

Comparison between the Mesiodistal Crown Dimensions of Second Primary Molar with Stainless Steel Crowns from Different Companies

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ABSTRACT

Background: Due to the variations in tooth anatomy and size among different populations, this study aimed to compare the mesiodistal width of primary second molars in Iraqi children with the mesiodistal width of stainless-steel crowns from different companies.

Materials and Methods: This cross-sectional study was conducted on 220 intact maxillary and mandibular primary second molars selected from boys and girls' Iraqi children aged 8-9 years collected from different primary schools in Baghdad city. The mesiodistal dimensions of the selected teeth and the available maxillary and mandibular stainless-steel crowns from three different companies were measured by using a 3-D scanner, and then the whole measurements were calculated using 3 shape Ortho-analyzer software program.

Results: Data were analyzed statistically via SPSS V 26 software and the results showed that there's non-significant difference between the MD measurements of second primary molars between right and left sides, and high significant difference were recorded with higher mean values for boys than girls. When comparing the same mesiodistal measurement between molars with that of stainless-steel crowns, only limited sizes of stainless steel crowns were found to be fitted to the molars of Iraqi children.

Conclusion: more studies need to be applied using other stainless steel crown companies to find the relation in the mesiodistal measurement of Iraqi populations.

Key words: mesiodistal width , second primary molars, stainless steel crown. (Received: 31/1/2021, Accepted: 1/3/2021)

INTRODUCTION

Clinicians should provide the best preventive or restorative dental treatment for pediatric patients to shape their teeth in the future. There must be an understanding of the pediatric patient's caries risk, the developmental stage of the dentition, and the dental pulp's status to determine the choice of restorative material and technique. The objective of any restorative procedure is to: restore the tooth damage from dental caries, protect and preserve the remaining pulp and tooth structure, retain adequate function and aesthetics and finally to maintain the arch length and space for the developing permanent successors.

Many restorative materials and techniques for carious teeth were introduced to restore the primary teeth ⁽¹⁾. Clinicians should determine the extent of tooth destruction and the ability to re-establish a functional crown morphology with adjacent contacts ⁽²⁾.

When dental caries affects more than one surface of the tooth, the restorative procedure becomes more difficult. Dental caries removal can necessitate more thorough cavity preparation. The larger the reconstruction, the more likely it is to fracture ⁽³⁾. Primary teeth have a higher rate of restorative material loss than permanent teeth ⁽⁴⁾. Patient cooperation, primary tooth morphology, variations in tooth anatomy, and the form of restorative material used all contribute to this ^(5,6). Stainless steel crowns, which have gained popularity among pediatric dentists due to their good performance as a restorative material, are one of the techniques for preserving carious primary molars ^(7,8) and because the complete coronal coverage of primary teeth enhances the tooth's structural integrity and the restoration's longevity ⁽¹⁾. In primary molars, stainless steel crowns are recommended, particularly when caries affect multiple surfaces ⁽⁹⁾. The stainless steel crown, which consists of a nickel-chrome alloy, was first introduced by Humphrey in 1950 ⁽¹⁰⁾. Nowadays, stainless steel crowns are used excessively to restore grossly decayed primary or early permanent teeth in pediatric dentistry.

However, the introduction of minimal intervention sealed restorations (known as the 'Hall crown

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technique') has made the use of these restorations more realistic ⁽¹¹⁾.

Commonly there are two major types of stainless steel crowns used either; pre-trimmed type, which has non-contoured sides but is festooned to follow a line parallel to the gingival crest; or the pre-contoured type, which reproduces a cervical contour similar to that of natural teeth and is also festooned ^(10,12). Pre-contoured stainless steel crowns are widely used because they are easy to manipulate and adapt, e.g., the 3M ESPE Stainless Steel Primary Molar Crown ND-96 (3M ESPE, St. Paul, MN, USA) and the KIDS CROWN (Shin hung, Seoul, Korea).

Morphological characteristics of primary teeth are precious tools for pediatric dentists, orthodontists, and anthropologists. Regarding the morphology of the maxillary primary second molars, it is rhomboidal in shape and resembles the permanent maxillary first molar in appearance; however, it is slightly smaller and at the same time larger than the first primary molar. In contrast to its mesiodistal measurement at the contact points, the crown is small at the cervix. Although the mandibular second molar looks and acts similarly to the mandibular first permanent molar, the primary tooth appear smaller in all dimensions when viewed from the occlusal surface ⁽¹³⁾. Therefore, an understanding of the morphologic characteristics of a SSC and the natural teeth of the patient is required to shorten the chair time and fit the margin of the stainless steel crowns. Studies on the morphology and size of the primary teeth or stainless steel crowns have not been actively pursued so far, and the existing studies on the morphology of teeth were primarily performed by measurements using a caliper ^(14,15). Alternative methods of measurement to the use of a caliper have been suggested. Nowadays, using the three dimensional (3D) computed tomography. Gradually, the use of 3D scanners is increasing and is now beginning to be used in the morphologic study of teeth ⁽¹⁶⁾. In this technique and after scanning the object from every angle, measure the distance, angle, and volume accurately by reconstructing the 3D image. In comparison with computed tomography scan (CT scan), 3D scanners do not require exposure to harmful radiation. Although 3D scanners have the disadvantage of the requirement for expensive equipment and software,

once the operator becomes accustomed to the process of using the 3D scanner, we can expect to shorten the time and achieve much more accurate results upon implementing stainless steel crowns.

In the present study, the main target was to measure the mesiodistal width of the primary second molar teeth in Iraqi children aged 8-9 years from Baghdad city and to compare the values for these dimensions to the values for the corresponding dimensions of stainless steel crowns manufacturer by three different companies of pre-contoured stainless steel crowns for the second primary molar using a 3D scanner. The three types of SSCs include (3M SSC, KIDS CROWN, RIHANI CROWNS) then using 3 SHAPE ANALYZER software program to perform the measurement.

MATERIAL AND METHODS

The Sample: This cross-sectional study was conducted on 55 children, 27 were boys, and 28 were girls aged 8-9 years at the mixed dentition stage from different primary schools in Baghdad\ Iraq, the total teeth selected for the measurement were 220 maxillary and mandibular second primary molars. A signed consent form was collected from parents for approval to participate their children in the study and to informed about any medical problems of their children (Appendix).

The selected children for the present study were with the following criteria:

- 1- Healthy children without any systemic disease, depending on the children's medical history given by their parents.
- 2- The dentition without any caries, restorations, hypoplasia, or other dental anomalies.
- 3- erupted and caries-free primary second molars.

Maxillary and mandibular alginate impressions were taken for the dentition for the selected children. The mesiodistal crown measurements of the second primary molars (E) were performed on dental models. The research did not include low-quality casts ^(14,17,18).

Methods: The Mesiodistal width of each second primary molar was measured on a dental study cast for each child at the widest distance between the contact points ^(14,19,20).

For the accuracy of the mesiodistal width of each stainless steel crown, first mounting one of each size of stainless steel crown from the kit on silicon impression material (C-silicon Protasil, VANNINI CENTAL INDUSTRY ITALY), labeled according to each company and quadrant, then waiting for

complete material setting according to the manufacturer instruction to be ready for scanning. (Figure 1).



Figure 1: mounting and labeling one of each size of stainless steel crown on silicon impression material.

Scanning of the selected study models and stainless-steel crown models to perform the measurement were applied using (D2000,3 shape, Denmark). To improve the 3D scanning measurement, a pre-treatment involving a specialized spray (scan spray NHT HIGH TECHNOLOGY, Latvia) to coat the metal surface was applied (Figure 2). The thickness of the coating was 15 μm . as suggested by the manufacturer, and thus, we subtracted this thickness from the measurement results of this study. After the scanning process, the image was analyzed using 3 SHAPE ORTHO ANALYZER programs to perform the measurements for the maxillary and mandibular study casts (Figure 3) and for the maxillary and mandibular set of stainless steel crowns (Figure 4).



Figure 2: specialized spray to coat the metal surface

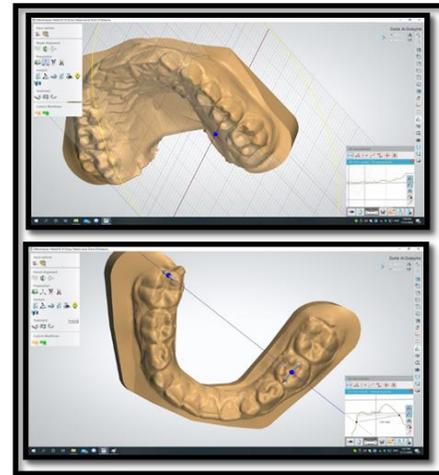


Figure 3: The maxillary and mandibular cast analyzing using 3 SHAPE ORTHOANALYZER program.

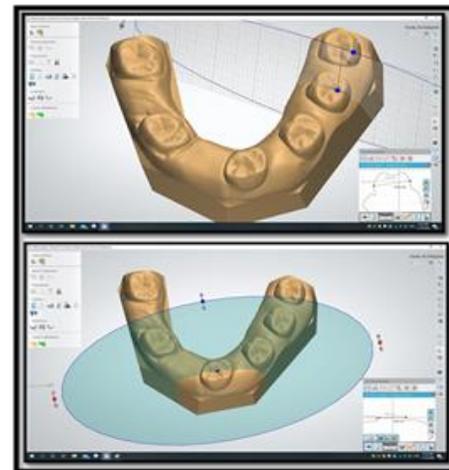


Figure 4: The maxillary and mandibular SSC set analyzing using 3 SHAPE ORTHOANALYZER program.

Each stainless steel crowns kit provide six sizes 2,3,4,5,6,7 and there are certain number of the crowns for each size, and since the dimensions of the same-size crowns manufactured by the same company are equal, two of the stainless steel crowns of each number were evaluated to increase the accuracy of the reading. MD measurements were applied on the second primary molars on the casts, then the same MD measurements were applied on the stainless steel crowns from three different companies (Figure 5): 3M crowns, kids crown and Rihany crowns for each size of the stainless steel crowns (sizes: 2,3,4,5,6,7) .

The MD dimension representative of each tooth and stainless steel crown was calculated by measuring the greatest distance between the midpoints of the mesial and distal contact points ⁽¹⁴⁾.



Figure 5: 3M crowns, Kids crowns, Rihany crowns.

Statistical analyses were carried out using the IBM SPSS Statistics version 26 USA. The descriptive statistics means, standard deviations, maximum and minimum values of the mesiodistal width for primary second molars and the stainless steel crowns were recorded. For comparison ,Paired sample t-test were applied to compare between right and left molars, and independent sample t-test were applied to compare between boys and girls. One sample t-test was used to compare the mean values of MD of the second primary molar with each size of the stainless steel crowns.

RESULTS

For the MD measurement for maxillary and mandibular right and left second primary molars, (Table 1) showed the descriptive statistics for the maxillary right second primary molar (Max RE), maxillary left second primary molar (Max LE), mandibular right second primary molar (Man RE) and mandibular left second primary molar (Man LE), and the least measurement value was recorded in the maxillary second primary molars for the girl’s sample (8.00) mm. with the highest value recorded in the mandibular second primary molars for the boys sample (11.60) mm. While the mean values revealed that the highest mean value recorded for the mandibular second primary molars in the boy’s sample (9.83) mm. and the least value for the maxillary second primary molars in the girls sample (8.80) mm. Also (Table 1) showed, statistically by the application of Paired sample t-Test to compare between the right and left sides of maxillary and mandibular MD width of second primary molars for both genders, the comparison revealed a non-significant difference between sides except in the maxillary MD measurement in boys’ sample, but the difference between sides about 0.04 mm.

Table 1: Comparison between right and left sides differences of maxillary and mandibular MD width of second primary molars for both genders.

MD (BOYS)						Sig. (2-tailed)	MD (GIRLS)						Sig. (2-tailed)
	N	Min	Max	Mean	SD			N	Min	Max	Mean	SD	
Max RE	27	8.29	9.90	9.1926	.44561	.043	Max RE	28	8.00	10.00	8.8182	.51159	.318
Max LE	27	8.30	9.87	9.1330	.43137		Max LE	28	8.00	10.00	8.8007	.52127	
Man RE	27	8.70	11.40	9.7833	.57805	.093	Man RE	28	8.50	11.50	9.5439	.59936	.077
Man LE	27	8.60	11.60	9.8326	.59155		Man LE	28	8.60	11.50	9.5732	.57915	

Table 2: Comparison between the mean MD values of the maxillary and the mandibular second primary molars between both genders.

Pair 1		Mean	Sig. (2-tailed)	Pair 2		Mean	Sig. (2-tailed)
Max E	boys	9.1628	.000	Man E	boys	9.8080	.031
	girls	8.8095			girls	9.5586	

(Table 2) the comparison between both genders statistically done by application of the independent sample t-test to compare the mean value of the second primary molars, and the result showed a highly significant difference, with the boys recorded higher mean values than girls.

One-Sample Test were applied to compare the MD mean values of the second primary molars for boys' and girls' sample in both arches with the MD width of stainless steel crowns of three manufactures (3M crowns, kid's crown, Rihany crowns) with, and the results showed:

1- For the 3M CROWN type, there's a highly significant difference for all MD measurements except for size maxillary 2 in boys sample and size mandibular 3 for the boys sample, which showed a non-significant difference, although there's a convergence of values between the mean value of size mandibular 2 which is about (9.4 mm.) with that of the girls sample in mandibular second

primary molars (9.55 mm.) but statistically showed a significant difference (Table 3).

2- The measurement of the KIDS CROWN type showed that there's a highly significant difference for all MD measurements except for size maxillary 2 in the girls sample and size mandibular 5 for the boys sample (Table 4).

3- The RIHANY CROWNS type, there's a highly significant difference for all MD measurement except for the size mandibular 5 crowns in the boy's sample, which is equal values about (9.8 mm.). Although there's a convergence of values between the mean value of size mandibular 3, which is about (9.8 mm.) with that of the girl's sample in mandibular second primary molars (9.55 mm.) but statistically showed a significant difference (Table 5).

Table 3: Comparison between the MD measurements of 3M SSC with second primary molars.

3M CROWN SIZES	Mean SSC MD	Max E boys	Sig. (2-tailed)	Max E girls	Sig. (2-tailed)	3M CROWN SIZES	Mean SSC MD	Man E boys	Sig. (2-tailed)	Man E girls	Sig. (2-tailed)
2	9.2	9.1628	.533	8.8095	.000	2	9.4	9.8080	.000	9.5586	.047
3	9.6	9.1628	.000	8.8095	.000	3	9.8	9.8080	.920	9.5586	.003
4	10.0	9.1628	.000	8.8095	.000	4	10.2	9.8080	.000	9.5586	.000
5	10.4	9.1628	.000	8.8095	.000	5	10.6	9.8080	.000	9.5586	.000
6	10.8	9.1628	.000	8.8095	.000	6	11.0	9.8080	.000	9.5586	.000
7	11.2	9.1628	.000	8.8095	.000	7	11.4	9.8080	.000	9.5586	.000

Table 4: Comparison between the MD measurements of KIDS CROWN SSC with second primary molars.

KIDS CROWN SIZES	Mean SSC MD	Max E boys	Sig. (2-tailed)	Max E girls	Sig. (2-tailed)	KIDS CROWN SIZE	Mean SSC MD	Man E boys	Sig. (2-tailed)	Man E girls	Sig. (2-tailed)
2	8.9	9.1628	.000	8.8095	.191	2	8.9	9.8080	.000	9.5586	.000
3	9.6	9.1628	.000	8.8095	.000	3	9.1	9.8080	.000	9.5586	.000
4	9.9	9.1628	.000	8.8095	.000	4	9.4	9.8080	.000	9.5586	.047
5	10.4	9.1628	.000	8.8095	.000	5	9.9	9.8080	.249	9.5586	.000
6	10.6	9.1628	.000	8.8095	.000	6	10.2	9.8080	.000	9.5586	.000
7	11	9.1628	.000	8.8095	.000	7	10.5	9.8080	.000	9.5586	.000

Table 5: Comparison between the MD measurements of RIHANY SSC with second primary molars.

RIH. CROWN SIZES	Mean SSC MD	Max E BOYS	Sig. (2-tailed)	Max E GIRLS	Sig. (2-tailed)	RIH. CROWN SIZES	Mean SSC MD	Man E BOYS	Sig. (2-tailed)	Man E GIRLS	Sig. (2-tailed)
2	7.3	9.1628	.000	8.8095	.000	2	7.7	9.8080	.000	9.5586	.000
3	7.6	9.1628	.000	8.8095	.000	3	8.6	9.8080	.000	9.5586	.000
4	8.5	9.1628	.000	8.8095	.000	4	9.3	9.8080	.000	9.5586	.000
5	9.3	9.1628	.024	8.8095	.000	5	9.8	9.8080	.920	9.5586	.003
6	9.5	9.1628	.000	8.8095	.000	6	10.2	9.8080	.000	9.5586	.000
7	9.8	9.1628	.000	8.8095	.000	7	10.4	9.8080	.000	9.5586	.000

DISCUSSION

Stainless steel crowns have been commonly used for the restoration of primary and permanent posterior teeth since Humphrey's introduction in 1950. No other restoration for primary teeth compares to the ease of use, longevity, and dependability of these full coverage crowns⁽²¹⁾. The Mesio-distal dimension (MD) have different terms that have used, such as tooth width^(22,23). Mesiodistal width⁽²⁴⁾ tooth breadth⁽²⁵⁾ and mesiodistal crown diameter⁽¹⁷⁾. The greatest distance between the normal contact areas on the proximal surfaces of the tooth crowns, measured parallel to the occlusal plane⁽²⁶⁾. The MD should be taken with the calipers parallel to both the occlusal and buccal (vestibular) surfaces, according to some researchers⁽²⁵⁾. According to Moorrees et al. in 1957, MD was calculated by measuring the greatest distance between the contact points when keeping calipers parallel to both the occlusal and vestibular surfaces⁽¹⁴⁾. The three companies of SSC that selected in the present study were the most commonly available for the restoration of primary molars in Iraq\ Baghdad; 3M SSC, the KIDS SSC and the RIHANY crowns.

The most important indications for using SSC as a restorative material for primary and young permanent teeth with extensive or multiple caries, hypoplasia, developmental anomalies, after teeth that treated with pulpotomy or pulpectomy, teeth with fractures and for the primary teeth that serve as abutments for space maintainers, orthodontic appliances and habit breaking appliances. Recently the SSC introduced for the hall's technique which is an alternative form of treating caries in primary molars that requires the placement of a stainless steel crown without the need for tooth preparation or caries removal, and it is limited to asymptomatic teeth with no symptoms of pulpal inflammation, necrosis, or periodontal involvement. Dr. Norna Hall of Scotland was the first to use the technique in 1988, and it has gradually risen in popularity in the United Kingdom, showing promise in evidence-based science^(8,27).

The MD measurement of the second primary molars:

The mesiodistal width of each molars and Stainless steel crowns were measured at the widest distance between the contact points. The MD mean values of the second primary molars of the boys and girls groups in the present study showed that there's a

non-significant difference between right and left sides for the maxillary and mandibular teeth in both genders^(28,29), except in boys maxillary second primary molars the right side slightly larger than the left side about 0.04mm. with a significant difference statistically, This comes in accordance with Tejero et al. study that found significant differences between right and left teeth for the deciduous maxillary second molars⁽³⁰⁾. Accordingly, the left and right sides mean values of second primary molars MD were merged together and genders comparison were performed using independent sample t-test which revealed high significant genders difference with the boys recorded higher MD measurements than girls this finding come in accordance with other studies found significant gender differences in the width of the primary second molars between genders.^(31,32, ,33,34,35).

The MD measurement of the stainless steel crowns:

The KIDS CROWN Company it manufactured in Korea while the 3M CROWNS and RIHANY CROWNS were made in the UNITED STATES OF AMERICA. For the primary posterior teeth, these crowns come in a range of sizes (sizes 2, 3, 4, 5, 6, 7). Since the dimensions of these crowns seem to have been calculated based on the manufacturing country's epidemiologic data, the key question here is whether these crown sizes are appropriate for use in Iraqi children's teeth. In order to explain this, we measured the mesiodistal (MD) dimensions of stainless steel crowns of the three mentioned companies and then compared statistically with the corresponding values of second primary molars on the study casts in Iraqi children at the mixed dentition stage.

The results revealed that for the 3M Company, the MD measurement from size 2-7 the difference between each size increase 0.4 mm. and the most suitable size used for the maxillary second primary molars is number 2 for the boys group with no significant difference between them, and showed that the values almost equal 9.2 mm and 9.16 mm for the Stainless steel crowns and maxillary second primary molar respectively. At the same time, the girls group showed a highly significant difference for all sizes, although there are nearby values in size 2, about 9.2 mm, the MD of the crown with 8.8 mm.

the MD width of the maxillary second primary molar. While the mandibular 3M crowns sizes show no significant difference only in size 3 for the boys group that recorded equal values about 9.8 mm. for MD of the stainless steel crowns and mandibular second primary molar respectively, with a high significant difference for the remaining sizes 2, 4,5,6,7. Although for the girls group, there's also a highly significant difference in all sizes with only a nearby value between crown size 2 about 9.4 mm with that of mandibular second primary molar MD dimension about 9.5 mm. This limitation in the available sizes for Iraqi MD measurement of the second primary molars may be due to the smaller MD mean values than those of American children according to previous American studies on white children^(36,37).

The kids crown MD measurement found that all the values in the maxillary crown showed that the difference between sizes from 2-7 is unequal number; the increase include 0.7, 0.3, 0.5, 0.3, 0.4 mm between each size. Statistically, there's a highly significant difference in all sizes except size 2 maxillary crown, which is about 8.9 mm., with the MD dimension of maxillary second primary molars about 8.8 mm. in the girl's group, which show a non-significant difference statistically. Regarding the mandibular crown's MD measurement, the difference between each size from 2-7 is 0.2, 0.3, 0.5, 0.3, 0.3 mm. The results statistically showed that, there's a non-significant difference in size 5 crown about 9.9 mm with the corresponding tooth MD about 9.8 mm for the boy's group with a highly significant difference recorded for the remaining sizes although size 4 crown about 9.4 mm is nearby to the MD measurement of the mandibular second primary molars about 9.5mm. in the girls group. Also, this limitation in the presence of suitable sizes for Iraqi children is the difference in the mean values of MD measurement in which the Korean children exhibit a larger MD dimension of the second primary molars than those of Iraqi⁽³⁷⁾.

The measurement for the Rihany crowns, which is an old company and made in the USA, showed that the maxillary crowns the differences between sizes from 2-7 are 0.3, 0.9, 0.8, 0.5, 0.3 mm. while for mandibular crowns, the difference between each size is 0.9, 0.7, 0.5, 0.4, 0.2mm. after analyzing the data statistically by comparing between the

Stainless steel crowns sizes and the MD measurement of the second primary molars revealed a highly significant difference for the whole sizes of the maxillary and mandibular crowns with one value showed a non -significant difference in size 5 mandibular crown about 9.8 mm. with an equal MD measurement of second primary molars about 9.8 mm. of the boys group. Also, the maxillary crown size 5 showed a significant difference with nearby values 9.3 mm with 9.16 mm. in the boys group. Another comparable value is seen in the girls group, the mandibular second primary molars about 9.5 mm. with the MD measurement of size 5 mandibular crown about 9.8mm. From the above, the preferred sizes that fit the second primary molars for Iraqi children are limited to the small sizes ranging from 8.8mm. to size 9.8mm. for the boys and girls' pediatric patients and these sizes are the most commonly consumed from the stainless steel crowns kits. Any modification for the unfitted size of Stainless steel crowns; smaller or larger size, lead to lack of adequate marginal adaptation the tooth, which is considered to be the main cause of microleakage around these crowns⁽³⁸⁾. The uses of large stainless steel crown size 10mm. and above of the three companies are not applicable for the Iraqi second primary molars width, but they may be useful for the first permanent molars in Iraqi children since the MD of this tooth ranging from 10mm. to 10.6mm. according to a previous Iraqi studies^(29,39). The manufacturing companies must consider the variations in MD width of the primary teeth between different populations before the production of Stainless steel crowns. By doing this, dental practitioners may save the time consuming for crown preparation, which is particularly very important when treating young, uncooperative children.

CONCLUSIONS

There are not enough scientific researches in our country about the size measurements of stainless steel crowns and whether they are suitable for primary molars of Iraqi children because such measurement is useful for clinical practice. Regarding the MD measurement of stainless steel crowns, including the three companies that are widely available in Iraq, it seems that only a few smaller sizes were applicable for use in daily clinical practice for Iraqi children, according to the

recorded measurement of the present study. Those facts are essential to know when using SSCs of standardized size with the aim of avoiding improper fit crowns. Researches need to be applied using other stainless steel crown companies to find the relation in the mesiodistal measurement with primary molars of Iraqi populations.

REFERENCES

1. Nicola P T Innes 1, David Ricketts, Lee Yee Chong, Alexander J Keightley, Thomas Lamont, Ruth M Santamaria ,Preformed crowns for decayed primary molar teeth. *Cochrane Database Syst Rev*, 2015. (12): p. Cd005512.
2. Lenters, M., W.E. van Amerongen, and G.J. Mandari, Iatrogenic damage to the adjacent surfaces of primary molars, in three different ways of cavity preparation. *Eur Arch Paediatr Dent*, 2006. 7(1): p. 6-10.
3. Ilie, N. and R. Hickel, Mechanical behavior of glass ionomer cements as a function of loading condition and mixing procedure. *Dent Mater J*, 2007. 26(4): p. 526-33.
4. Reinhard hickel, christoph kaaden, ekaterini paschos, , verena buerke, , franklin garcía-godoy, & juergen manhart, Longevity of occlusally-stressed restorations in posterior primary teeth. *Am J Dent*, 2005. 18(3): p. 198-211.
5. Gift, H.C., S.T. Reisine, and D.C. Larach, The social impact of dental problems and visits. *Am J Public Health*, 1992. 82(12): p. 1663-8.
6. Tinanoff, N. and J.M. Douglass, Clinical decision-making for caries management in primary teeth. *J Dent Educ*, 2001. 65(10): p. 1133-42.
7. Seale, N.S., The use of stainless steel crowns. *Pediatr Dent*, 2002. 24(5): p. 501-5.
8. Seale, N.S. and R. Randall, The use of stainless steel crowns: a systematic literature review. *Pediatr Dent*, 2015. 37(2): p. 145-60.
9. Guideline on Paediatric Restorative Dentistry. 2019. american academy of pediatric dentistry .17;38:250–262).
10. Humphrey WP. Use of chrome steel in children's dentistry. *Dental Survey*. 1950; 26:945-949.
11. Altoukhi, D.H. and A.A. El-Housseiny, Hall Technique for Carious Primary Molars: A Review of the Literature. *Dent J (Basel)*, 2020. 8(1).
12. Arthur J.Nowak, Pediatric dentistry infancy through adolescence.2013. 6th ed.ch.22 restorative dentistry for primary dentition. St. Louis, Mo.: Elsevier/Saunders. p:316-319.
13. McDonald, R.E., D.R. Avery, and J.A. Dean. dentistry for the child and adolescent. 2011. Restorative Dentistry. .8th ed. Mosby International Ltd; p.376-82.
14. Moorrees C.F.A., E jensen, P. kai-jen yen, S. O. thomsen., Mesiodistal crown diameters of the deciduous and permanent teeth in individuals. *J Dent Res*, 1957. 36(1): p. 39-47.
15. Eric Vela , Reginald W Taylor, Phillip M Campbell, Peter H Buschang, Differences in craniofacial and dental characteristics of adolescent Mexican Americans and European Americans. *Am J Orthod Dentofacial Orthop*, 2011. 140(6): p. 839-47.
16. Jihyun Lee, Teo Jeon Shin, Young-Jae Kim, Jung-Wook Kim, Ki-Taeg Jang, Sang-Hoon Lee, Chong-Chul Kim, Hong-Keun Hyun, A morphometric study on stainless steel crowns of the primary first molar using a three dimensional scanner. *The Journal of the Korean Dental Association*, 2016. 54: p. 414-428.
17. Axelsson, G. and P. Kirveskari, Crown size of permanent teeth in Icelanders. *Acta Odontol Scand*, 1983. 41(3): p. 181-6.
18. Yuen, K.K., L.L. So, and E.L. Tang, Mesiodistal crown diameters of the primary and permanent teeth in southern Chinese--a longitudinal study. *Eur J Orthod*, 1997. 19(6): p. 721-31.
19. N Bravo , M Facal, M Maroto, E Barbería, Relationship between mesiodistal crown diameters of permanent first molars and deciduous second molars. *Eur J Paediatr Dent*, 2010. 11(3): p. 115-21.
20. Al-Dulayme, D.A. Maxillary Dental Arch Dimensions in a Sample of Iraqi Children at the Mixed Dentition Stage. 2009. Vol.:6 No.:4 :p.349-355.
21. Mata, A.F. and R.D. Bebermeyer, Stainless steel crowns versus amalgams in the primary dentition and decision-making in clinical practice. *Gen Dent*, 2006. 54(5): p. 347-50; quiz 351, 367-8.
22. Miyabara, T., An Anthropological Study of the Masticatory System in the Japanese. *Dental Cosmos*, July, 1916. Volume 58(Issue 7): p. 739-749.
23. Lundstrom, A., Intermaxillary tooth width ratio and tooth alignment and occlusion. *Acta Odontol Scand*, 1955. 12(3-4): p. 265-92.
24. Bolton, W.A., Disharmony In Tooth Size And Its Relation To The Analysis And Treatment Of Malocclusion*. *The Angle Orthodontist*, 1958. 28(3): p. 113-130.
25. Lundström, A.,Variation of tooth size in the etiology of malocclusion. *American Journal of Orthodontics*, 1955. 41(11): p. 872-876.
26. Lavelle, C.L., The relationship between stature, skull, dental arch and tooth dimensions in different racial groups. *Orthodontist*, 1971. 3(1): p. 7-11.
27. Innes, N.P., D.J. Evans, and D.R. Stirrups, The Hall Technique; a randomized controlled clinical trial of a novel method of managing carious primary molars in general dental practice: acceptability of the technique and outcomes at 23 months. *BMC Oral Health*, 2007. 7: p. 18.
28. Hikmat BYM. Mesio-distal diameter and occlusal features in the primary dentition of 4-5 year old children from Baghdad- Iraq. A master thesis, Department of POP, College of Dentistry, University of Baghdad, 1989.
29. Al-Dulayme D.A., The relation between the mesio-distal crown widths of the deciduous second molars and

- the permanent first molars. Journal of baghdad college of dentistry, 2014. 26 (3): p. 113-117.
30. Tejero A, P.E., Laniza A., (Estudio biometrico de la denticion temporal. Rev ESP Ortod, 1991. 21: p. 167-79.
 31. M Santoro I, M E Ayoub, V A Pardi, T J Cangialosi, Mesiodistal crown dimensions and tooth size discrepancy of the permanent dentition of Dominican Americans. Angle Orthod, 2000. 70(4): p. 303-7.
 32. Lysell L, Myrberg N. Mesio-distal tooth size in the deciduous and permanent dentitions. Eur J Orthod 1982; 4:113-22.
 33. Marin JM, Barber E, Moreno JP, Planells P, De Nova J, Costa F. Study the mesio-distal diameters of the teeth in a population Spanish children. Pediatr Odont 1993; 2 (2): 67-76.
 34. Hattab, F., Odontometric study of deciduous and permanent teeth in Jordanians. Dental News, 1997. 4: p. 17-24.
 35. Black, T.K., 3rd, Sexual dimorphism in the tooth-crown diameters of the deciduous teeth. Am J Phys Anthropol, 1978. 48(1): p. 77-82.
 36. Warren, J.J., S.E. Bishara, and T. Yonezu, Tooth size-arch length relationships in the deciduous dentition: a comparison between contemporary and historical samples. Am J Orthod Dentofacial Orthop, 2003. 123(6): p. 614-9.
 37. Dong-Hyuk Im , Tae-Woo Kim , Dong-Seok Nahm , Young-II Chang, Spacing and crowding of the primary dentition in Korean children - relationship to tooth sizes and dental arch dimension. The Korean Journal of Orthodontics, 2006.
 38. Bahman Seraj , Mahdi Shahrabi, Pouria Motahari, Rahil Ahmadi, Sara Ghadimi, Shahram Mosharafian, Kaveh Mohammadi, Mohammad Javad Kharazifard, Microleakage of stainless steel crowns placed on intact and extensively destroyed primary first molars: an in vitro study. Pediatr Dent, 2011. 33(7): p. 525-8.
 39. Ahmed Z. Diab B. The effect of nutritional status on mesiodistal and bucco/ lingual or palatal diameters of permanent teeth among fifteen years old students. JBCD 2016 June;28(2):108-14.

المستخلص:

نظراً للاختلاف بين احجام الاسنان بين الشعوب المختلفة , تهدف هذه الدراسة إلى مقارنة العرض الأنسي للأضراس اللبنية الثانية في الأطفال العراقيين الذين تتراوح أعمارهم 8-9 سنوات مع العرض الأنسي للتيجان المصنوعة من الفولاذ المقاوم للصدأ وذلك بسبب التباين التشريحي في تشريح الأسنان بين المجموعات السكانية المختلفة.

المواد والطرق: أجريت هذه الدراسة المقطعية على 220 ضرساً لبنيماً "سليماً" للفك العلوي والفك السفلي تم اختيارهم من مجموعتي الذكور والإناث من مدارس ابتدائية مختلفة من مدينة بغداد \ العراق. تم قياس الأبعاد المتوسطة للأسنان المختارة وتيجان الفولاذ المقاوم للصدأ للفك العلوي والفك السفلي من ثلاث شركات مختلفة باستخدام ماسح ضوئي ثلاثي الأبعاد ، واحتساب القياس بالكامل باستخدام برنامج (3Shape Orthoanalyzer)

وعند مقارنة العراض الأنسي للأضراس اللبنية وجدت أنه احصائياً لا يوجد فرق بين الجهتين اليمين واليسار تم تسجيل فرق ذو دلالة إحصائية مع قيم متوسطة أعلى للأولاد من البنات وعند مقارنة نفس القياس الأنسي بين الأضراس مع التيجان المصنوعة من الفولاذ المقاوم للصدأ ، تم العثور على أحجام محدودة فقط من التيجان الفولاذية المقاومة للصدأ مناسبة لأضراس الأطفال العراقيين. يجب تطبيق المزيد من الدراسات باستخدام شركات اخرى مصنعة للتاج الفولاذ المقاوم للصدأ لإيجاد العلاقة في القياس الوسطي المتوسط للسكان العراقيين.

