ECRONICON OPEN ACCESS

EC DENTAL SCIENCE
Research Article

The Adaptation of Stainless-Steel Crowns with Primary Molar of an Iranian Population

Atousa Janeshi[1], Porousha Mahjoub[1], Hossein Soltani[2], Dorsa Rahi[2]* and Dina Maleki[2]

[1]*Assistant Professor, Dental Sciences Research Center, Department of Pediatric Dentistry, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran*

[2]*DDS, Dental Sciences Research Center, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran*

***Corresponding Author:** Dorsa Rahi, DDS, Dental Sciences Research Center, School of Dentistry, Guilan University of Medical Sciences, Rasht, Iran.

Received: March 29, 20231; **Published:** April 20, 2023

Abstract

Objectives: This study compared the dimensions of two SSC brands with the dimensions of the maxillary and mandibular primary molars in order to determine the SSC with better adaptation in the Iranian population.

Materials and Methods: In this analytic cross-sectional study, 224 primary molars were evaluated. Impressions were taken and casts were poured with dental stone casting material. Teeth were divided into 4 groups: the upper first molar, the upper second molar, the lower first molar, and the lower second molar. Then, each group was divided into left and right subgroups. Mesiodistal (MD) and Buccolingual (BL) dimensions of teeth were measured using a digital caliper with 0.01 mm accuracy. MD and BL dimensions of SSCs from two different brands (MIB and 3M) were also measured. The acquired dimensions of teeth and the related crown were compared. Data were assessed using an independent t-test at a significance level of 0.05.

Results: The greatest and least MD dimensions respectively belonged to the lower second molar and upper first molar. Also, the greatest and least BL dimensions respectively belonged to the upper second molar and lower first molar. The similarity of teeth and the SSC dimensions were better in the MIB group than in the 3M group. The similarity of teeth and the SSC dimensions were significantly different based on gender in the maxillary left second primary molar (MD), maxillary right first primary molar, mandibular left first primary molar, maxillary right second primary molar and mandibular right second primary molar (BL).

Conclusion: MIB crowns are recommended over 3M crowns as in most cases MIB has similar dimensions to primary molars of the Iranian population.

Keywords: *Pediatric Dentistry; Deciduous Teeth; Stainless Steel; Crown; Adaptation*

Abbreviations

MD: Mesiodistal; BL: Buccolingual; SSC: Stainless Steel Crown

Introduction

Primary teeth play an important role in the growth and development of children. Generally, all 20 primary teeth erupt by the age of 30 months and will be present in the mouth for 3 to 9 years. Canine and molars have the longest presence [1]. Efforts to preserve primary teeth until permanent teeth have grown, have led to the introduction of many restorative materials and techniques [2]. Using Stainless Steel Crowns (SSCs) is one of these techniques. Humphrey was the first to introduce pre-formed SSCs for pediatric dentistry in the 1950s [3]. SSC has been used as a permanent restoration for the reconstruction of primary teeth along with pulpotomy or pulpectomy, primary teeth with developmental defects, or extensive, multilevel carious lesions [4]. These crowns are very common in pediatric dentistry due to their maximum durability and stability, and they can maintain the health of the surrounding tissues and prevent the spread of caries by completely covering the tooth surfaces. The use of SSC is often preferred to extensive and multilevel amalgam restorations [5]. The design of these crowns has changed over time and these changes have been made in order to improve morphological features and be most similar to the anatomy of the teeth [6].

Principles of dental preparation must be followed thoroughly before SSC placement. In addition, inadequate marginal adaptation and inadequate adhesion to severely damaged teeth at the proximal, buccal, and lingual surfaces are the limitations to the use of SSCs [6]. If successful marginal adaptation is achieved, SSC lifespan is reported to be between 5 and 15 years [7].

Different SSCs in size, shape, and contour by different manufacturers were introduced to the dental market [8]. Among these, the 3M and MIB SSCs are the most used in Iran [6]. These SSCs are festooned, trimmed, and pre-crimped to make them more compatible with the tooth surface. However, most dentists prefer to perform crimping on these crowns again in the clinic with special pliers [9,10]. To date, there is no SSC that has ideal marginal adaptation without the manipulation of the margins performed by the dentist [7].

It is important to note that variation in tooth size in different ethnicities is not a major problem because SSCs are made in different dimensions. But because these crowns are selected based on the MD adaptation with the teeth (to achieve proper contact with adjacent teeth), the main problem is the BL adaptation with the teeth.

Choosing the correct SSC in terms of marginal adaptation and proximal fit has always been a challenge for dentists, especially pediatric dentists. At the beginning of the treatment, in order to achieve the maximum amount of adaptation and retention while maintaining the structure of the tooth, it is better for the clinician to choose the SSC that is appropriate for the size of the primary teeth.

Aim of the Study

The aim of this study was to identify the two most widely used SSC (3M (St. Paul, MN, US)) and MIB (Shinhung Co. Seoul, South Korea) in terms of MD and BL adaptation in primary teeth of Iranian children to decrease the preparation and removal of healthy tooth tissue as well as chair time in the clinic.

Materials and Methods

This descriptive-analytical study was conducted to evaluate the adaptation of two types of primary molar SSCs available in the Iranian market. This study was performed on 224 molar primary teeth of children aged 4 to 10 years referred to the pediatric department of the Dental School.

The study was approved by the ethics committee of the School of Dentistry. All participants signed informed consent forms prior to participation in the study. They were ensured of the confidentiality of their information and were not physically or financially harmed during the study.

Systemically healthy children with intact primary molars, with no developmental disorders (hypoplasia, etc.) were included. Children with systemic disease, premature birth, dental caries, and restorations were excluded.

An impression was made of the primary molar teeth using alginate material (chromogel, Iran), and the casts were plastered with type 4 acetone. Low-quality casts were excluded from the study. Group 1 included 56 maxillary first primary molars teeth, and group 2 and group 3 included 56 maxillary second primary molars and 56 mandibular first primary molars teeth, respectively. And group 4 included 56 mandibular second primary molars.

Half of the teeth in each group belonged to girls and the other half belonged to boys. Also in each group, the right and left halves were also considered. MD and BL dimensions of the teeth were measured on the cast by a digital caliper (ACCUD, Austria) with an accuracy of 0.01 mm. The largest distance between the center of the mesial margin of the mesial marginal ridge and the center of the distal margin of the distal marginal ridge was considered as the MD dimension. To measure the BL dimension, the largest BL distance of the tooth in the free gingival area was measured. The BL and MD dimensions of each tooth were measured twice and the mean value was considered as the final value.

The MD and BL dimensions of number 2 to 7 SSCs of 3M (St. Paul, MN, US) and MIB (Shinhung Co. Seoul, South Korea) were measured for each group. The BL and MD dimensions of each SSC were measured twice and the mean value was considered as the final value. The largest distance between mesial and distal marginal ridge of SSC was measured as the MD dimension. BL dimension was measured 1 mm gingivally to the marginal gingiva using sprue wax. The wax was applied to the SSC margin in the buccal and lingual aspects and glued with Super glue. In order to prevent from deformation, each SSC was kept at 24°C for 24 hours until the waxes were set. The thickness of 3M SSCs in the cervical is reported to be 154 microns and the thickness of MIB SSCs was obtained to be 151 microns; twice this amount was deducted from the external BL dimension to obtain the internal BL dimension [11]. The mean, minimum and maximum differences between the BL and MD dimensions of the teeth with their similar SSCs were measured and according to these values, the most suitable SSC was selected from the two selected brands.

Results

The teeth of 56 participants were evaluated in this study of which 50% (11) were girls and 50% (11) were boys. The MD and BL adaptation of 3M and MIB SSCs are presented in table 1-4. The MD adaptation of 3M SSC size 3 and MIB SSC size 4; and the BL adaptation of 3M SSC size 7 and MIB SSC size 6 were better than other SSCs in maxillary left first primary molars.

Crown Size	Type of Teeth	Left or right	Mesiodistal Adaptation	T	P-value	Buccolingual Adaptation	T	P-value
2	D*	Left	0.279	2.42	0.023	2.10	23.04	<0.001
		Right	0.19	2.07	0.048	1.61	14.75	<0.001
	E**	Left	0.04	0.52	0.608	0.50	4.66	<0.001
		Right	-0.03	0.38	0.706	1.09	9.40	<0.001
3	D	Left	-0.276	2.4	0.023	1.53	16.74	<0.001
		Right	-0.075	0.80	0.432	1.40	12.83	<0.001
	E	Left	-0.18	2.32	0.028	0.08	0.77	0.448
		Right	-0.49	5.60	<0.001	0.38	3.29	0.003
4	D	Left	-0.476	4.14	<0.001	1.42	15.59	<0.001
		Right	-0.38	4.04	<0.001	1.18	10.81	<0.001
	E	Left	-0.79	9.96	<0.001	-0.44	4.15	<0.001
		Right	-0.86	13.37	<0.001	-0.35	2.99	0.006

5	D	Left	-0.876	61.7	<0.001	1.05	11.47	<0.001
		Right	-0.915	9.73	<0.001	0.54	4.98	<0.001
	E	Left	-1.05	13.30	<0.001	-0.81	7.57	<0.001
		Right	-1.18	13.37	<0.001	-0.61	5.23	<0.001
6	D	Left	-1.256	10.92	<0.001	0.63	6.92	<0.001
		Right	-1.51	16.06	<0.001	0.004	0.39	0.701
	E	Left	-1.66	21	<0.001	-1.16	10.85	<0.001
		Right	-1.54	17.45	<0.001	-1/11	9.58	<0.001
7	D	Left	-2.11	18.34	<0.001	0.1	1.05	0.301
		Right	-1.91	20.31	<0.001	-0.11	1.03	0.311
	E	Left	-1.98	24.98	<0.001	-1.68	15.72	<0.001
		Right	-1.95	22.10	<0.001	-1.42	12.24	<0.001

Table 1: *Mesiodistal and buccolingual adaptation of 3M SSCs in maxillary left and right first and second primary molars. *First Primary Molar/ **Second Primary Molar.*

Crown Size	Type of Teeth	Left or right	Mesiodistal Adaptation	T	P-value	Buccolingual Adaptation	T	P-value
2	D	Left	0.67	5.97	<0.001	1.48	14.21	<0.001
		Right	1.27	12.57	<0.001	1.18	12.42	<0.001
	E	Left	0.48	3.50	0.002	0.80	6.72	<0.001
		Right	0.57	4.16	<0.001	0.85	10.03	<0.001
3	D	Left	0.43	3.88	0.001	0.99	9.54	<0.001
		Right	0.65	6.40	<0.001	1.16	12.16	<0.001
	E	Left	0.08	0.59	0.563	0.25	2.11	0.044
		Right	0.15	1.08	0.288	0.048	5.68	<0.001
4	D	Left	0.01	0.12	0.902	0.65	6.27	<0.001
		Right	0.22	2.16	0.040	0.73	7.64	<0.001
	E	Left	-0.18	1.31	0.201	0.07	0.56	0.580
		Right	-0.29	2.13	0.042	0.08	0.92	0.364
5	D	Left	-0.37	3.31	0.003	0.29	2.80	0.009
		Right	-0.15	1.49	0.148	0.56	5.90	<0.001
	E	Left	-0.64	4.66	<0.001	-0.28	2.37	0.025
		Right	-0.69	5.06	<0.001	-0.16	1.84	0.077
6	D	Left	-0.85	7.60	<0.001	-0.35	3.41	0.002
		Right	-0.69	6.77	<0.001	0.23	2.38	0.025
	E	Left	-0.95	6.92	<0.001	-0.51	4.30	<0.001
		Right	-0.98	7.14	<0.001	-0.25	2.95	0.006
7	D	Left	-1.20	10.68	<0.001	-0.52	5.04	<0.001
		Right	-0.92	9.09	<0.001	-0.38	3.98	<0.001
	E	Left	-1.22	8.89	<0.001	-1.08	9.03	<0.001
		Right	-1.40	10.25	<0.001	-0.69	8.07	<0.001

Table 2: *Mesiodistal and buccolingual adaptation of 3M SSCs in mandibular left and right first and second primary molars. *First Primary Molar/ **Second Primary Molar.*

Crown Size	Type of Teeth	Left or right	Mesiodistal Adaptation	T	P-value	Buccolingual Adaptation	T	P-value
2	D	Left	0.659	5.72	<0.001	1.71	18.77	<0.001
		Right	0.625	6.65	<0.001	1.36	12.51	<0.001
	E	Left	-0.21	2.64	0.014	0.78	7.33	<0.001
		Right	0.16	1.77	0.087	0.85	7.29	<0.001
3	D	Left	0.204	1.77	0.088	1.05	11.53	<0.001
		Right	0.255	2.71	0.012	0.90	8.28	<0.001
	E	Left	-0.75	9.45	<0.001	0.20	1.85	0.076
		Right	-0.48	5.43	<0.001	0.29	2.47	0.020
4	D	Left	-0.031	0.273	0.787	0.75	8.18	<0.001
		Right	-0.01	0.11	0.916	0.43	3.97	<0.001
	E	Left	-0.98	12.36	<0.001	-0.48	4.52	<0.001
		Right	-0.83	9.40	<0.001	0.05	0.41	0.688
5	D	Left	0.261	2.27	0.031	0.43	4.67	<0.001
		Right	-0.17	1.81	0.082	0.35	3.24	0.003
	E	Left	-1.39	17.59	<0.001	-0.80	7.52	<0.001
		Right	-1.14	12.97	<0.001	-0.45	3.85	0.001
6	D	Left	-0.591	5.14	<0.001	0.16	1.77	0.089
		Right	-0.51	5.42	<0.001	-0.14	1.31	0.202
	E	Left	-1.68	21.26	<0.001	-1.36	12.72	<0.001
		Right	-1.36	15.41	<0.001	-1.21	10.44	<0.001
7	D	Left	-1.006	8.74	<0.001	-0.58	6.35	<0.001
		Right	-0.94	9.99	<0.001	-0.80	7.32	<0.001
	E	Left	-2.05	25.93	<0.001	-1.72	16.14	<0.001
		Right	-1.64	18.58	<0.001	-1.46	12.59	<0.001

Table 3: *Mesiodistal and buccolingual adaptation of MIB SSCs in maxillary left and right first and second primary molars. *First Primary Molar/ **Second Primary Molar.*

Crown Size	Type of Teeth	Left or right	Mesiodistal Adaptation	T	P-value	Buccolingual Adaptation	T	P-value
2	D	Left	0.73	6.56	<0.001	1.18	11.37	<0.001
		Right	1.33	13.11	<0.001	1.43	15	<0.001
	E	Left	0.31	2.30	0.029	0.84	7.05	<0.001
		Right	0.37	2.69	0.012	0.79	9.33	<0.001
3	D	Left	0.26	2.31	0.029	0.78	7.52	<0.001
		Right	0.77	7.59	<0.001	0.92	9.63	<0.001
	E	Left	-0.07	0.54	0.591	0.24	1.98	0.057
		Right	0.008	0.06	0.953	0.36	4.21	<0.001

4	D	Left	-0.06	0.55	0.590	0.48	4.63	<0.001
		Right	0.13	1.27	0.214	0.62	6.48	<0.001
	E	Left	-0.36	2.66	0.013	-0.01	0.11	0.913
		Right	-0.27	1.95	0.061	0.16	1.86	0.073
5	D	Left	-0.39	3.45	0.002	0.14	1.36	<0.001
		Right	-0.31	3.02	0.005	0.28	2.96	0.006
	E	Left	-0.84	6.16	<0.001	-0.38	3.21	0.003
		Right	-0.81	5.90	<0.001	-0.42	1.86	0.009
6	D	Left	-1.10	9.79	<0.001	-0.04	0.37	0.711
		Right	-0.71	6.97	<0.001	0.001	0.01	0.991
	E	Left	-1.21	8.86	<0.001	-0.72	6.02	<0.001
		Right	-1.26	9.23	<0.001	-0.61	7.13	<0.001
7	D	Left	-1.50	13.41	<0.001	0.65	6.31	<0.001
		Right	-1.09	10.72	<0.001	-0.49	5.14	<0.001
	E	Left	-1.71	12.46	<0.001	-1.08	9.03	<0.001
		Right	-1.63	11.94	<0.001	-0.80	9.42	<0.001

Table 4: *Mesiodistal and buccolingual adaptation of MIB SSCs in mandibular left and right first and second primary molars. *First Primary Molar/**Second Primary Molar.*

For the maxillary right first primary molars the MD adaptation of 3M SSC size 3 and MIB SSC size 4; and the BL adaptation of 3M SSC size 6 and MIB SSC size 6 were better than other SSCs. The MD adaptation of 3M SSC size 3 and MIB SSC size 4; and the BL adaptation of 3M SSC size 5 and MIB SSC size 6 were better than other SSCs in mandibular left first primary molars.

For the mandibular right first primary molars the MD adaptation of 3M SSC size 5 and MIB SSC size 4; and the BL adaptation of 3M SSC size 6 and MIB SSC size 6 were better than other SSC. The MD adaptation of 3M SSC size 2 and MIB SSC size 2; and the BL adaptation of 3M SSC size 3 and MIB SSC size 3 were better than other SSCs in maxillary left second primary molars.

The MD adaptation of 3M SSC size 2 and MIB SSC size 2; and the BL adaptation of 3M SSC size 4 and MIB SSC size 4 were better than other SSCs in maxillary right second primary molars. The MD adaptation of 3M SSC size 3 and MIB SSC size 3; and the BL adaptation of 3M SSC size 4 and MIB SSC size 4 were better than other SSC in mandibular left second primary molars. For the Mandibular right second primary molars, the MD adaptation of 3M SSC size 3 and MIB SSC size 3; and the BL adaptation of 3M SSC size 4 and MIB SSC size were better than other SSCs.

Discussion

Pre-formed SSC have a variety of sizes. To choose the right size the MD dimension of the tooth or the control tooth is measured [12]. Choosing the correct SSC in terms of marginal adaptation and proximal fit has always been a challenge for dentists, especially pediatric dentists. Predetermined differences in SSCs and their design have been made to ease their selection processes [8]. Given this, differences in the size of teeth of different populations and racial groups are an important issue to consider during SSC selection. These differences are significant in some cases; for example, evidence has shown that black Americans have larger teeth than white Americans [13]. Males also have larger teeth than females [14,15]. The results of a study conducted in Iceland on the MD and BL dimensions of primary teeth showed that Icelanders have the largest dental crown dimensions among Europeans [16]. A study was conducted in Taiwan to design a

suitable SSC. The results of this study showed that the MD dimensions of the teeth of Taiwanese children were smaller than those of Australians and larger than those of white Americans, and that the BL dimensions were smaller than those of Indian and Icelandic children [17]. In a study in Spain, the dimensions of primary molars were analyzed and the greatest difference was found in the first molars [18]. In a study in China, primary molars showed differences in size, and the SSC of the first primary molars showed the greatest variation in dimensions (while the second primary molars had the least variation) [19].

Assessments of tooth dimensions in different populations, ethnicities, and genders show differences in tooth size. The question that needs to be considered is whether the ratio of the MD dimension to the BL is the same in different races, and whether the available SSCs are suitable for different populations [8]. The results of the present study showed that the mean of the largest MD width was related to the second primary molar with an average of 9.914 mm. Also, the largest BL dimension belonged to the maxillary second primary molars with an average of 10.371 mm. The smallest tooth in terms of MD dimension was determined as the maxillary first primary molars with an average of 7.158 mm and the smallest BL dimension belonged to the mandibular primary molars with an average of 7.402 mm. Similarly, in 2010, a study by Eigbobo., *et al*. [17] on 8,000 primary teeth in Nigerian children found that the largest MD dimension of all measured teeth belonged to the mandibular second primary molars with an average of 10.20 mm. Also, the largest BL dimension belonged to the maxillary second primary molars with an average of 9.84 mm. The smallest MD and BL dimensions among the primary molars belonged to the first primary molar with a mean of 7.63 mm and the first primary molar with a mean of 7.20 mm [20].

Also, in a study conducted by Tahririan., *et al*. [21] in 2012 on patients referred to Isfahan Dental School, the sizes of their primary and permanent teeth were measured. The results were in consistent to the present study. These results suggest that the MD width of primary teeth in this study is significantly larger than the sizes reported by Moyers., *et al*. [22] and smaller than the sizes reported by Casamassimo., *et al*. [23]. It can be said that the average size of teeth in different societies has been different for genetic and environmental reasons and this shows the importance of choosing the correct SSCs to match the teeth of any particular population [21,24].

The results showed that in the MD dimension, the best adaption to MIB SSCs was observed in the maxillary first primary molars (left and right sides), the mandibular right first primary molars and the maxillary right second primary molars, respectively.

Also, in the BL dimension, the best adaptation was observed in the maxillary first primary molars (both sides), the mandibular right first primary molars and the maxillary second primary molars (both sides) Out of 16 dental groups studied, 9 groups were more compatible with MIB than 3M SSCs.

Similarly, and according to the mean values obtained, in the MD dimension of the mandibular left first primary molars and maxillary left second primary molars (left and right sides) and in the BL dimension of the mandibular left first primary molar and the mandibular second primary molars (left and right sides) were more compatible with 3M SSC, which included 7 dental groups out of the 16 study groups.

Comparing the adaptation according to the gender, only the MD adaptation of maxillary left second primary molars with MIB SSCs was different; so that the adaptation was significantly better in girls than boys. The BL adaptation of maxillary right first primary molars with MIB SSCs was significantly better in boys than girls, and the BL adaptation of mandibular left first primary molars with 3M SSCs was better in girls than boys.

Ideally, the left and right antimetric teeth should erupt symmetrically. Differences in the dimensions of antimetric teeth may be due to internal or external factors, defined as "stress". The results of a study conducted by Nishino., *et al*. on the MD dimensions of Indonesian primary teeth showed that the dimensional differences between the right and left teeth were significant [25]. The results of the study by Nishino., *et al*. showed that the difference in the size of the left and right teeth is greater in the posterior teeth [25]. In their 2015 study,

Afshar., *et al*. [8] compared the MD and BL dimensions of two brands of SSCs (MIB and 3M) with maxillary primary molars. According to the results of this study, both brands were significantly different from the desired teeth in both dimensions. However, the mean of the measurements showed that the MIB brand was less different from the maxillary primary teeth in both MD and BL dimensions. The results of the present study also confirm these findings that for the first primary molar on both sides of the MIB SSCs show greater adaptation in both MD and BL dimensions.

Conclusion

Choosing a suitable SSC with maximum compatibility with the tooth can prevent excessive tooth preparation and also prevent microleakage and recurrent caries. According to the results, in some groups of this study, the dimensions of MIB SSC showed notably more similarity to the dimensions of the primary teeth compared to 3M SSC. And also due to the lower price of these SSCs in comparison with the 3M brand, dentists and professionals can consider MIB SSCs as a suitable and cost-benefit alternative to 3M SSCs.

Bibliography

1. Harris Edward F and Loren R Lease. "Mesiodistal tooth crown dimensions of the primary dentition: a worldwide survey". *American Journal of Physical Anthropology: The Official Publication of the American Association of Physical Anthropologists* 128.3 (2005): 593-607.
2. Sztyler Klaudia., *et al*. "Review on Preformed Crowns in Pediatric Dentistry-The Composition and Application". *Materials* 15.6 (2022): 2081.
3. Ninawe Nupur., *et al*. "Zirconia Crowns in Pediatric Dentistry: A Review". *Journal of Positive School Psychology* 6.8 (2022): 1718-1724.
4. Hendi A., *et al*. "Composite Preheating". *Journal of Dentomaxillofacial Radiology, Pathology and Surgery* 8.1 (2019): 37-40.
5. Amlani Dharanshi V and Melina Brizuela. "Stainless Steel Crowns in Primary Dentition". (2022).
6. Afshar Hossein., *et al*. "Comparison of marginal circumference of two different pre-crimped stainless steel crowns for primary molars after re-crimping". *Journal of Dentistry* 12.12 (2015): 926.
7. Zinelis Spiros., *et al*. "Morphological and compositional alterations of in vivo aged prefabricated pediatric metal crowns (PMCs)". *Dental Materials* 24.2 (2008): 216-220.
8. Afshar Hossein., *et al*. "Comparison of primary molar crown dimensions with stainless steel crowns in a sample of Iranian children". *Journal of Dental Research, Dental Clinics, Dental Prospects* 9.2 (2015): 86.
9. Vejdani Javaneh., *et al*. "The prevalence of malocclusion and dental caries in 11-to 14-year-old children in Roudsar, Iran". *Journal of Dentomaxillofacial* 8.4 (2019): 7-12.
10. Afshar H and M Mozafari Kojidi. "Evaluation of marginal circumference and marginal thickness changes in precrimped stainless steel crowns, after recrimping". *Journal of Dental Medicine* 19.2 (2006): 57-62.
11. Gundewar Manjari S., *et al*. "Comparative Microleakage Evaluation through the Interfaces between the Tooth and Cement after Stainless Steel Crown Cementation in Primary Molars: An In Vitro Study". *International Journal of Clinical Pediatric Dentistry* 15.2 (2022): 159-163.
12. Helder Colleen., *et al*. "Stainless Steel Crown Size Selection Predicted by Digital Radiographic Primary Molar Measurements". *Pediatric Dentistry* 44.3 (2022): 186-191.

13. Kayal Shaden. "Retention of Zirconia Crowns Compared to Stainless Steel Crowns: In-Vitro. Diss". *Tufts University School of Dental Medicine* (2022).

14. Moradinia Mohammad., *et al*. "Determination of proper band size for stainless steel crowns of primary second molars: A cross-sectional study". *Journal of Orthodontic Science* 11.1 (2022): 45.

15. Joshi Riddhi S., *et al*. "Longevity of stainless steel crowns on primary molars-A systematic review and meta-analysis". *Journal of the Scientific Society* 50.1 (2023): 28.

16. Nikhil Das KR., *et al*. "Clinical Evaluation of Zirconia and Stainless-Steel crowns in Primary Molars-A Randomized Control Trial". *International Journal of Pedodontics Rehabilitation* 7.2 (2022): 30-38.

17. Eigbobo Joycelyn., *et al*. "Dimenzije zubnih kruna u mliječnoj denticiji kod djece u Nigeriji Tooth Crown Dimensions of Primary Dentition in the Nigerian Population". *Acta Stomatologica Croatica* 44.4 (2010): 269-277.

18. Liu Huei-Hsien., *et al*. "Crown diameters of the deciduous teeth of Taiwanese". *The Kaohsiung Journal of Medical Sciences* 16.6 (2000): 299-307.

19. Ling JYK and RWK Wong. "Tooth dimensions of southern Chinese". *Homo* 58.1 (2007): 67-73.

20. Abu Alhaija ESJ and MA Qudeimat. "Occlusion and tooth/arch dimensions in the primary dentition of preschool Jordanian children". *International Journal of Paediatric Dentistry* 13.4 (2003): 230-239.

21. Anderson Arnett A. "Dentition and occlusion development in African American children: mesiodistal crown diameters and tooth-size ratios of primary teeth". *Pediatric Dentistry* 27.2 (2005): 121-128.

22. Qvist Vibeke., *et al*. "The longevity of different restorations in primary teeth". *International Journal of Paediatric Dentistry* 20.1 (2010): 1-7.

23. Casamassimo Paul S., *et al*. Pediatric dentistry: infancy through adolescence, 5/e. Elsevier India (2012).

24. Ramazani Mohsen., *et al*. "Gingival evaluation of primary molar teeth restored with stainless steel crowns in Pediatric Department of Zahedan-Iran Dental School–a retrospective study". *Stainless Steel* 117.84 (2010): 4-11.

25. WM Bin Alshaibah., *et al*. "Comparative study on the microbial adhesion to preveneered and stainless steel crowns". *Indian Journal of Dentistry* 2.4 (2011): 123-128.

Volume 22 Issue 5 May 2023