



Awareness About Stainless Steel Crowns Among House Surgeons – A Survey

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INTRODUCTION:

Dental caries is a very common condition, especially in young children. [1] Primary teeth require special care since they are used for eating, speaking, and acting as natural space maintainers in the dental arch. The treatment of dental caries in children is a long-standing issue that entails a variety of obstacles, including as behaviour management and the necessity for a long-lasting therapy that lasts until tooth exfoliation. [2,8]

Humphrey introduced preformed metal crowns, sometimes known as stainless steel crowns, to paediatric dentistry in 1950[3]. They have now shown to be an essential restorative material in the treatment of significantly fractured primary teeth. They are typically seen to be preferable to massive multi-surface amalgam restorations, and they have a longer clinical lifetime than two or three surface amalgam restorations. [4;5] In fact, when temporary full-coronal covering is necessary, no restorative material has given the benefits of cheap cost, dependability, and durability. [6;7]

KEYWORDS: Deciduous teeth; stainless steel crown; pediatric dentistry; Dental caries; restorative material

METHODOLOGY:

A questionnaire survey was conducted among dental residents to assess their awareness and knowledge about the stainless steel. Ethical clearance from the institutional review board was obtained. The survey was conducted by generating online google forms and circulated through social media platforms. The questionnaire comprised of 10 questions which has the combination of both selected responses to certain questions and some close ended questions (yes/no/not aware of). After agreeing to an informed consent form, the questionnaire was given to each volunteer. Each respondent was given a brief explanation of the study's objectives before responding to the questionnaire, and information confidentiality was assured. A total of 51 dental residents participated in this survey. All the participants were briefed about the purpose of the study and an informed consent was obtained before the survey through Google forms and assured that their participation was purely voluntary.

STATISTICAL EVALUATION:

Non - probability, convenient stratified sampling technique was employed in this observational study having a cross - sectional design. Responses were noted among the selected population group under the study and evaluated for statistical analysis by PSPP software Version 3.0.

RESULT SUMMARY:

On the analysis of the given study, the mean age of the study participants was observed to be 20.7 2.42 years (mean \pm S.D) with a 95% confidence level. Among the study participants, around 28 (54.9%) were aware that stainless steel was introduced by Humphrey (Q1), whereas 23 (45.1%) were unfamiliar with it. 37 (72.5%) out of 51 participants were not aware that stainless steel crown is a semipermanent restoration (Q2), while 14 (27.5%) out of 51 responded correctly. The majority of participants, 34 (67%), were unaware that stainless steel crowns are indicated in primary teeth for restoration of hypoplastic teeth following pulpotomy or pulpectomy procedures and as an abutment for space maintenance, except for teeth that are not restorable (Q3), while 17 (33.3%) were aware of it. Only 18 (35.3%) participants know that stainless steel crowns are contraindicated in medically compromised patients (Q4), and a majority of 33 (64.7%) participants were unaware of this. The iron content of a 3M stainless steel crown is 10% (Q5), but only 12 (23.5%) of the 51 participants were aware of it.

A majority of 34 (66.7%) of the participants were unaware that (Q6) Crimper plier is used to obtain snap fit of stainless steel crown only 17(33.3%) were aware of it. On the contrary, 41.2% (21 out of 51) consider stainless steel crowns should extent intra-gingivally 0.5-1.0cm (Q7) despite 58.8% (30 out of

51) firmly disagrees it. In a stainless steel crown on a deciduous molar with over hanging margin, gingival pain and inflammation occurs due to Entrapment of plaque beneath it (Q8) and about only 19.6% (10 out of 51) have responded correctly, a majority of 80.4% (41 out of 51) were unfamiliar. Around 23(45.1%) out of 51 participants predominantly agrees that (Q9) window is prepared on the labial aspect for aesthetics in basket crown technique whereas 28 (54.9%) disagrees. Around 23.5% (12 out of 51) of participants are aware that a feather edge finish line is used for stainless steel crown (Q10), while 86.3% (44 out of 51) are unaware that (Q11) stainless steel crown retention is primarily achieved by crimping, and approximately 13 (25.5%) out of 51 participants agree that zinc phosphate is the best luting cement. The overall knowledge analysis revealed no significant differences, but the majority of respondents were unfamiliar with stainless steel crowns.

DISCUSSION:

The questionnaire based survey was conducted amongst the dental students in Tamilnadu to assess their knowledge, awareness, and perspective about stainless steel. Dental students must have adequate knowledge about stainless steel as they are future clinicians, pediatricians.

Stainless steel was initially used in paediatric dentistry in 1947, as reported by Engel, and was popularised in 1950 by Humphrey. Primary teeth are more prone to decay than permanent teeth. They also have bigger pulp with conspicuous pulp horns, which places strict requirements on cavity design. As a result, a full-coverage restoration is necessary. [8] Caries care in primary dentition is difficult and complex due to the requirement for behaviour control methods and long-lasting therapies that persist till tooth exfoliation, both of which are addressed by the use of stainless steel crowns. According to studies, paediatric dentists are more likely than general dentists to use semi-permanent stainless steel crowns to repair carious deciduous dentition [25;9]. **Among the study participants, around 54.9% were aware that stainless steel was introduced by Humphrey, whereas 45.1% were unfamiliar with it. 72.5% of participants were not aware that stainless steel crown is a semi-permanent restoration.**

Despite their aesthetic disadvantage, stainless steel crowns remain the treatment of choice for the following reasons:

1. Durability
2. Efficiency
3. Longevity
4. Cost-effectiveness
5. Reliability

Stainless steel is most commonly used after pulp therapy, multi-surface caries restorations, patients at high risk of caries, deciduous teeth with developmental defects such as amelogenesis imperfecta, dentinogenesis imperfecta, enamel hypoplasia, teeth with extensive wear, where the restoration is likely to fail, e.g., proximal box formed is extended beyond the anatomic line angles, fractured teeth, abutment for space maintainer[10], Patients who are unlikely to show up for follow-up appointments[11].The majority of participants, **67% were unaware that stainless steel crowns are indicated in primary teeth for restoration of hypoplastic teeth following pulpotomy or pulpectomy procedures and as an abutment for space maintenance, except for teeth that are not restorable , while only 33.3% participants were aware of it.**

They are not recommended in primary teeth with more than half of the root resorption, primary teeth approaching exfoliation (6 to 12 months), teeth with excessive mobility, patients with nickel allergies and sensitivity[12], inability to fit the crown due to the patient's lack of cooperation[13], and in patients with medical complications. **Only 35.3% participants know that stainless steel crowns are contraindicated in medically compromised patients, and a majority of 64.7% participants were unaware of this.**

Iron, carbon, chromium, nickel, manganese, and other elements combine to form stainless steel. The name "Stainless Steel" is applied when the chromium concentration reaches 11% and is typically between 12% and 30%. Chromium oxidises, forming a thin surface coating of chromium Oxide (Cr₂O₃) that protects against corrosion. There are three types of stainless steel: ferritic, martensitic, and austenitic. Austenitic stainless steel, which is made of chromium (11.5%-25%), nickel (7%-22%), and carbon (0.25%), is widely utilised in the manufacture of dental equipment. Stainless Steel Crowns include around 18% Chromium, 8% Nickel, and a trace of additional components and are classified as 18-8 Stainless Steel. [14;15]. **Only 23.5% of the 51 participants were aware that the iron content of a 3M stainless steel crown is 10%.**

The chosen crown should restore the prepared tooth's contact area and occlusal alignment. Crowns can be selected by trial and error or by measuring the mesiodistal breadth of the tooth space with dividers. [16;17] It might also be useful to measure the size of the opposing tooth. When you try on a properly fitted crown, it should snap or click into place. Because of the soft tissue, whether the tooth to be repaired is essential or nonvital, local anaesthetic should be utilised while putting a stainless-steel crown. Other aspects to consider while choosing a crown are occlusal anatomy, primate spaces, and crown height. [18;19;20].

A huge green stone is utilised to provide a knife-edge finish at the crown's cervical margin. The bur is turned 45 degrees anticlockwise. The margins are then smoothed down with a rubber wheel. The crown type can be smoothed and polished on the dental lathe with a piece of cloth or chamois wheel, then finished with Tripoli polishing agent and jeweller's rouge. [21] **Around 23.5% of participants are aware that a feather edge finish line is used for stainless steel crown**

A poorly suited crown will serve as a gathering place for microorganisms, contributing to recurrent caries or incipient periodontal disease. The crown is crimped in the gingival third of the crown with the No. 417 Crimping pliers. Crimping requires the pliers to be 'walked' continuously across the whole crown without lifting. There will be a progressive bend in the gingival third of the crown when crimping is completed. Crimping is used to protect sensitive tissues, minimise cement leakage, contamination, and provide proper retention. [15;8] **A majority of 66.7% of the participants were unaware that Crimper plier is used to obtain snap fit of stainless steel crown only 33.3% were aware of it, while 86.3% are unaware that stainless steel crown retention is primarily achieved by crimping .41.2% consider stainless steel crowns should extent intra-gingivally 0.5-1.0cm despite 58.8% firmly disagrees it. In a stainless steel crown on a deciduous molar with over hanging margin, gingival pain and inflammation occurs due to Entrapment of plaque beneath it and about only 19.6% have responded correctly, a majority of 80.4% were unfamiliar.**

To fix the crown, luting cement should be applied. Once the crown is in place on the prepared tooth, it should be held in place with pressure until the cement solidifies. Although glass ionomer, zinc polycarboxylate, and zinc phosphate cement are recommended by manufacturers, fluoride-leaching cement provides additional advantages. RMGIC is the recommended option due to its clinical benefits. [22] However, research indicates that the type of cement used has minimal influence on retention, with the most important retentive components come from correct crown contouring and crimping. **Approximately 25.5% of participants agree that zinc phosphate is the best luting cement.**

CONCLUSION:

In primary and permanent teeth in young children, a stainless-steel crown is highly suggested. The lifespan of SSC is determined by the dental material's qualities, the operator's expertise, the child's age, and the child's willingness to undergo the treatment. Although there were no significant variations in general knowledge, the majority of respondents were unfamiliar with stainless steel crowns. To promote the use of these successful appliances by general dentists, a greater degree of training in this therapy at the undergraduate level and access to postgraduate courses are necessary.

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