Original Research Article

Evaluation of esthetic parameters of the face and components of smile in children with deciduous dentition

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ABSTRACT

Aim: In the present era, esthetics has become an important dimension in dental practice as parents and children are equally self-conscious of their appearance. Children now desire to possess an aesthetically pleasing smile. Harmonizing an esthetic smile integrates facial and dental components. Since the scientific data on pediatric esthetics are limited, the aim of the study was to evaluate esthetic parameters of the face and components of smile in children with deciduous dentition.

Materials and Methods: After fulfilling inclusion criteria, 3 sets of facial photographs of 100 children were obtained, comprising of frontal at rest, frontal smile and profile at rest images under standardised photographic technique. Linear measurements of facial and dental parameters were assessed with the help of Adobe photoshop and static norms were obtained by taking the average value. Subjective evaluation was performed by a group of professionals using Q-sort technique to list the attractive features in children.

Results: Static norms were obtained for facial and dental parameters. Attractive children showed decreased facial height, anterior lower facial height, vermilion height and bigonial width. They also displayed decreased smile index and buccal corridor ratio along with parallel smile arc and more than 3/4th of crown height visibility during smiling.

Conclusion: Attractive children presented facial and dental parameters variable from normative values.

Clinical Significance: The study results can be utilised during restorative and prosthetic rehabilitation among children to improve esthetics.

1. Introduction

Beauty is defined as "a state of harmony – a balance of facial proportions – a balanced relationship among skeletal structures, teeth, and soft tissue".[1] Today's generation including children pay particular attention to their aesthetic appearance. Goldman and Lewis postulated that "attractive children, who receive more favourable reactions from others, will be more comfortable in social settings and develop better social skills than less attractive children".[2]

Due to increasing social demand for improved facial characteristics, today's dentists have started to be aware of how to produce a pleasing esthetic outcome.

An esthetic smile is indispensable to facial attractiveness, which also contributes to psychosocial well-being.[3] Harmonizing an esthetic smile integrates facial and dental components.[4] Smile can be classified into two types; social and enjoyment smile. Social smile is a voluntary posed smile, not accompanied by emotions and can be sustained as a static facial expression. On the other hand, enjoyment smiles are involuntary, elicited by laughter, unposed, reflects the emotion that one is experiencing at that moment and

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cannot be sustained. Posed social smile has been referred to as a reliable reference for measurement and characterization of the smile.[5]

Smile esthetics can be evaluated by clinical examinations, direct facial measurements,[6] from photographs[7] or by utilizing laser scanning techniques[8] and computerized methods.[9] Photographs allow the observation of harmonious relationship between soft and hard facial tissues, at a low cost without exposing the patient to radiation. Most frequently captured photographic views for evaluating facial esthetics are profile image, frontal image with the lips together, and frontal smiling images which allows complete visualization since dynamic characteristics are not taken into consideration.[8]

Literatures refer "ideal" as the averageness seen among population however, esthetics can be best understood in a subjective sense. Obtaining averages of the components of smile among various population, exhibits its general pattern of occurrence termed as static norm. Subjective evaluation can be achieved using Q-sort technique, which has shown to be a more reliable method.[10] Perception of esthetics may vary among people, but the evaluator must have the ability to correctly perceive and judge beauty. This is achieved by selecting the appropriate panel for subjective evaluation. The scientific data on Pediatric dental esthetics are limited and almost non-existent, therefore we aimed at evaluating esthetics of face and components of smile in children during deciduous dentition period, to aid in treatment planning, particularly in the field of restorative and prosthetic dentistry. Therefore, photogrammetric method was adopted to establish static norm for various facial and dental parameters and Q-sort assessment was used to quantify attractiveness with the help of visual judgement of these photographs by 9 experienced professionals.

2. Materials and Methods

100 children of age 2.5-7 years with complete deciduous dentition and normal dentofacial structures accompanying their parents to the outpatient department were selected. The approval from the Ethical and Research Committee was obtained prior to the study along with written consent from the parents of participating children after explaining the type and the importance of this study. The study included subjects with complete primary teeth and normal occlusal relationship. Those with dental caries, one or more missing teeth or any craniofacial deformities were excluded. Photographs of children in different views i.e profile, frontal at rest and frontal smile were analyzed for its objective and subjective evaluation in order to determine static norm and attractive features in children.

Images were captured in a similar environment and lighting conditions using Sony Cyber-shot Digital still camera (16.2 mega-pixels, automatic mode) which was mounted on an adjustable tripod stand, placed at a distance of 15 inches with its lens centered between the subject's eyes and also parallel to the horizontal plane. A position was marked on the floor using an adhesive tape where the child stood, to capture frontal photographs in a natural head position. Soft tissue landmarks like trichion, nasion, pogonion and subnasal were marked by inspection and palpation to precisely locate it on the photographs. Frontal at rest photographs were captured when the child was in his/her most relaxed position and frontal smile was obtained by instructing the child to smile while saying "cheese". To capture lateral profile at rest, subjects were asked to turn to their left side, to look at themselves in the mirror which was placed at a distance of 100cm, at their eye level. All the parameters were measured using Adobe photoshop ruler in millimeters(mm). The components assessed using landmarks (Figure 1) are given in the Table 1.

2.1. Subjective evaluation of frontal smile images using Q-sort technique

All coloured frontal photographs of 100 children captured during smiling were printed individually in good quality cards of size 4×5 inches in colour contrast. These were displayed to the 9 evaluators i.e. 3 Cosmetic dentists, 3 Photographers and 3 Artists having a minimum of 10 years experience in their respective fields. Esthetic evaluation of the smile parameters were performed using Q-sort assessment.

The panelists were given the following verbal instructions:[10]

1. Please evaluate the smiles for the esthetic value disregarding the facial blemishes, any variation in teeth shade or picture quality.
2. From the 100 photographs, select the 5 least and the 5 most attractive smiles and set them at left and right extremes respectively.
3. From the remaining 90 photographs, choose the 8 least and the 8 most attractive smile photographs and set them as in Q-sort frame.
4. Continue this process and set aside 12 and then 16 from each extreme
5. The remaining 18 photos will represent smiles that you consider to have neutral attractiveness.
6. Once the Q-sort with 9 groups is completed, survey the distribution and draw a line (cut point) between the two columns separating "unattractive" from "attractive" smiles.
7. After drawing the line, leave the Q-sort intact so that it can be scored later.

After the verbal instructions, the panelists were given written instructions to review before beginning. The cut-off point between "unattractive" and "attractive" smiles were marked on the distribution located on the written instruction form.

Table 1: List of facial and dental parameters assessed

Components	Description
Facial Parameters	
Inter-trichion-nasion distance [IT-N]	Distance between trichion and nasion
Facial height	Distance between nasion and pogonion
Anterior upper facial height	Distance from nasion to subnasal.
Anterior lower facial height	Distance between subnasal and pogonion
Upper facial width	Distance between two exocanthions
Mouth width	Distance between cheilion of one side to the other side
Vermilion height	Distance between labiale superius and labiale inferius
Bigonial width	Distance between two soft tissue gonion4
Nasal depth	Distance between pronasal and alar
Facial depth	Distance from subnasal to tragus
Dental Parameters(Figure 2)	
Maxillary incisor exposure [MIE]	Amount of vertical display of the maxillary central incisors
Smile index [SI]	Width (intercommisural width on smiling) Height (interlabial gap on smiling)
Buccal corridor ratio	[inner commissure width-visible maxillary dentition width / Inner commissure width] × 100
Most posterior maxillary tooth visible	Smiles were categorised as displaying teeth up to the canines, 1st molar and 2nd molar. In case of a discrepancy between the two sides, the most posterior tooth was considered.
Smile arc	Two lines were drawn, one along the maxillary incisal edges and other one along the upper border of the lower lip and checked if they are parallel, flat or reverse
Anterior height of the smile	High smile (a contiguous band of gingiva above the maxillary central incisor), Average smile (showing 75% to 100% of the maxillary central incisors), Low smile (showing <75% of the maxillary central incisors).
Posterior height of the smile	Visibility of most posterior tooth was considered for posterior height of smile. It can be high, average or low smile.

Each column contained a specific number of photographs like 5, 8, 12, 16, 18, 16, 12, 8 and 5 respectively from left to right. The photographs sorted in each of 9 groups were noted and each of the 9 groups of images were given a score ranging from 0 to 8 (least attractive to most attractive from left to right). The scores each subject received from the various judges were averaged to generate the subject's overall Q-sort score. The cut-off point separating the "unattractive" and "attractive" images was given a numeric value. The cut-off points from the various judges were averaged to generate the overall demarcation between "attractive" and "unattractive" images. Statistical analysis of linear measurements of all images were carried out using Mann Whitney test and Chi square test and Intraclass correlation coefficient test was carried out to assess the reliability of subjective evaluators.

3. Results

The participants belonged to an average age of 4.6±0.88 years with 54% of them being males and 46% females. Static norm was established from the average value of linear measurements recorded for facial and dental parameters (Table 2). Subjective evaluators categorised the children into attractive and unattractive group based on perception using Q-sort technique. The average values obtained signifies the static norm after which subjective evaluation was carried out by 3 groups of evaluators. The intra-class correlation coefficient values [ICC] of these evaluators were found within the range of good reliability [0.75-0.95] with Cosmetic Dentists having ICC being 0.89. All 3 Cosmetic Dentists gave same cut-off score [4.5] whereas it varied within the Photographers and Artists [mean cut-off score being 3.83 and 4.17 respectively].

On comparison of mean values of facial and dental parameters between unattractive and attractive groups using Mann Whitney Test, attractive group showed significantly decreased Facial height [p= 0.02], Anterior lower facial height [p=0.002], Bigonial width [p=0.04], smile index [p=0.002], buccal corridor ratio [p<0.001] but significantly increased maxillary incisor exposure [p value <0.001], Interlabial gap [p =0.002] and Visible maxillary dentition width [p= 0.002].

Table 2: Static norms and comparison between unattractive and attractive group pertaining to facial and dental components using Mann Whitney Test (in mm)

Components	Mean (static norm)	SD	Groups	N	Mean	SD	P-Value
Inter-Trichion-Nasion distance	53.6	7.9	Unattractive	58	54.1	8.4	0.98
			Attractive	42	52.8	7.2	
Facial height	89.6	8.6	Unattractive	58	91.5	9.0	0.02*
			Attractive	42	87.0	7.6	
Anterior upper facial height	49.5	4.5	Unattractive	58	49.7	4.6	0.48
			Attractive	42	49.2	4.5	
Anterior lower facial height	40.1	5.9	Unattractive	58	41.8	6.2	0.002*
			Attractive	42	37.8	4.5	
Upper facial width	79.8	7.6	Unattractive	58	81.0	7.8	0.19
			Attractive	42	78.3	7.2	
Mouth width	41.7	5.6	Unattractive	58	42.5	5.4	0.15
			Attractive	42	40.6	5.7	
Vermilion height	14.5	3.2	Unattractive	58	15.0	3.4	0.04*
			Attractive	42	13.8	2.6	
Bigonial width	97.3	9.5	Unattractive	58	98.6	9.5	0.04*
			Attractive	42	95.4	9.4	
Nasal depth	15.2	3.3	Unattractive	58	15.1	3.0	0.63
			Attractive	42	15.4	3.7	
Facial depth	89.2	15.3	Unattractive	58	89.7	14.9	0.8
			Attractive	42	88.5	15.9	
Maxillary incisor exposure	4.4	1.4	Unattractive	58	3.9	1.4	<0.001*
			Attractive	42	5.1	1.0	
Intercommisure width	52.3	6.2	Unattractive	58	52.0	6.3	0.5
			Attractive	42	52.8	6.2	
Interlabial gap	6.3	2.5	Unattractive	58	5.6	2.4	0.002*
			Attractive	42	7.2	2.3	
Smile index	9.87	4.51	Unattractive	58	11.17	5.15	0.002*
			Attractive	42	8.06	2.54	
Inner commissure width	41.9	6.0	Unattractive	58	41.1	6.2	0.16
			Attractive	42	43.0	5.7	
Visible maxillary dentition width	36.2	6.6	Unattractive	58	34.4	6.5	0.002*
			Attractive	42	38.7	6.0	
Buccal corridor ratio	13.99	7.10	Unattractive	58	16.71	7.27	<0.001*
			Attractive	42	10.24	4.83	

mm=millimetre, SD=standard deviation, N=frequency

On comparison of dental components significant difference was found between unattractive and attractive groups using Chi Square Test, in terms of 1st molar as the posterior maxillary tooth visible [p= 0.002], average anterior and posterior height of smile [p value <0.00, 0.03 respectively] in attractive group (Table 3).

4. Discussion

A person's smile is a strong determinant of facial attractiveness. Smile corrections, even in young children, may be fundamental in preventing bullying or teasing and preserving healthy psychological development. A detailed examination of smile characteristics is an essential part of treatment planning in restorative dentistry especially in anterior dentition where aesthetic demands are high. [11]

Harmonizing an esthetic smile, requires a perfect integration of facial and dental parameters. [4] The golden proportion has been used in dentistry in an attempt to improve facial function and possibly esthetics, by simplifying the diagnosis of facial and dental disharmony. But some studies demonstrated that the golden proportion is not a universal decisive factor to be considered for esthetic and pleasing smile and it is found to change with the growth of face. [12] It is also found to be inconsistent with relative tooth width in primary dentition. [13] These drawbacks have led us to choose and analyse common features of a posed smile and linear measurements of face among a sample of children with deciduous dentition.

The secondary objective of this study was to list the attractive and unattractive features in children by subjective

Table 3: Comparison between unattractive and attractive group pertaining to dental components using Chi-Square test

Components	Category	Total	%	Unattractive	%	Attractive	%	P-Value
Posterior Maxillary Tooth visible	Lateral Incisor	13	13.0%	11	19.0%	2	4.8%	0.002*
	Canine	46	46.0%	32	55.2%	14	33.3%	
	I Molar	39	39.0%	15	25.9%	24	57.1%	
	II Molar	2	2.0%	0	0.0%	2	4.8%	
Smile arc	Parallel	90	90.0%	52	89.7%	38	90.5%	0.89
	Not Available	10	10.0%	6	10.3%	4	9.5%	
Anterior height of smile	Low Smile	33	33.0%	29	50.0%	4	9.5%	<0.001*
	Average Smile	47	47.0%	20	34.5%	27	64.3%	
	High Smile	20	20.0%	9	15.5%	11	26.2%	
Posterior height of smile	Low Smile	61	61.0%	42	72.4%	19	45.2%	0.03*
	Average Smile	36	36.0%	14	24.1%	22	52.4%	
	High Smile	2	2.0%	1	1.7%	1	2.4%	
	Not Available	1	1.0%	1	1.7%	0	0.0%	

evaluation which was carried out by 9 selected panelists involving Artists, Photographers and Cosmetic Dentists. Image assessment was performed by adopting Q-sort technique where all images were scored within the sample of images by the evaluators. An average cut-off score [4.17] was obtained which delineated between unattractive and attractive group. Only a smaller number of images were considered attractive by cosmetic dentists suggesting their keenness to observe dento-labial esthetics whereas a large number of images were considered attractive by photographers and artists because they evaluate the attractiveness of a smile by considering the entire face. The ICC values suggested that all the three heterogenous groups of evaluators were reliable for the evaluation of smile esthetics with more consistent rating among Cosmetic Dentists. Hence, they are much more reliable in rating children into attractive and unattractive groups based on smile esthetics.

4.1. Inter- trichion nasion distance [upper facial height]

Appropriate hairstyle can mask deformities of the upper third of face yet it is important to record because its deformity might indicate a craniofacial syndrome. The mean upper facial height was found to be approximately 54mm whereas a slightly higher value [60.5mm] was found in an anthropometric study[14] conducted among 6-8 years old children. Despite considering longer forehead as modern facial proportions of beauty,[15] in the present study, it did not have any effect on smile esthetics.

4.2. Facial height

Increased facial height is seen in individuals with adenoid facies. In the present study, the norm established for facial height was found to be 90mm which was slightly higher than that given by Sforza[8] in children of the same age group

[77-85mm]. On subjective evaluation, the attractive children possessed significantly reduced facial height in comparison to children deemed unattractive and this was in accordance with the findings from an Italian study wherein attractive children in the 6–7-year-age group[8] showed statistically significant difference.

4.3. Anterior upper facial height

It signifies nasal length and Indian nose should be considered as a different entity in comparison to those of Caucasian, Oriental, and African populations.[16] The average value was found to be approximately 49mm in the present study whereas in a 3D facial morphometric study, it ranged between 36.7-40.4mm8 and an anthropometric study[17] on Romanian children showed values ranging from 31-43 mm. Thus, the variation in the average values can be attributed to difference in the ethnicity, as an average Indian exhibits increased nasal length.[16]

4.4. Anterior lower facial height

According to Mack et al, the lower 1/3 of the face significantly influences the facial appearance[18] with immense contribution of the lips and the chin.[19] In the present study, the static norm obtained was 40mm and this was similar to the findings by Sforza.[6] We observed that attractive children possessed significantly lesser lower facial height than unattractive group and this is in agreement with findings among Italian attractive children.[6]

4.5. Upper facial width & mouth width

Pathologically, increased intercanthal distance is due to telecanthus and orbital hypertelorism. We obtained the static norm as 80mm, similar to a study,[8] in which the values ranged between 81-86mm among preschoolers. The average mouth width was found to be 42mm whereas Sforza et al[8] found slightly lesser average value among 4-5 years age

group of children.

4.6. Vermilion height

The lips form a transition zone between the facial skin and the oral mucosa contributing in phonation and providing anterior oral seal while swallowing. The average vermilion height was found to be 14.5mm and similar value has been expressed among children.[8] In attractive children, it was found to be significantly decreased in contrast to Sforza's findings of increased vermilion height. This difference may be due to our use of smile images for subjective evaluation showing lip activity. Thus, our study revealed that in Indian children, attractive lips were those which were thin, having average width, with reduced vertical height

4.7. Bigonial width [lower facial width]

The average bigonial width was found to be 97mm and this value was closer to that of an anthropometric study on children.[17] Boboc[20] noted a lower value among Romanian children whereas higher value was observed among Turkish adults.[21] In the present study, attractive group was found to have significantly decreased inter-gonial width which contradicts with studies performed on Italian children and adolescents.[8,22] This is due to the fact that the subjects with increased upper facial width will show increased bigonial width however in our study attractive children had decreased upper facial width resulting in a decreased gonial width.

4.8. Nasal depth

Nose is the most prominent structure in the profile of face. But nasal depth has not been studied in young children and we obtained its average value as 15mm. Among adults, males have greater nasal depths measuring 30mm. This could be because nose continues to grow downward and forward till growth ceases and as age increases the nasal volume also increases resulting in increased nasal length, nasal width and nasal depth.

4.9. Facial depth

The mean facial depth was found to be 89mm, equivalent to that given by Sforza[8] in children with deciduous dentition. But an anthropometrical analysis in children[17] and a photogrammetry study among adults showed much higher values to that of what we obtained.

Facial parameters like anterior upper facial height, upper facial width, mouth width, nasal depth and facial depth did not contribute much to attractiveness in healthy children.

4.10. Maxillary incisor exposure [MIE]

In the present study, the mean value of MIE was found to be 4.4mm suggesting that most children exposed more than $3/4^{th}$ of clinical crown height during smiling. Attractive group displayed significantly higher MIE due to their decreased vermilion height, which directly influences dental exposure as stated by Bernal et al.[23] Lower MIE, which is related to low smile line was considered as an unattractive feature on subjective evaluation. Thus, MIE should be set to approximately 5mm during smiling during restorative and prosthetic treatment.

4.11. Smile arc

The parallelism of internal lower lip curvature and upper incisal curvature is a determinant of harmonious smile in adults. The present study showed parallel arc (Figure 2) in 90% of the subjects with no findings of flat or inverted arc and this is contradicted by a study[23] in which some children displayed flat and inverted smile arc, which could be due to attrition of canines or lack of incisor eruption. But our study included only those subjects having complete primary teeth with no attrition. Predominance of parallel smile arc is also observed in adults but Maulik and Nanda[24] found flat smile predominance, mostly in those who have undergone orthodontic treatment. Children rarely undergo orthodontic treatment and the subjects in our study did not have any sort of dental history, hence all of them exhibited parallel smile arc. In 10% of children, smile arc was not available as the incisal edges were covered by lower lip. We did not observe any significant difference between attractive and unattractive group as majority of children showed parallel smile arc as a common trait suggesting its incorporation during restorative and prosthetic treatment.

4.12. Posterior maxillary tooth visible

A tooth was counted as visible when more than 50% of its surface was revealed.[3] The present study revealed that the most posterior visible maxillary tooth was canine followed by 1st molar and lateral incisor. No literature is available on this parameter in case of deciduous dentition, whereas in permanent dentition Maulik and Nanda[24] observed 2nd premolar and Khan et al[11] observed 1st premolar as the most posterior visible tooth. The visibility of 1st primary molar as the posterior most tooth was found to be statistically significant in attractive group and the smile was found to be unattractive if it ends in canine, which we obtained as a static norm. Thus attractiveness of posterior visible tooth is correlated to increased visibility of maxillary dentition. Hence, unesthetic components like clasps, stainless steel crowns etc should be avoided in this esthetic zone which extends from 1st primary molar on one side to the other side. Also 1st primary molars can be arranged as the most posterior maxillary tooth visible in children requiring complete denture.

4.13. Smile index [SI]

Smile index (Figure 2) is used to compare pre- and post-treatment smiles as well as smile esthetics among different individuals and it varies in posed and unposed smiles due to soft tissue movements. A large smile index indicates a large outer commissural width and/or a small inter-labial gap displaying a limited smile area. In the current study, the average smile index was found to be 9.87 whereas Bernal et al[23] found SI of 6.63 among Italian children. The variation in the value was because most children in our study showed decreased interlabial gap which consequently increased the smile index. We observed significantly decreased SI in attractive group and according to Ackermann[25] as a person ages, the smile index significantly increases. On the contrary, Wang et al[3] found significantly increased SI in attractive group whereas Ahrari et al[26] suggested that SI was not an influential variable in smile attractiveness of orthodontically treated patients. The conflicting result might be due to the difference in age, interlabial gap, upper lip thickness, maxillary incisor exposure and the type of smile and dentition.

4.14. Buccal corridor ratio

Different methods exist to measure buccal corridor ratio among which we followed the method described by Moore et al.[27] The buccal corridor was categorised as medium-narrow (28% buccal corridor), medium(15%), medium-broad(10%) and broad smile fullness(2%).[27] We obtained an average of 14% buccal corridor (Figure 2) for the entire sample suggestive of medium smile fullness. As per our knowledge, no norms for buccal corridor ratio exists for deciduous dentition, other than posterior buccal corridor space described by Bernal et al[23] who suggested that the values increased with further development of dentition. In the present study, attractive group showed increased visible maxillary dentition width which influences the buccal corridor ratio resulting in medium-broad smile fullness. This indicates that the selected panelists in our study prefer smiles that are visibly filled with teeth between both the commissures. Numerous literatures are in accordance to our finding that a minimal buccal corridor is preferred esthetically, and large buccal corridor is considered as an undesirable trait.[28,29] We observed that this parameter is effective in the selection of attractive and unattractive images in full-face view and hence contradicts the statement that the buccal corridor has no effect on the esthetic evaluations of smiles.[7] Thus increasing the dentition width will minimise the buccal corridor ratio and enhance esthetics during restorative and prosthetic rehabilitation.

4.15. Anterior height of smile

It is the extent of vertical tooth display during smiling. In the present study, average smile was predominant
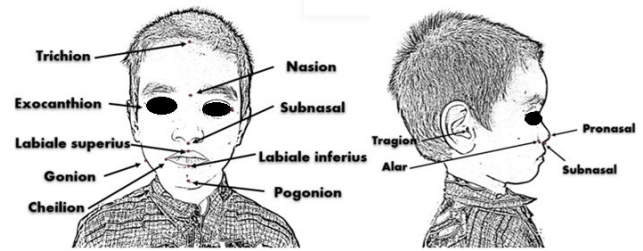

Fig. 1: Landmarks used in frontal and lateral view

in children followed by high smile and low smile. Disagreement with our finding, was noticed in a study by Bernal et al[23] where high smile was predominant in children but this study had only 29 participants with deciduous dentition. Thus, our research contradicts a common statement that "kids show more teeth at rest and more gum at smile than adults". Average smile was found to be attractive and low smile was found to be unattractive with statistically significant difference between them. Though there are no comparable studies in children, our finding is similar to those observed in adults in whom average smile is attractive.[3] This parameter is inter-related to the lip thickness, MIE, facial height and its knowledge is very essential in rehabilitation of anterior teeth. Thus, in children who have increased or decreased facial height who normally possess gummy smile or low smile respectively, clinical crown height can be altered by arranging teeth gingivally or incisally in order to obtain an average smile (Figure 2).
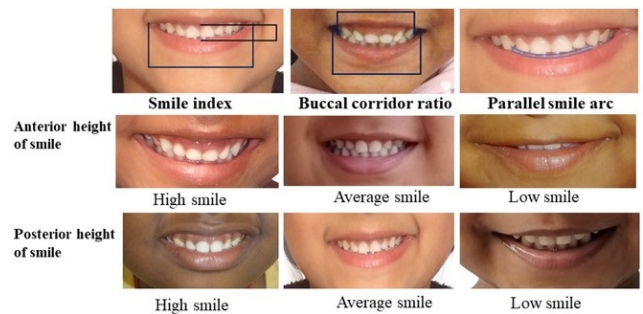

Fig. 2: Dental components assessed from smile images

4.16. Posterior height of the smile

It was first assessed by Maulik and Nanda[24] and it is entered as high, average or low smile in relation to maxillary 1st premolar. Since a higher percentage of smiles in children have canine as the most posterior teeth and no comparable study exists in case of deciduous dentition, we recorded the posterior height of smile in relation to the most maxillary posterior tooth visible. In the present study, low smile was predominant in comparison to average smile, and high smile was least observed. If patients have reverse or flat smile

arcs, they will most likely show more posterior gingiva on smiling.[30] Since 90% of subjects in this study had parallel arc, the chances of finding high posterior smile height are even lesser. It was observed that low posterior smile, which was seen predominantly among the subjects, was categorised as unattractive whereas attractive children possessed average posterior height of smile. Our finding is supported by Wang et al.,[3] who established a correlation between position of the posterior gingival margin and smile esthetics (Figure 2).

Therefore, to improve smile esthetics as a whole, clinicians should pay close attention to face-lip-teeth-gingiva and its relationship to maxillary anterior as well as posterior region during treatment.

5. Conclusion

Smiling is one of the most critical facial expression and is known as a non-verbal parameter of correspondence. Creating an aesthetically pleasing smile requires the integration of facial and dental components. So far, there are no available data that includes evaluation of both dental and facial parameters in children with deciduous dentition. Within the limitations of our study, we derived static norms and established certain criteria which must be taken into consideration during smile designing in pediatric dentistry.

Based on our findings, the following conclusions were drawn;

1. The value of static norms obtained in children with primary dentition were lesser than that of adults.
2. Artists, Photographers and Cosmetic Dentists can be relied on for subjective evaluation of smile and Cosmetic Dentists provided a more consistent opinion.
3. Attractive children presented facial and dental parameters variable from normative values.
4. Attractive children were those with decreased facial height, anterior lower facial height, vermilion height and bigonial width. Overall, they possessed smaller faces in comparison to children deemed unattractive.
5. Attractive children also displayed decreased smile index and buccal corridor ratio along with parallel smile arc and more than $3/4^{th}$ of crown height visibility during smiling.

Appreciation of what society considers acceptable and aesthetically pleasing is crucial for a successful outcome of prosthetic and restorative treatment. But further detailed research on each parameter and also on correlation between dental and facial parameters are required. Strict adherence to esthetic criteria may lead to functional failure, thus each case must be assessed individually along with the consideration of the preferences of the patient to obtain adequate results in oral rehabilitation.

6. Source of Funding

None.

7. Conflict of Interest

None.

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