



## Use of stainless steel crowns and zirconia crowns in posterior primary teeth for children in different age groups

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### ABSTRACT

Children are more susceptible to Early Childhood Caries and trauma. Post endodontic treatment, it is necessary for coverage of the treated teeth, and full crowns are considered to be the best option for the same. Preformed crowns for primary molars are available in many sizes and materials to be placed over decayed or developmentally defective teeth. They can be made completely of stainless steel, stainless steel with a white veneer cover or made wholly of a white ceramic material when aesthetics is concerned. The main aim of this study is to assess the prevalence of usage of stainless steel crowns and zirconia crowns in posterior teeth for pedo patients in different age groups. 89000 case sheets were reviewed between June 2019 - March 2020 for possible inclusion and exclusion criteria. Case sheets of 1496 pediatric patients who underwent stainless steel crown and zirconia crown placement in posterior teeth were obtained from a Private Dental Institute. Collected data were analysed using SPSS statistics software. Results showed that stainless steel crowns were more prevalently used among all age groups (99.54%) and were more prevalent among the age group 0-5 years (69.61%). Stainless steel crowns were also found to be more prevalent among male pediatric patients (57.80%). In Conclusion, stainless steel crowns were most prevalent among all age groups and are more prevalent among male pediatric patients.



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### INTRODUCTION

Dental caries is one of the most common, widespread multifactorial diseases among human beings. It leads to consequences like damage to aesthetics, self-esteem, mastication, speech and development of oral habits which will affect overall health (Attari and Roberts, 2006; Subramanyam, 2018). Restoration of the teeth affected by caries is necessary to preserve its state till eruption of permanent teeth. Posterior teeth are always given importance as they are vital particularly in mastication and development of occlusion (Hajiahmadi et al., 2017; Tote et al., 2015). The treatment of carious primary molars has always been a challenge

to the clinician (Usha *et al.*, 2007). Various materials have been used over the years such as amalgam, composites, and stainless steel crowns to restore such teeth with varying success rates (Schüler, 2014). Stainless steel crowns are accepted by pediatric dentists as an alternative for restoration of primary molars affected by enamel and dentin disorder, extensive caries and post pulpal therapy (Schüler, 2014). Stainless steel crowns were found to be extremely durable restoration with enamel clear cut indications for use in primary teeth (Seale, 2002). Stainless steel crowns are not much popular due to the fact that people from today's society are more conscious to esthetics.

Zirconia is a crystalline dioxide of zirconium that has mechanical properties similar to those of metals and its colour is similar to that of teeth. Its disadvantage was its high cost. They are available as NuSmile, Kinder, EZ pedo. Since then, various companies have introduced zirconia crowns as a new full-coverage restoration which combines excellent esthetics with superior mechanical properties. In spite of increasing parental demands, a recent review of the literature revealed that no studies have been published with the clinical success and parental satisfaction of zirconia crowns in primary molars (Mathew, 2020).

The main aim of this study is to assess the prevalence of usage of Stainless steel crowns and zirconia crowns in posterior teeth for pediatric patients in different age groups.

## MATERIALS AND METHODS

This retrospective study was set in a hospital-based university setting. Ethical approval was obtained from the institutional ethical committee (ethical approval number: SDC/SIHEC/2020/DIASDATA/0619-0320). 89000 case sheets were reviewed for data collection in the present study. Ethical approval for this study was granted by the institute's ethical committee. The consent for the usage of dental records was obtained during their visit to the institute for treating their child's dental needs and completed case sheet details of 1496 pediatric patients between ages 1-17, who underwent placement of stainless steel crowns and zirconia crowns between June 2019 - March 2020 from a private dental college. The inclusion criteria were, children below 13 years of age, children having primary molars who received stainless steel crowns and zirconia crowns, photographic evidence of the crown that is delivered, complete case records. Exclusion criteria were crowns involving primary anterior teeth, permanent anterior teeth and permanent posterior

teeth; incomplete or censored data and missing photographic evidence of the final luting of the crown.

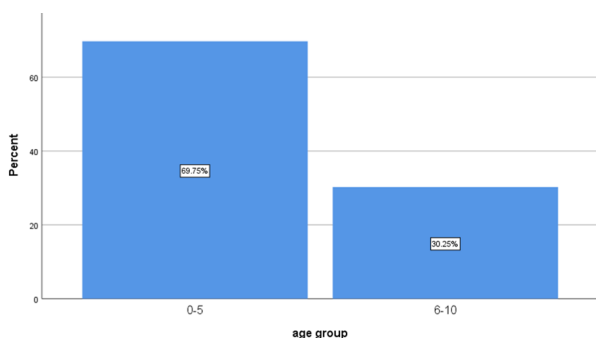
The procedure followed during crown preparation for stainless steel crowns were, first the administration of local anaesthesia was done followed by rubber dam isolation of the tooth. Standardized tooth preparations for SSCs (3M™ ESPE™ SSCs, 3M ESPE, St. Paul, MN, USA) were performed for teeth in one group. The periodontal probe was used to determine the mesiodistal dimension of each tooth. The occlusal surface reduction of 1.0–1.5 mm with a diamond coarse shoulder bur (836KRS-014C-FG, NTI-Kahla GmbH, Germany) was done. Needle diamond bur (859 L-010F-FG, NTI-Kahla GmbH, Germany) was used to prepare mesial and distal surfaces and all line angles were rounded. The pre-contoured and pre-trimmed stainless steel crowns were fitted and crimped with pliers (No. 800112 and 800417, 3M ESPE, St. Paul, MN, USA). In the other group, tooth preparation was done for zirconia crowns (NuSmileZR; NuSmile® Ltd., Houston, TX, USA). The occlusal surface of the teeth was done using a coarse football diamond bur (379-023C-FG, NTI-Kahla GmbH, Germany) and reduction by 1–1.5 mm was done. Proximal, buccal, and lingual reductions by 0.5 mm were made using a coarse tapered diamond bur (858-012C-FG, NTI-Kahla GmbH, Germany). Feather edge margin was carefully obtained using a fine-tapered diamond bur (858-014F-FG, NTI-Kahla GmbH, Germany) and all line angles were rounded. Luting of crowns was done using type I Glass Ionomer Cement. The type and size of crown and adaptation methods done for each molar were recorded. Postoperative instructions were given to the patients and scoring for placement of crown was completed.

Cross-checking of data including digital entry, the procedure followed and evidence of intraoral photographs was done by an additional reviewer and as a measure to minimise sampling bias, samples for the group were picked by simple random sampling. The data that were collected were entered into the excel sheet. Data analysis was done using SPSS PC Version 23.0 (IBM;2016) software for statistics. The data obtained were analyzed and Chi-square test was done to compare the results with the age and gender of the child.

## RESULTS AND DISCUSSION

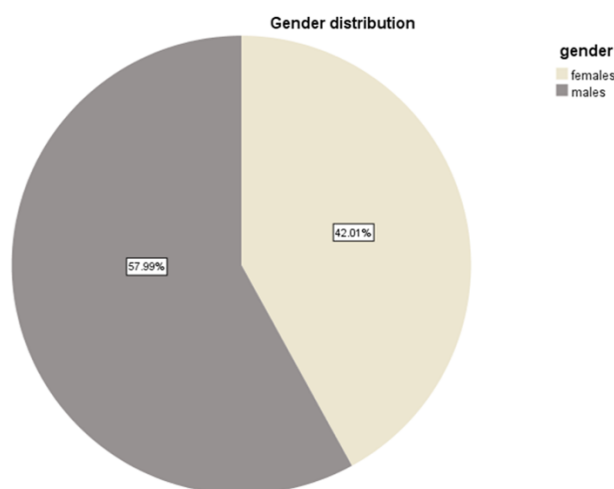
The final sample size included 1496 records of children who received stainless steel crowns and zirconia crowns. The age distribution among the study population showed that 69.75% of the children were

of the age group 0-5 years and 30.25% were 6-10 years. Children during 0-5 years of age had higher chances of receiving full coronal restoration. (69.75%) (Graph 1). The distribution of children based on gender showed 57.99% were males and 42.01% were females. Children who were males received higher full coronal restoration (57.99%) compared to females (Graph 2). Stainless steel crowns were found to be highly used (99.54%) when compared to zirconia crowns among the children taken in the present study. (Graph 3). On comparing the distribution of the type of crowns with the age group of children, all the children in the age group of 0-5 years received only stainless steel crowns (69.75%). However, a very minimal of 0.46% only received zirconia crowns in 6-10 years of age. (p-value = 0.000) (Graph 4). This difference was statistically significant. (p = 0.000) On comparing the distribution of the type of crowns with the gender of the children, it was observed that stainless steel crowns and zirconia crowns were more prevalent among male pediatric patients (57.53%) compared to children who were females (Graph 5). This difference was also statistically significant (p = 0.000).

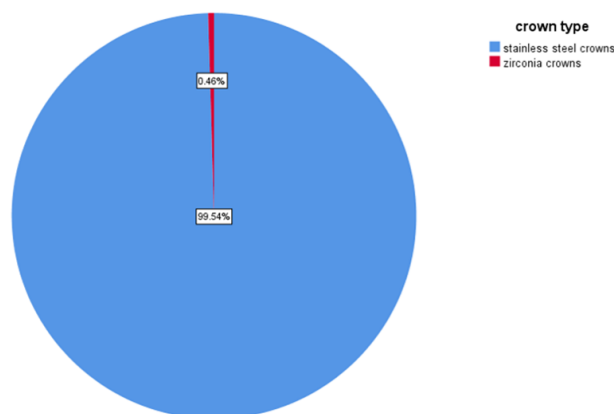


Graph 1: Bar chart showing the distribution of children based on age.

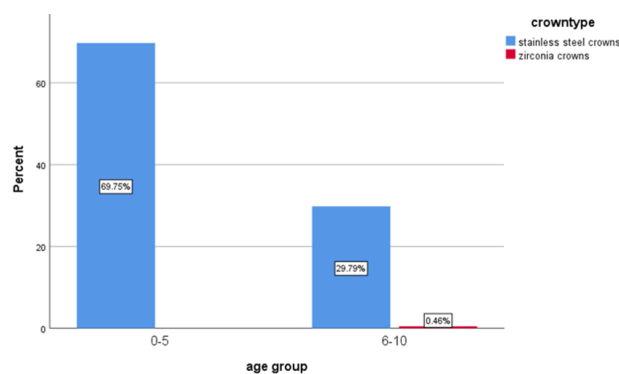
Early childhood caries (ECC) also known as baby bottle caries, baby bottle tooth decay, and bottle rot is a disease known for deep caries in the teeth of infants or young children (Lavanya Govindaraju, Ganesh Jeevanandan, E. M. G. Subramanian, 2017; Govindaraju et al., 2017). This begins as soon as the teeth erupt and rapidly progress to extensive decay of all primary teeth (Somasundaram et al., 2015; Govindaraju L., Jeevanandan G., Subramanian, 2017). Children are susceptible to dental caries due to many factors like parental neglect/unawareness, dietary habits and are considered as a public health problem (Gurunathan and Shanmugaavel, 2016). Prevention of dental caries is necessary to avoid premature loss of primary teeth since primary teeth act as a natural space maintainer and guide the eruption of permanent teeth to their optimal position



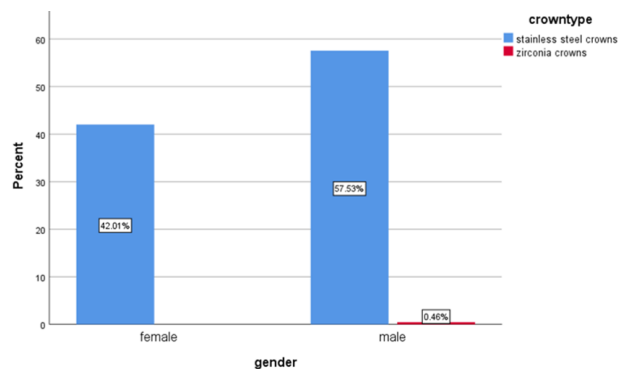
Graph 2: Pie chart showing the distribution of children based on gender.



Graph 3: Pie chart showing the prevalence of the type of crowns delivered among study.



Graph 4: Bar chart showing association of different types of crowns to different age groups in the study.



Graph 5: Bar Chart showing association of different types of crowns to different genders in the study.

in the dental arch (Govindaraju, 2017). The indirect causes of this negligence of oral hygiene maintenance can be due to the presence of abnormal frenal attachment, ranula (Christabel, 2015; Packiri, 2017). The preservation of the primary tooth in the dental arch in its normal function and pathology free is of utmost importance (Ravikumar et al., 2017; Ramakrishnan and Shukri, 2018). The second reason is to decrease the risk of spread of caries to the permanent teeth in the future (Jeevanandan and Govindaraju, 2018; Panchal et al., 2019). Post endodontic treatment, it is necessary to provide crowns to prevent further spread of decay. Crowns are also provided for extreme cases of fluorosis, amelogenesis and dentinogenesis imperfect and trauma cases caused due to neglect (Lakshmanan et al., 2020; Jeevanandan, 2017).

Results of the previous study indicated that stainless steel crowns were found to be most prevalent among all age groups (99.54%) and Zirconia crowns were found to be least prevalent among all age groups (0.46%) and stainless steel crowns were more prevalent among age group 0-5 yrs. Studies by Aiem et al. (2017) also showed similar findings showing that SS crowns were highly preferred for the teeth affected by deep caries. This was attributed to the fact that patients between age 0-5 years are more prone to early childhood caries (Innes, 2015). But this was contradictory with the findings of previous studies by Choi (2016) and Lee (2019), whose findings showed that Zirconia crowns were more prevalent when compared to Stainless steel crowns. This can be attributed to the fact that stainless steel crowns are not aesthetically appealing, according to studies by Maciel (2017) and Abdulhadi (2017), which showed that parents of pediatric patients showed more concern towards aesthetics. This finding was also supported by Zimmerman (2009), in which it was found that parent's opinion towards stainless steel crowns was negative due to its low

aesthetic value. Stainless steel crowns and zirconia crowns were found to be more prevalent among children who were males. This could be due to poor oral hygiene maintenance and higher cariogenic index, which could have resulted in the necessity of full coverage restorations.

Zirconia crowns were least preferred among the study population (0.46%). Similar findings were shown in a previous study by Bica et al. (2017); M. G. Mathew (2020), where it was seen that zirconia crowns had better clinical performance and less plaque deposition when compared to stainless steel crowns. But, this is contradictory to findings of a study by Abdulhadi (2017), which showed that zirconia crowns had good aesthetics and stress-bearing capacity and was highly preferred. This contradiction can be attributed to the fact that zirconia crowns have not cost-friendly and are costlier than stainless steel crowns, which was similar to the findings in a study by Abukabbos et al. (2018).

Thus, we can see that stainless steel crowns were more prevalent among age 0-5 year pediatric patients, due to their susceptibility to early childhood caries, enamel and dentin defects, trauma and stainless steel crowns were more suitable for those conditions. Cost also plays a huge role, since parents of these pediatric patients included in the study were from the middle class.

With increased sample size and expansion of study groups with the inclusion of pediatric patients undergoing treatment for crown placement from different social backgrounds and geographic location, we can assess the results with accuracy.

## CONCLUSION

Within the limits of the present study, the most prevalent type of crown used as full coverage restoration of primary molars were stainless steel crowns with a male gender predilection among the pediatric patients under age group 0-5 years.

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## Conflict of Interest

The authors declare that there are no conflicts of interest for this study.

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