

AWARENESS AMONG DENTAL STUDENTS ON DIFFERENT TYPES OF PERMANENT DENTURE BASE MATERIALS USED IN COMPLETE DENTURE

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ABSTRACT:

AIM: The aim is to analyse about the awareness among dental students on different types of permanent denture base materials used in complete denture.

OBJECTIVE AND METHODOLOGY: This survey is done to analyse the awareness among dental students regarding different types of permanent denture base materials used in complete denture.

BACKGROUND: The ideal denture base material should possess some properties. It include biocompatibility, good esthetics, high bond strength with available denture teeth, radiopacity, ease of repair, and should possess adequate physical and mechanical properties. The materials such as polystyrene and light-activated urethane dimethacrylate have been developed, but PMMA remains the preferred material for removable complete and partial prostheses.

REASON: The purpose of this study is to evaluate the knowledge and awareness among students regarding permanent denture base materials in complete dentures.

Keywords: acrylic, denture base, metal, nylon based, prosthesis, edentulous ridge

INTRODUCTION:

The Glossary of Prosthodontics defines a complete denture as a removable dental prosthesis that replaces the entire dentition and associated structures of the maxilla or mandible and a denture base as the part of the denture that rests on the foundation and to which teeth are attached[1].

A complete denture is a prosthesis is composed of artificial teeth -ceramic or acrylic resin, attached to a rigid denture base. The denture base in turn derives its support from the underlying residual alveolar bone and oral mucosa, teeth, and/or implants. Since the removable complete denture prosthesis derives no fixed support from the supporting structures the support derivation is based on the philosophy of maximum coverage or the snow shoe concept. For a snow shoe concept to be effectively employed, the rigidity of the denture base becomes an essential commodity[2].

History reveals that denture bases were formed from a variety of materials including wood, bone, ivory, gold, silver, porcelain, vulcanite etc. In the past, a custom fabricated denture base that can fit perfectly in the oral cavity were in fact a luxury that was available only to wealthy and powerful men. Ivory dentures were much aesthetic but had to be carved to customise the fitting surface. Gold and silver denture bases were frequently used because of their ability to be formed by cold working owing to their ductility and malleability. But, like ivory they were again luxury items and not everyone could have afforded it.[3]

In the latter half of nineteenth century, vulcanite was developed by Nelson Goodyear. Vulcanite ruled the denture fabrication industry for quite a long period until the introduction of PMMA resins in twentieth century. PMMA resins become the viable aesthetic and economic alternative for the metallic and vulcanite denture bases. Apart from gold and silver alloys, aluminium was also used in the nineteenth century. Other than metals and vulcanite, gutta percha, celluloids, thermo formable tortoise shells etc were also in being[4,5].

As discussed earlier the basic requirement for a denture base is rigidity. Although individual denture bases may be formed from metals or metal alloys, the majority of denture bases are fabricated using common polymers. Such polymers are chosen based on availability, dimensional stability, handling characteristic, colour, and compatibility with oral tissues[6].

The modern denture base materials can be broadly classified into three groups namely acrylic resin denture bases, metallic denture bases and thermoplastic resin denture bases. The most popular of all is the acrylic or the PMMA resin which remains the preferred material for removable complete and partial prostheses. Various modified and improved forms of PMMA resins are available in recent pasts and there has been more than one way to fabricate a satisfactory denture base using PMMA resins. For example Urethane Dimethacrylate, a derivative of the acrylic based material can be cured by blue light and offers much more flexibility in fabrication. Polymerisation of PMMA is based on chemical interaction between the monomer and polymer in the presence of an activator and an initiator. Activation can be by means of heat, light or a chemical agent. All these three types of acrylic resins pass off very easily for a denture base material in terms of rigidity, aesthetics and economics[7].

After the acrylic resins, the other most commonly used material for forming denture bases are the metals. Both precious/semi precious alloys and base metal alloys are used. Due to reduced cost and acceptable anti corrosive properties base metal alloys are becoming more and more popular as a choice for forming a denture base. Metal denture bases can be made stronger in much thinner sections compared to the polymers like acrylic resin and hence can contribute to the reduction in bulk of the denture across the palate. This is an important factor to the patient since more tongue space is created resulting in increased acceptance towards the denture treatment. Also because of the increased thermal conductivity of the metallic bases, the patient will be able to feel more of the warmth and cold of food, increasing the palatability of the food. Furthermore, the metal denture bases have increased tissue tolerance because of a less irritating surface, owing to their high polishability and ability retain the same. This in turn can reduce plaque accumulation and reduce tissue irritation, which is a common problem with resin denture bases[8,9]

Increased weight, although a negative impact for an upper denture proves beneficial in a mandibular denture, as the weight tends to keep the denture in close approximation with the basal tissues, resulting in increased stability of the dentures. Some disadvantages of metal bases are greater initial and greater restorative costs, difficulty and expensive nature of rebasing and regrounding the occlusion, less margin of error permissible in the posterior palatal seal, increased weight for a maxillary denture. In the end, metals without being combined with polymeric denture bases cannot be used successfully over a longer period as the supporting tissues keep changing their volume and character. The combination of metals with polymers allow adjustments like rebasing and relining in those areas where resorption occurs. For example, in a maxillary arch the palatal bone is much stable to resorption and hence the metallic denture bases are restricted within the palatal vault and combined with polymeric materials over the alveolar ridge and the periphery[10]

Thermoplastic resins or nylon based polymers are the third group of contemporary polymers that are commonly used for denture base fabrication. Thermoformed polymers differ from the acrylic in the manner that they can be formed by heating and injecting them into a mould. The rigidity of thermoplastic resins become questionable in thinner sections and hence the philosophy of cross arch stabilisation and maximum force distribution may become obsolete. However there are always some situations that demand a flexible denture base to be used. For example, a Kennedy's class 4 edentulous situation in a mandibular arch may not require much of load or stress bearing capability. This when combined with lingually tilted posterior remaining teeth will pose a serious trouble in construction of a metallic or acrylic denture base owing to severe lingual undercuts that may present in these patients. In such cases a flexible thermoplastic base can be of help to fabricate a denture base that can flex and enter undercut and remain adapted to the tissues in close quarters after denture seating. This would not be possible if we use a metal or acrylic denture base, as the undercuts need to be blocked out or eliminated by grinding natural tooth structure that may predispose the teeth to dentinal hypersensitivity. Also in places where a metallic clasp is not well accepted in terms of aesthetics, a thermoplastic resin extension can function like clasp. Since thermoplastic resins can be pigmented to vary the shades the denture base can be much more aesthetic compared to metallic bases[11]

Moreover, unlike the acrylic resin denture bases there are no chances of leaching of unpolymerised monomers and low molecular weight polymers from the flexible denture bases as they are basically pre-polymerised literally devoid of monomers or low molecular weight polymeric chains. This is a good news when it comes to the biocompatibility or tissue acceptance. And, in terms of fabrication, thermoplastics are always fabricated only by means of injection moulding techniques which are known for the dimensional accuracy. Hence the adaptation of thermoplastic resins will never be questionable when compared to acrylic resins which are notoriously known for decreased palatal adaption when fabricated by compression moulding or fluid resin technique owing to their uncontrolled polymerisation shrinkage. During processing, many other variables may also affect the dimensional changes of acrylic denture base resins, including the size, shape, and thickness of the denture, the thermal expansion and contraction of the acrylic resin and stone, the polymer/monomer ratio, the presence of artificial teeth, and the processing methods.

One major disadvantage of thermoplastic materials is that there is no chemical adhesion to ceramic denture teeth or the frequently used contemporary cross linked acrylic resin denture teeth. Some mechanical locking undercut needs to be created on the under surface for the denture teeth to be retained in the base. This becomes a problem in a case where the inter occlusal distance between the edentulous ridges are compromised. This is one situation where acrylic resins score much more above the thermoplastic and metallic denture bases. Acrylic resin denture bases have a strong chemical adhesion to the cross linked acrylic denture teeth and hence can retain the tooth even when it is ground down to look like a veneer. Also, chair side relining and rebasing of flexible thermoplastic prostheses using a tissue conditioner or a soft-liner is difficult and also because they lack cross linking between the polymeric chains they are prone to absorb colorants and staining materials from food if it is not polished properly and cleaned by the patient regularly.[12]

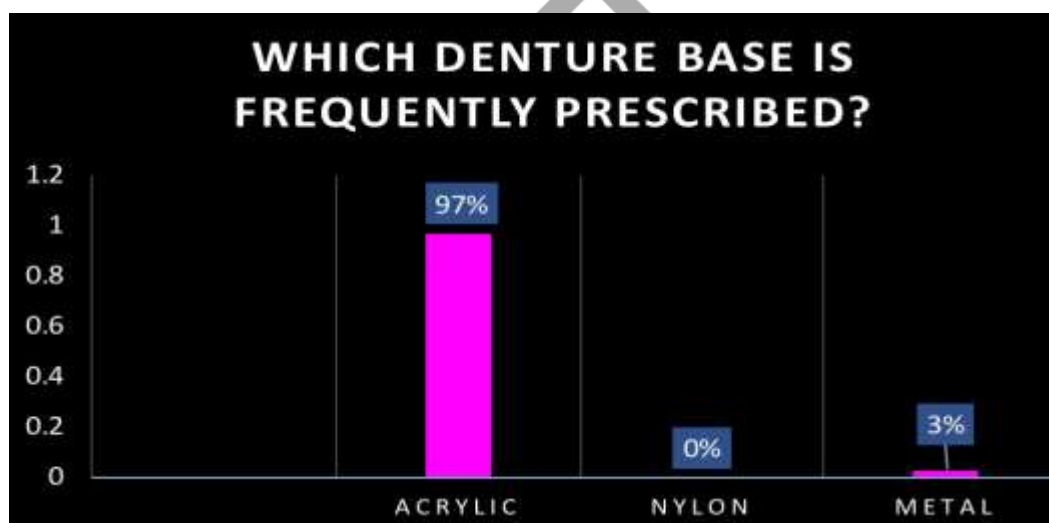
MATERIALS AND METHOD:

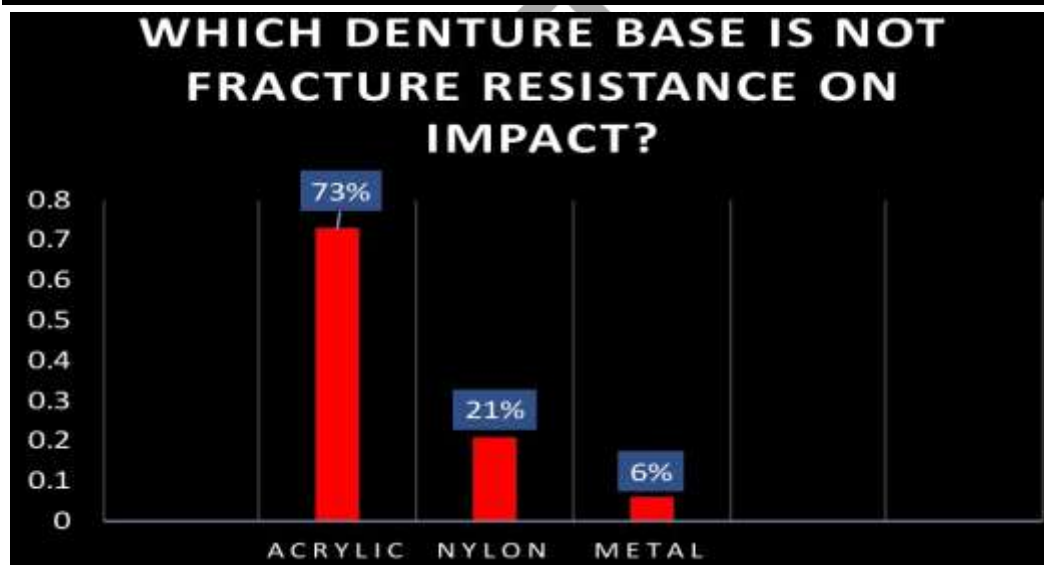
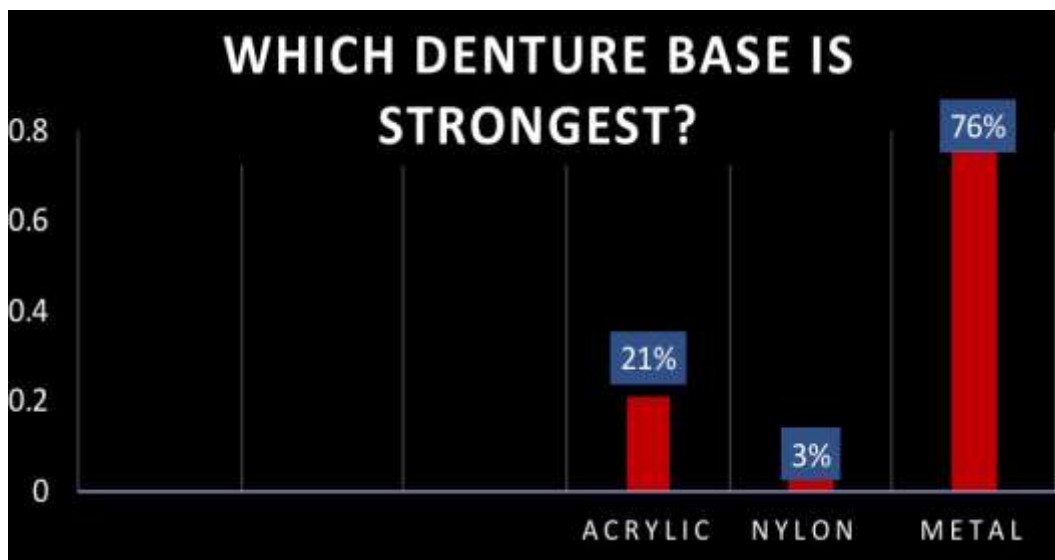
This study was done to understand the level of knowledge, attitude and practice of choice of permanent denture base materials among dental students and practitioners. A random sampling was done and hundred interested participants were selected which included, both students and practitioners. A questionnaire containing 15 questions was given to the selected persons and responses were obtained and analysed using descriptive statistics.

The questionnaire used in the study is as below

1. What type of denture bases do you frequently prescribe in your practice?
 - a. Acrylic
 - b. Nylon based
 - c. Metal
2. Which denture base do you think is strongest?
 - A. Acrylic
 - B. Nylon based
 - C. Metal
3. Which denture base do you think is not fracture resistant on impact?
 - A. Acrylic
 - B. Nylon based
 - C. Metal
4. Which denture base do you think is easy to repair?
 - A. Acrylic
 - B. Nylon based
 - C. Metal
5. Which denture base do you think is more biocompatible?
 - A. Acrylic
 - B. Nylon based
 - C. Metal
6. Which denture base do you think can be made thinner?
 - A. Acrylic
 - B. Nylon based
 - C. Metal
7. Which denture base do you think is heavier?
 - A. Acrylic
 - B. Nylon based
 - C. Metal
8. Do you think heavier denture base is advantageous sometimes?
 - A. Yes
 - B. No
 - C. Not sure
9. Which denture base do you think is economical?
 - A. Acrylic
 - B. Nylon based
 - C. Metal
10. Which denture base do you think can be characterised with pigments?
 - A. Acrylic
 - B. Nylon based
 - C. Metal
11. Which denture base allow the patient to feel the cold and warmth of food?
 - A. Acrylic
 - B. Nylon based
 - C. Metal
12. Which denture base do you think can have a chemical bond with the cross linked resin teeth that are in common use nowadays?

- A. Acrylic
 - B. Nylon based
 - C. Metal
13. Do you think metal denture base can be used alone in fabrication of dentures without combination of other materials?
- A. Yes
 - B. No
 - C. Not sure
14. Do you think metal denture base becomes extinct in future?
- A. Yes
 - B. No
 - C. Not sure
15. Does your technician try to sell flexible denture base?
- A. Yes, very often
 - B. No, he never talks about
 - C. Yes, sometimes

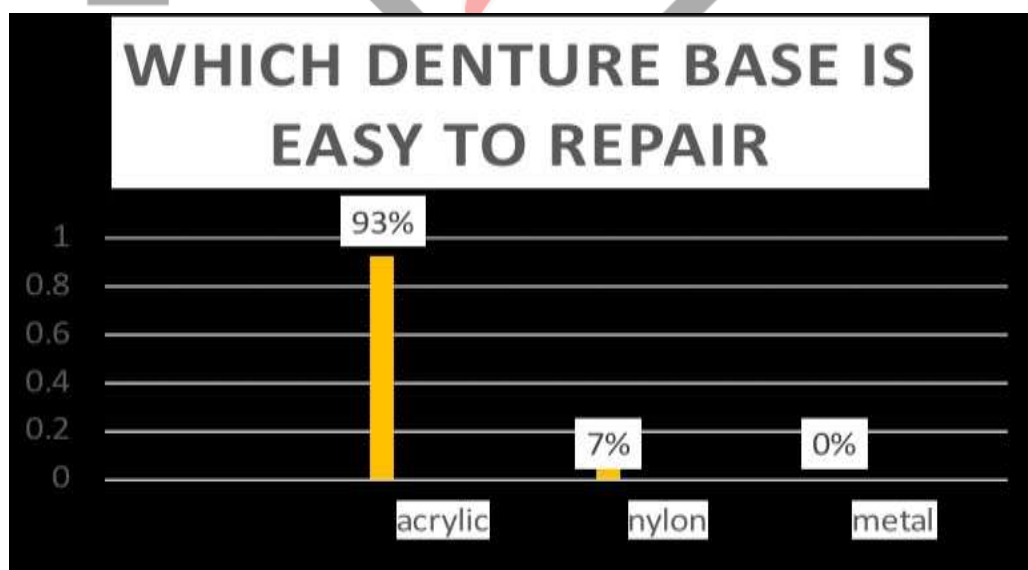
RESULTS:**Graph 1: responses to question number one**

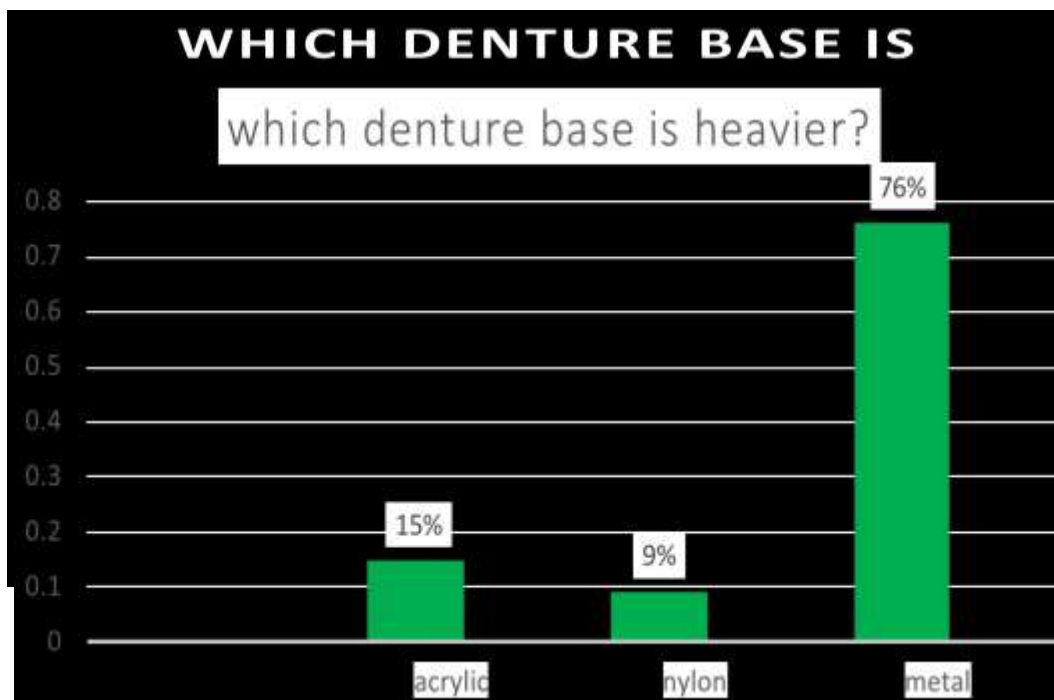


Graph 2: responses to question number two

Graph 3: : responses to question number three

Graph 4: : responses to question number four

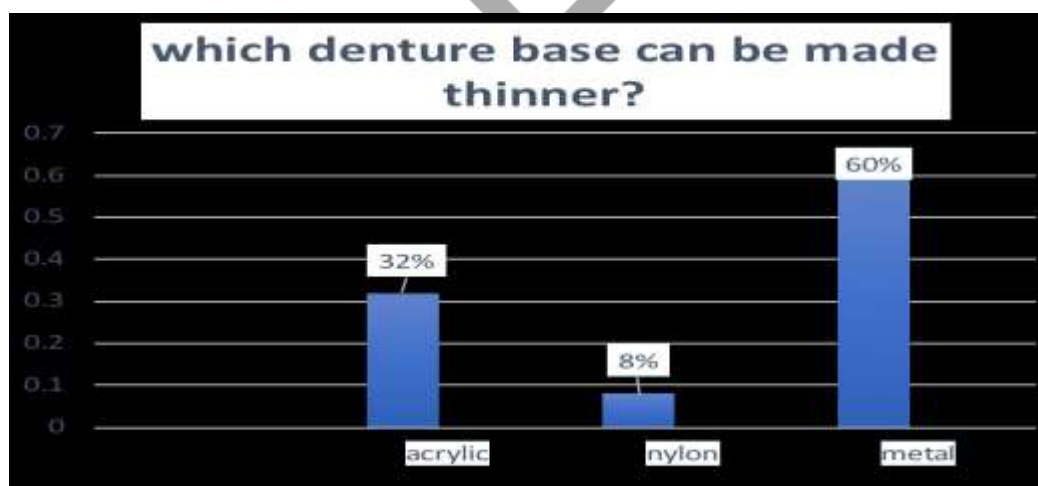
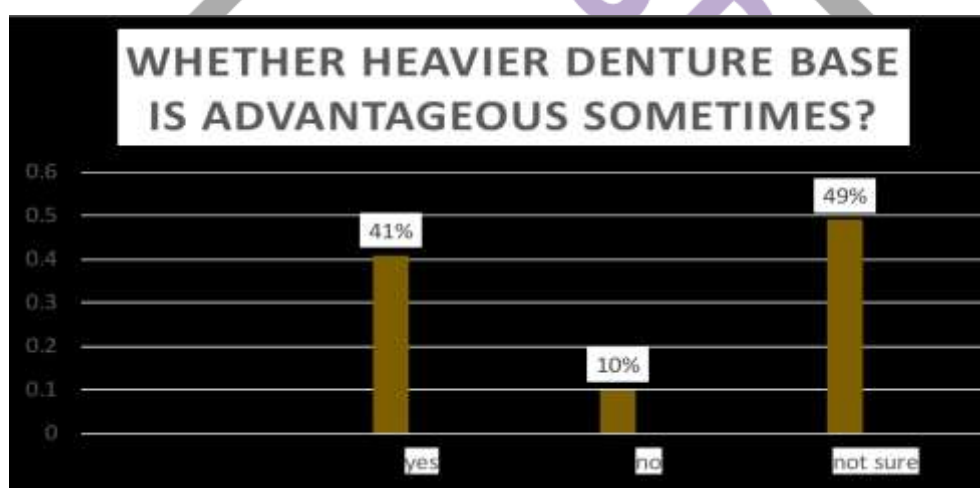


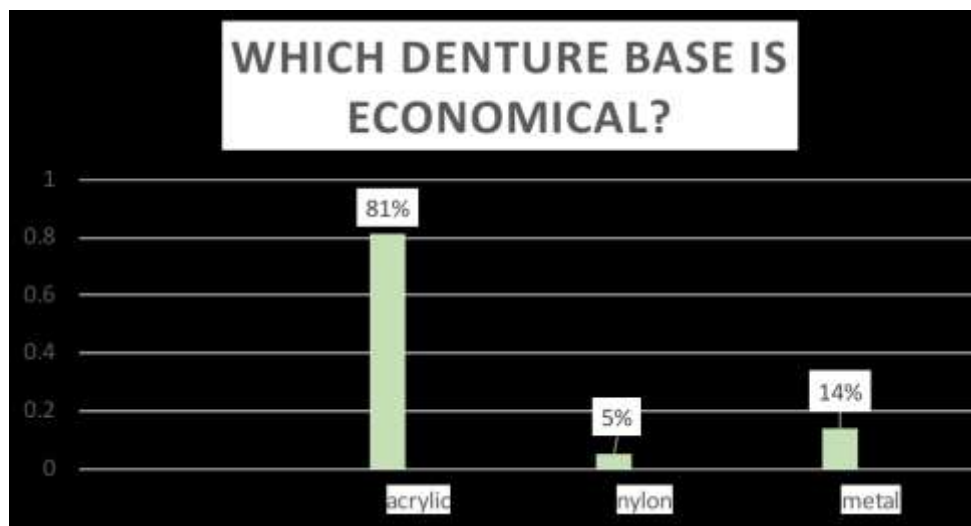


Graph 5: responses to question number five

Graph 6 responses to question number six

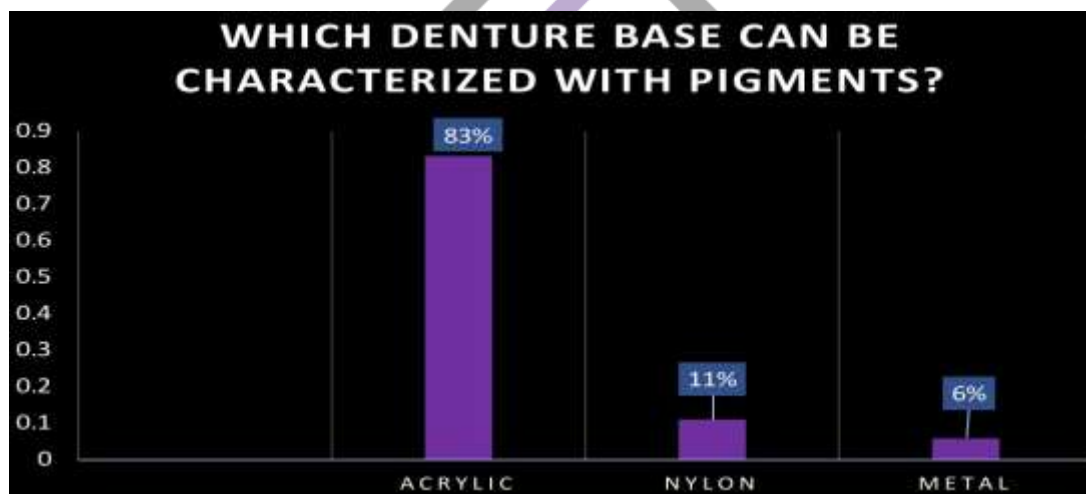
Graph 7: responses to question number seven





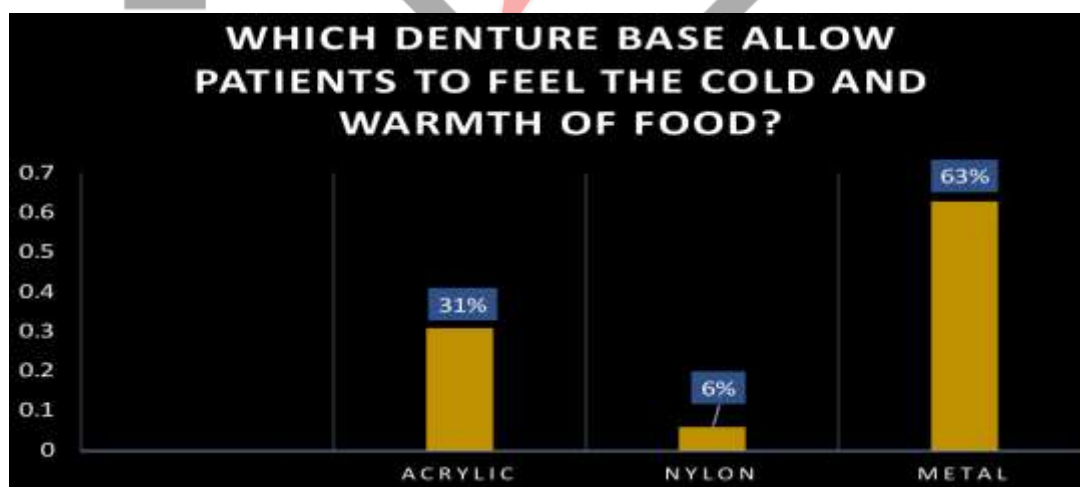
Graph 8: responses to question number eight

Graph 9: responses to question number nine



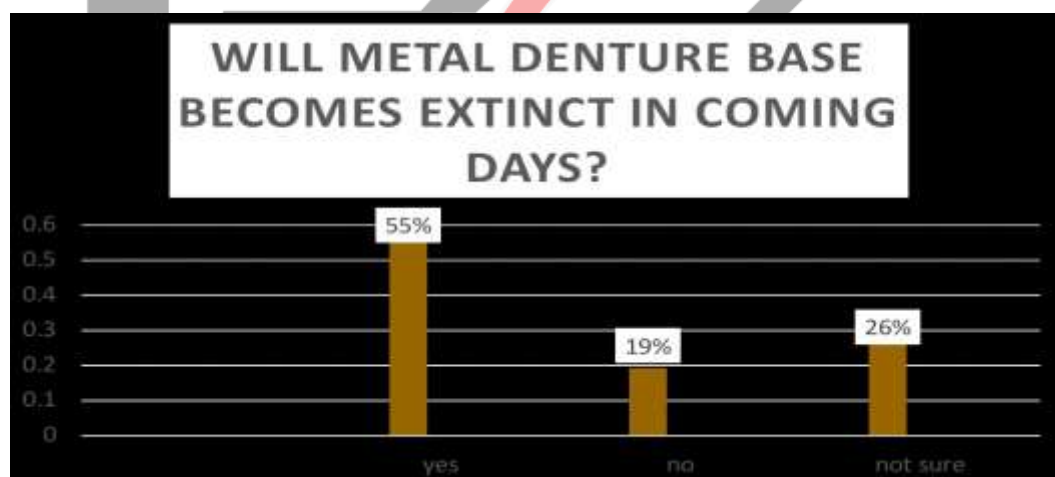
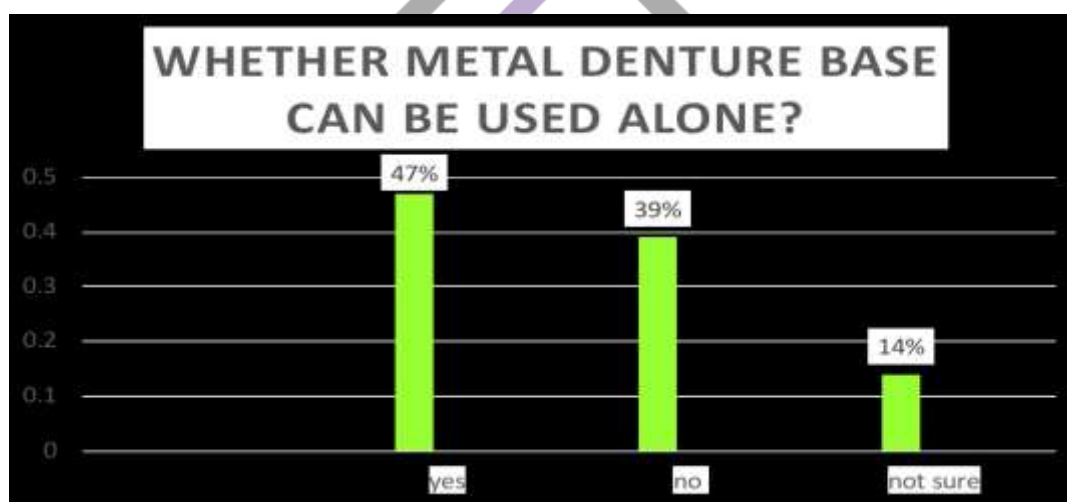
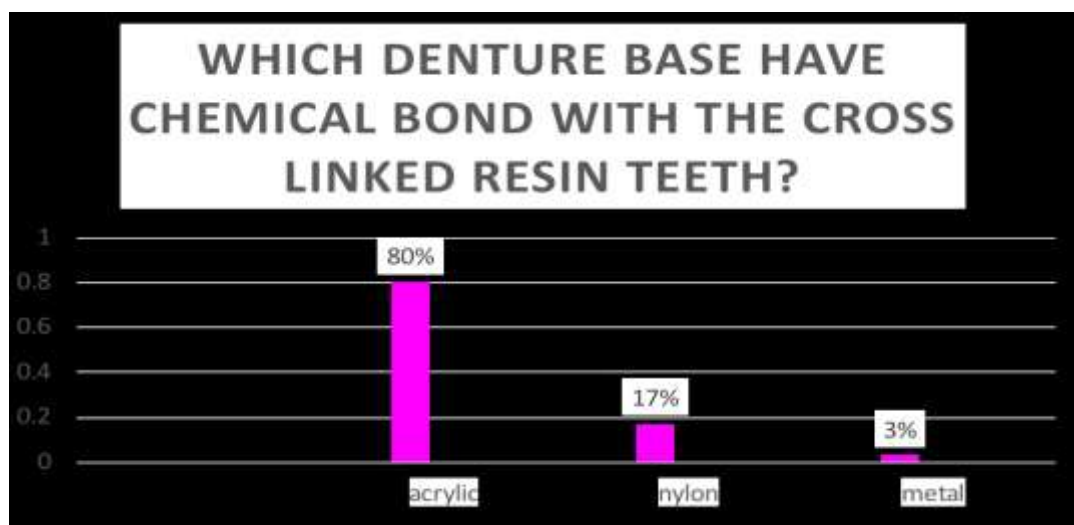
Graph 10: responses to question number ten

Graph 11: responses to question number eleven



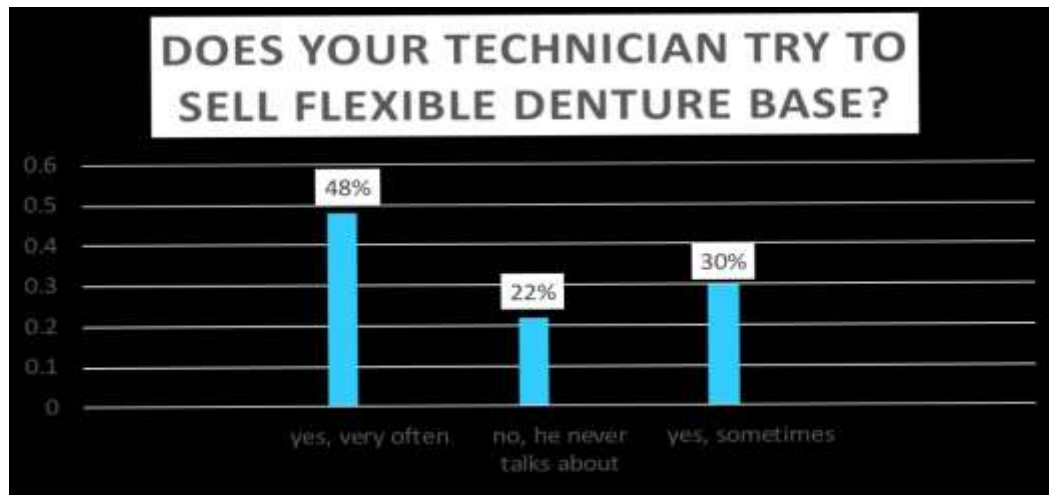
Graph 12: responses to question number twelve

Graph 13: responses to question number thirteen



Graph 14: responses to question number 14

Graph 15: responses to question number 15



DISCUSSION:

The survey on "knowledge and awareness among dental students and practitioners on different types of permanent denture base materials used in complete denture was conducted. A questionnaire was prepared and were asked to mark. According to the questionnaire, 97% of the participants prefer acrylic denture base, 3% prefer metal. The frequently prescribed denture base material is acrylic because of esthetics and it can be easily relined and rebased. 76% of the participants said metal is the strongest denture base material, 9% said nylon and 15% said acrylic. Majority of the participants said metal is the strongest denture base because they are strong even in thin sections and does not get fractured easily. 73% of the participants said acrylic denture base is not fracture resistant on impact, 21% said nylon and 6% said metal. Majority of them said acrylic is not fracture resistant on impact because it has low strength and it cannot be used in thin sections like a metal denture base. 93% of the participants said acrylic denture base is easy to repair, 7% said nylon[13]. Majority of them said acrylic because it is clinically easy to perform. 41% of the participants said heavier denture base is advantageous because it has adequate strength. 83% of the participants said that acrylic denture base material is characterised with pigments, 11% of them said that it is nylon, 6% of them said that if is metal and this result is similar according to Bohra PK et al. 60% of the participants said that metal denture base can be made thinner, 32% said acrylic denture base, 8% of them said nylon and according to Alan. B et al metal alloy may be cast much thinner than acrylic resin and still have adequate strength and rigidity. 63% of the participants said that metal denture bases allow the patients to feel the cold and warmth of the food, 31% said acrylic denture base, 6% said nylon denture base and according to Alan. B et al temperature changes are transmitted through the metal bases to the underlying tissues, thereby helping to maintain the health of those tissues[14,15,16]. Conversely, acrylic resins have insulating properties that prevent interchange of temperature between the inside and outside of the denture base. 81% of the participants said that acrylic denture base is more economical, 14% said metal base and 5% of them said nylon denture base. [17,18,19]. 80% of the participants said that acrylic denture base have chemical bond with the cross linked resin teeth, 3% said metal denture base and 17% said nylon denture base. 47% of the participants said that metal denture base can be used alone, 39% said that metal denture base cannot be used alone and 14% of the participants are not aware. 60% of the participants said that acrylic denture base is more biocompatible, 19% said metal denture base and 15% said nylon denture base. 55% of the participants said that metal denture base will become extinct in coming days, 26% said metal denture base and 19% said nylon denture base. 48% of the participants said that the technician try to sell the flexible denture base very often, 22% said they try to sell sometimes and 30% of the participants said that the technician doesn't try to sell flexible denture base materials. [20,21]

CONCLUSION:

The survey results show that the participants are more aware about the properties and nature of acrylic denture bases, which again is identified as the most commonly prescribed denture base. However, awareness about metal and nylon based or flexible dentures seems to be little lesser than that of acrylic denture bases, and both of them were identified as less common in use. The fact is that all three types of permanent denture bases will have their place in practice and it is required that all of us know better about them.

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