner (Shofu), Hydro-Cast (Sultan Chemists).

The loss of resilience, water absorption, support of bacteria and yeasts growth, color change, and loss of adhesion to the denture base resin are the main problems during the clinical use of TCs. As a result, the materials require regular replacement at short intervals. TCs are recommended as provisional liners to maintain the fit of removable dentures and to prevent mechanical irritation from the denture [6]. TCs may also be used to rehabilitate

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**Received:** April 12, 2021

**Accepted:** May 12, 2021

**Published:** May 17, 2021

**Citation:** Dhanraj M Ganapathy, Karthiga Devi, Visalakshi Ramanathan. Knowledge, Attitude And Practice Of Tissue Conditioner Among Undergraduate Dental Students - A Questionnaire Study. *Int J Dentistry Oral Sci.* 2021;08(05):2474-2479. doi: <http://dx.doi.org/10.19070/2377-8075-21000486>

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cancer patients. The polymer powder, used in the formulation of TCs generally consists of polyethyl methacrylate (PEMA) and the liquid plasticizer is ester-based in ethyl alcohol solution without an acrylic monomer [7]. The plasticizers are low molecular weight aromatic esters. Mixing of the powder and liquid results in polymer chain entanglement and the formation of a coherent gel characterized by viscoelastic behavior appropriate to its intended clinical use. The loss of surface integrity and surface roughness of TCs are regarded as the main problems in the denture bearing oral mucosa conditions resulting in inflammation of oral mucosa of

the denture-bearing area - denture stomatitis [8]. TCs provide an even distribution of masticatory force, accurately modeling itself to the changes which occur during the healing of lesion of substrate and can act therapeutically by incorporating antifungal or antibacterial agents [9].

The polymer powder, used in the formulation of TCs, generally consists of polyethyl methacrylate (PEMA) of molecular weights ranging between  $1.79 \times 10^5$  and  $3.25 \times 10^5$ . The liquid plasticizer is ester-based in ethyl alcohol solution without an acrylic

Figure 1. Questionnaire used for the study.

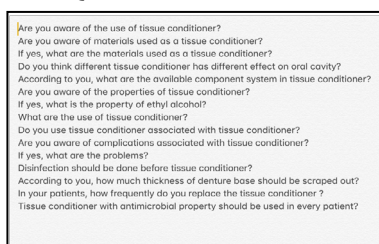


Figure 2.

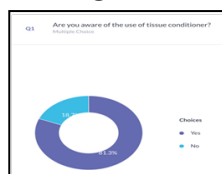


Figure 3.



Figure 4.



Figure 5.

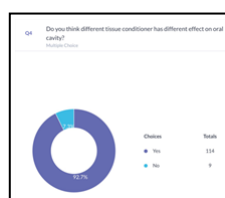
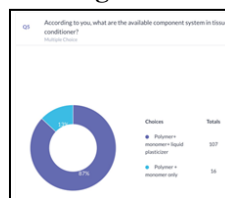


Figure 6.



monomer. The plasticizers are low molecular weight aromatic esters, such as dibutyl phthalate, butyl phthalyl butyl glycolate, butyl benzyl phthalate, and benzyl benzoate [5-7]. Their role is to lower the polymer glass transition temperature of the acrylic polymer, softening the otherwise rigid polymer [2, 3]. Mixing of the powder and liquid results in a polymer chain entanglement and the formation of a coherent gel characterized by viscoelastic behavior appropriate to its intended clinical use [8, 9]. The PEMA particles are slowly penetrated by the large molecules of the ester-based plasticizer, while the alcohol swells the polymer and hence accelerates plasticizer penetration to produce a clinically acceptable gelation time. Polymethyl methacrylate (PMMA), a commonly used acrylic polymer, is unsuitable in this application, because it is insoluble in ethanol [2, 10, 11].

The limitations of TCs result from the effects of the oral cavity environment on physical properties of TCs which necessitate frequent replacement of the material. The ethanol and plasticizers leach into the saliva, which is then absorbed by the polymeric phase of the gel [13-15]. It has been shown that over a period of 1 week, water sorption increased from 0.2 to 5.6 mg/cm, and solubility ranged from 0.03 to 0.40 mg/cm for various commercial products [16-18].

One of the main problems with silicone-based TCs concerns bonding to the denture base surface. It has been shown that "adhesion" between the lining material and base of the denture is the most common source of failure of a resilient-lined denture. As a result, this creates a potential space for denture plaque and calculus formation and leads to micro leakage [2, 19, 20]. Hence the aim of the survey is to assess the knowledge, attitude and practice of tissue conditioner among undergraduate dental students.

## Materials and Method

The cross-sectional survey was conducted on a sample size of 120 private undergraduate dental practitioners. The practitioners were personally approached by the investigator, and the response rate for the study was 100%. The survey was conducted using a self-directed, comprehensive, closed ended validated questionnaire with 16 questions [Figure 1]. This 16 item questionnaire included five knowledge-related questions [indication, technique, type of material, durability, and disinfection], six items on practice [clinical practice, material used, technique, recall, evaluation, and instructions to the patients] which were graded on a 5-point Lik-

ert scale (strongly agree, agree, don't know, disagree, and strongly disagree), reflecting the level of agreement of dentists' decision along the scale.

## Results

### Discussion

Among 100 dental practitioners most of them are aware about the use of tissue conditioner, that is 90 of the are aware of it (Figure 1).

This study concluded that 81.3% are aware of the use of tissue conditioner. 78% are aware of the materials used, 77.2% were aware of the properties of tissue conditioner, 77.8% were aware of the use and 91% were aware of the complications of tissue conditioner but the daily use of resilient liners was minimal. Hence awareness programs to be initiated among dental practitioners for using tissue conditioner in their daily practice.

Tissue conditioners (TCs) are short-term soft liners made from amorphous polymers, formed in situ from a mixture of a polymer powder and a liquid plasticizer. For the materials used as a tissue conditioner, 87 of the are aware of the materials used in and the properties of materials, 42% of the are unaware of material and properties of materials (FIGURE 1-7). The PEMA particles are slowly penetrated by the large molecules of the ester-based plasticizer, while the alcohol swells the polymer and hence accelerates plasticizer penetration to produce a clinically acceptable gelation time. Polymethyl methacrylate (PMMA), a commonly used acrylic polymer, is unsuitable in this application, because it is insoluble in ethanol [19]. Plasticizers, in the absence of ethanol, do not produce clinically acceptable gelation time because of the slow penetration of polymer particles by large plasticizer molecules [20]. It has been shown that the molecular weight of polymer powder, plasticizer type, ethanol content and powder liquid ratio can affect the viscoelastic properties of the TC as determined by a dynamic mechanical test. In addition, the gelation of a PEMA based system can be controlled over a wide range by varying the polymer molecular weight and in particular, the ethanol content [21]. Other factors also impact the gelation process such as: molecular weight and the size of polymer powder particles, the proportion of liquid and powder, the plasticizer content and the temperature in which the process occurs [22]. It was shown that the gelation time is reduced with the increase in polymer molecular weight

Figure 7.

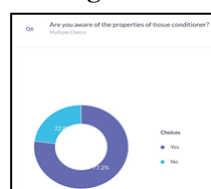
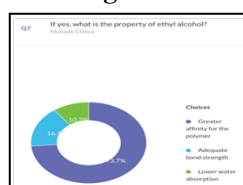


Figure 8.



and with the increase in the powder/liquid ratio as well as the increase ethanol content in the liquid component.

Regarding the properties of ethanol 88 of them are aware and in that low water absorption property was highlighted by 10% (FIGURE 8). The high content of ethanol has an impact on the weight loss and on the material shrinkage in the mouth cavity [23]. It has been demonstrated that the greatest amount of ethanol is released from the surface of the tissue conditioner in the first 12 h after prosthetic relining [24]. It has been stated that a high ethanol content in the TC increases the material plasticity and flexibility after gelation. Where as the type of the softener used impacts the plasticity, it does not change the material flexibility during the period of usage. Murata et al. claimed that the application of the right proportion of powder and liquid enhances the flexibility of the TC after the gelation [25]. Because of the differences in the physical properties and the chemical composition of various TCs, the authors recommend choosing materials according to the intended use and desirable flexible properties.

Regarding the use of tissue conditioner 88 of them are aware (FIGURE 9). They are routinely used to improve the fit and function of an ill-fitting denture prior to replacement. They can also be used to treat abused mucosal tissues underlying ill-fitting acrylic dentures as temporary expedients. Additionally, these materials are recommended for making functional impressions.

Regarding the complications 91 was aware and major percentage was towards water absorption complication. The loss of resilience, water absorption, support of bacteria and yeasts growth, color change, and loss of adhesion to the denture base resin are the main problems during the clinical use of TCs. As a result, the materials require regular replacement at short intervals. The loss of surface integrity and surface roughness of TCs are regarded as the main problems in denture bearing oral mucosa conditions, resulting in the inflammation of oral mucosa of the denture-bearing area - denture stomatitis [26]. The frequency of this ailment, which may also be caused by mechanical irritation from the denture, is rated as 40–65% among the acrylic denture wearers [27]. TCs provide an even distribution of masticatory force, accurately

Figure 9.

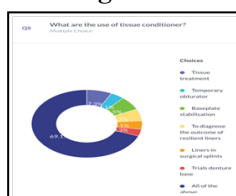


Figure 10.



Figure 11.

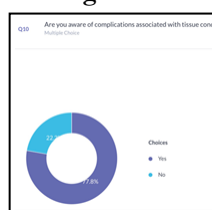


Figure 12.

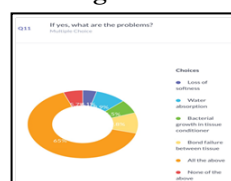


Figure 13.



Figure 14.



Figure 15.

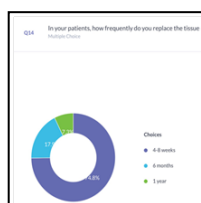


Figure 16.



modeling itself to the changes which occur during the healing of lesion of substrate and can act therapeutically by the incorporation of an antifungal or antibacterial drugs. Conditioners provide a particularly useful alternative for patients who do not wear dentures during the healing period of prosthetic substrate before relining the old denture [28].

Chow et al. showed that 5% of itraconazole added to Coe Soft or FITT materials maintains the highest activity in the first 3 days, after which the relining material must be replaced to ensure a good therapeutic effect [29]. Fungal growth on TC surfaces can cause irritation of the oral mucosa. Adhesion of *Candida albicans* to the surface of TCs is a result of cell proliferation and matrix production [30]. Radnai et al. found that chlorhexidine digluconate gel added to TC had no inhibitory effect on the growth of *Candida albicans*, but the incorporation of miconazole gave a dose-related inhibitory effect on candidal growth in vitro. Moreover, Gebremedhin et al. demonstrated that miconazole exhibits high antifungal activity against biofilms of various *Candida* species developed on heat-cured poly(methyl methacrylate) discs in vitro [31]. Schneid et al. demonstrated that a sustained release delivery system incorporating antifungal agents - nystatin, chlorhexidine, clotrimazole and fluconazole into a number of TCs significantly inhibited the growth of *Candida albicans*, although the hardness of the material increased [32]. On the other hand, Toda et al. found that in -corporating an antimicrobial polymer - 10% poly (2-tert-butylaminoethyl) methacrylate (PTBAEMA) into one TC -Coe Soft increases the wettability and roughness of the TC surface and decreases the adhesion of *Streptococcus mutans* and *Staphylococcus aureus* to the surface [33]. No anti-microbial effect was observed against *Candida albicans*. It has also been suggested that anti-microbial agents, such as silver zeolite, be incorporated in to the TC powder, since a TC containing Ag-zeolite showed a dose- dependent inhibitory effect on *Candida albicans* [34].

The soft resilient nature of TCs on the acrylic denture surface facilitates a whole range of diagnostic and treatment modalities. They are used to restore the condition of inflamed denture bearing oral mucosa, and in taking functional impressions. They may also be used as provisional liners to improve the fit of the acrylic dentures, to prevent mechanical irritation from the denture plate, and for trial evaluation of border extensions. TCs may also be used to modify dentures during implant surgery and rehabilitate cancer patients requiring obturation. Their physical properties of TCs, such as viscoelastic properties and dimensional stability, vary depending on the materials used [35]. Thus, a single type of TC may not be capable of fulfilling all of the applications adequately. The ideal resilient denture liners should possess higher elasticity during mastication and then behave viscously to distribute the functional and nonfunctional forces and relieve the pain [36]. When used for interim relining, the material should be dimensionally stable to prevent changes in the vertical dimension of occlusion. It should also be compatible with the dental stones [37].

The essential issue is to maintain denture hygiene with the relining material on the fitting surface of the denture. Prostheses should be thoroughly cleaned before relining and patients should be informed about the necessity of ensuring regular hygiene of the oral cavity during the treatment.

## Conclusion

In conclusion, it should be emphasized that biological materials for tissue regeneration lose their beneficial denture physical properties in a short period of time; hence, they are designed only for short-term denture relining. It is worth mentioning that in the case of prolonged use, the materials are mechanically irritating on the mucosa, causing the accumulation of denture plaque on the surface and an increase of denture stomatitis symptoms.

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