Dentistry Section

Assessment of Tooth Shade in Primary Dentition among Indian Paediatric Population and its Association with Skin, Lip and Gingival Colour: An Observational Study

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ABSTRACT

Introduction: Assessment of dental aesthetics is a complex procedure because a large number of factors can contribute to aesthetic perceptions. These factors include hard tissue characteristics such as tooth colour, shape and alignment, and soft tissue considerations like gingival colour, skin complexion and lip shade. Studies have not been reported evaluating harmony between primary tooth shades related to soft tissue characteristics in children.

Aim: To determine the shade of primary teeth and associate it with skin, lip and gingival colour among Indian paediatric population.

Materials and Methods: Among 318 consented children, after collecting the demographic information, clinical examination was conducted independently by three calibrated examiners for tooth shade, skin, lip and gingival colour using standard protocol. The collected data were statistically analysed using Pearson correlation and chi-square test.

Results: Tooth shade of primary central incisors among half of the study subjects did not match with any of the shades of Vitapan classical shade guide (n=152, 47.79%). A1 (Vitapan classical) was the most commonly observed shade among primary incisors (n=135, 42.45%). Intra and inter arch primary tooth shade variation was not observed (p<0.001). A statistically insignificant negative correlation was observed when primary tooth shade was correlated with skin and lip colour (p=0.11), and a positive correlation with gingival colour (p=0.71).

Conclusion: It was found that the shade of primary dentition among half of the children did not match with any of the shades in the Vitapan classical shade guide and there is a need for a new shade guide for primary dentition which can be used effectively and efficiently for clinical purposes.

INTRODUCTION

A smile is the most perceptible record of a Dentist's care [1]. Child's aesthetics is the guide to adult aesthetics. There are two types of caries that is early childhood and rampant caries which rapidly destroy coronal tissue specially the surfaces that are normally immune to decay leading to early loss of tooth structure [2]. Aesthetic problems in childhood can have a significant influence on psychological development and interaction with peers [3,4].

Assessment of dental aesthetics is a complex procedure because a large number of factors can contribute to aesthetic perceptions [5]. These factors include hard tissue characteristics such as tooth colour, shape and alignment, and soft tissue considerations like gingival colour, skin complexion, lip shade and facial expressions [5]. Selection of colour of teeth for aesthetic reconstruction when all records of form, colour and size have been lost requires knowledge and understanding of a number of physical and biological factors directly related to the patient [1]. Few attempts have been made to evaluate the harmony between tooth shade, skin colour and facial attractiveness in adults with permanent dentition [1,6,7]. However, studies have not been reported evaluating harmony between primary tooth shades related to soft tissue characteristics in children. Hence the aim of the present study was to determine the shade for primary teeth and to find its association with skin, gingiva and lip colour among Indian paediatric population.

MATERIALS AND METHODS

This was a descriptive cross-sectional study. Ethical clearance was obtained from the Institutional Ethical Committee (Ethical Reg

No.JSSDCH/Ethical/13/2016-17). Present Study was conducted at JSS Dental College and Hospital, Mysore between the time period of January 2017 to June 2017. All information about the study subjects and their identity was anonymous. After giving written information regarding the nature of the study, permission was obtained from concerned school authorities. Participants and parents were explained about the nature of the study and written informed consent was obtained from parents. They were informed to withdraw from the study at any point of time during the observational trial.

Study Area and Subject Selection

Subjects for the present study were selected from pre-primary schools, a total of 2457 children aged between 3.5-5.5 years were screened for inclusion criteria. Systemically healthy, cooperative children of both the genders with completely erupted, intact anterior teeth free of restorations, malformations, defects, and discolourations were included in the study. Children with traumatic injuries to the upper anterior teeth, white spot lesions and those with poor oral hygiene were excluded from the study. Following preliminary screening, a total of 318 children were included in the study after obtaining consent from the parents. Demographic information of children was collected from the school records. Clinical examination was conducted independently by three trained and calibrated examiners. Before final round of examination, a pilot study was conducted on randomly selected sample of 50 children, all the examiners inspected two times with a gap of 15 days to find out the intra-examiner reproducibility.

Tooth shade selection was done in an open natural daylight against a greyish background at a close point with patient seated on an upright sitting chair with mouth at clinician's eye level using Vita Classic guide tab. Shade tab was positioned adjacent to the middle one third of the facial surface of maxillary central incisors. Shade tabs were rapidly scrutinised from the darker shades by the procedure of elimination to find out the best possible match in a time frame of 10 seconds [1]. Shade readings were made at the starting of the procedure to overcome the effects of dehydration, fatigue and tiring of the operator. Skin colour was identified in three locations: 1) Forehead 5 mm above nasal bridge; 2) Right ear lobe; and 3) The junction between ala tragus line-vertical lines from outer canthus in left malar area to overcome the variation due to mild skin inflammations and sun burn [8]. Skin colour was assessed by Lakme shade guide and has been divided into light, medium and dark complexion [6]. In cases where we found difference in skin shade or in case of confusion darker shade was selected [9].

Lip and gingival colour was assessed based on pigmentation. Lip colour has been classified into pale pink, pink, reddish pink, brownish pink and brown and gingival colour into pale pink, pink, brownish pink and brown [7]. All the three examiners conducted the study in a similar way so as to evaluate the inter-examiner variability. In case of confusion, re-examination was done and decision was made.

STATISTICAL ANALYSIS

The SPSS version 23.0 statistical package (SPSS Inc., Chicago, IL, USA) was used for the general descriptive analysis of the sample and for evaluation of each of the variables. The Pearson correlation test was to correlate independent variables. Chi-square test was applied for comparing the distributions of the categorical variables and treatment groups. Statistical significance was considered for $p < 0.05$.

RESULTS

The present observational trial comprised of a total of 318 children (n=149, 46.9% males and n=169, 53.1% females) between the age 3.5-5.5 years (n= 216, 67.9% 4-year-old and n=102, 32.1% 5-year-old). Inter-examiner reliability for assessing primary dentition tooth shade was assessed using kappa coefficient which was found to be 0.87. The results showed that shade of primary dentition among half of the study subjects did not match with any of the shades in the Vitapan classical shade guide (n=152, 47.79%). A1 (Vitapan classical) was the most commonly observed shade among primary incisors, canines and molars of both the arches followed by A2 and C1 [Table/Fig-1,2]. The predominant skin colour among children observed was medium (n=240, 75.5%), lip colour was brownish pink (n=102, 32.1%) and gingival colour was brownish pink (n=180, 56.6%) [Table/Fig-3].

Shade	Maxillary incisor	Percentage	Maxillary canine	Percentage	Maxillary molar	Percentage
A1	135	42.45%	141	44.33%	138	43.39%
A2	12	3.77%	9	2.83%	8	2.51%
B1	9	2.83%	7	2.20%	3	0.94%
C1	10	3.14%	6	1.88%	5	1.57%
Not able to match	152	47.79%	155	48.74%	164	51.57%

[Table/Fig-1]: Shade distribution among maxillary primary incisors, canine and molars.

Intra arch correlation of tooth shades for incisors, canines and molars in both upper and lower arches using Pearson's correlation showed statistically significant positive correlation ($p < 0.001$) that indicates no variation in tooth shades [Table/Fig-4].

Since inter arch correlation showed no variation in primary tooth shade, incisors are taken for inter arch correlation of primary tooth

Shade	Mandibular incisor	Percentage	Mandibular canine	Percentage	Mandibular molar	Percentage
A1	120	37.73%	126	39.62%	129	40.56%
A2	10	3.14%	10	3.14%	10	3.14%
B1	8	2.51%	4	1.25%	8	2.51%
C1	12	3.77%	7	2.20%	6	1.88%
Not able to match	168	52.83%	171	53.77%	165	51.88%

[Table/Fig-2]: Shade distribution among mandibular primary incisors, canine and molars.

Colour	Frequency	Percentage (%)
Skin colour		
Fair	63	19.8
Medium	240	75.5
Dark	15	4.7
Lip colour		
Pale pink	81	25.5
Pink	63	19.8
Reddish pink	6	1.9
Brownish pink	102	32.1
Brown	66	20.8
Gingival colour		
Pale pink	78	24.5
Pink	30	9.4
Brownish pink	180	56.6
Brown	30	9.4

[Table/Fig-3]: Distribution of skin, lip and gingival colour among children.

Tooth	Correlation	p-value
Maxillary arch		
Incisor to canine	0.88	<0.001
Canine to molar	0.98	<0.001
Incisor to molar	0.94	<0.001
Mandibular arch		
Incisor to canine	0.88	<0.001
Canine to molar	0.98	<0.001
Incisor to molar	0.90	<0.001

[Table/Fig-4]: Intra arch comparison of different tooth shades.

shade and it showed statistically significant positive correlation ($p < 0.001$) [Table/Fig-5].

Tooth shade	Correlation	p-value
Maxillary to mandibular arch	0.79	<0.001

[Table/Fig-5]: Inter arch comparison of different tooth shades.

Correlation of primary tooth shade with gender showed statistically non-significant association (p=0.31) [Table/Fig-6].

Tooth shade	Correlation	p-value
Tooth shade to gender	0.057	0.31

[Table/Fig-6]: Comparison of tooth shade to gender.

A negative correlation was observed when primary tooth shade was correlated with skin and lip colour of children however, it was found to be statistically non-significant (p=0.11). When tooth shade was compared to gingival colour, a statistically non-significant positive correlation was observed (p=0.71). This indicates in children, shade of the primary teeth cannot be related to skin, lip and gingival colour [Table/Fig-7].

Parameters	Correlation	p-value
Tooth shade to skin colour	-0.89	0.11
Tooth shade to lip colour	-0.09	0.11
Tooth shade to gingival colour	0.02	0.71
[Table/Fig-7]: Comparison of tooth shade to different parameters.		

DISCUSSION

In literature, studies have not been reported evaluating harmony between primary tooth shades related to soft tissue characteristics in children. Therefore, present study was designed with an aim to determine the shade for primary teeth and associate it with skin, lip and gingival colour among Indian children.

Accurate identification of shade is critical in the success of dental treatment [10]. Shade match is a complex phenomenon which encompasses both subjective and objective characteristics [1]. Various dental shade systems are available for the purpose of shade matching which includes the shade guide, shadepilot, digital camera, RGB devices-shade scan, spectrophotometry-Vita Easy shade, colourimeter-Shade Vision for dental shade matching [11,12]. Of these many methods seem to be more expensive and also host some difficulty regarding the standardisation.

Even though, Vitapan classical shade guide is not considered as a suitable shade guide for primary teeth, in present study Vitapan was used as there is no specific shade guide available for primary teeth. Vitapan shade guide is the most commonly used shade tab for determination of tooth shade by the clinicians. It is considered as a 'gold standard in dentistry because it is simple to use, easily accessible and gives reliable results [13-16].

The present study results show that shade of primary dentition among half of the study subjects did not match with any of the shades in the Vitapan classical shade guide. This finding is in contradiction with the findings observed by Paravina RD et al., Kim J et al., and Chenchugopal M et al., [15,17,18]. The reason might be, in the present study, we used only one type of shade matching system and we tried to record the exact shade of tooth and not the closest matching shade.

A1 was the most commonly observed shade among primary dentition which is in accordance with studies by Kim J et al., and Chenchugopal M et al., [17,18]. The prevalence of A1 shade in present study was found 42.45% which is in accordance with the study by Chenchugopal M et al., (40.15%) and in both the studies the study population is Indian [18]. However, study by Kim J et al., reported higher prevalence of A1 shade (82%) compared to present study [17]. The reason might be a different population (US) and studies have proven that there are racial variations in the prevalence of tooth shade. A comparison of four shades from four different shade guides with primary teeth colour of African American, Caucasian, and Hispanic children has revealed significant differences among the shades of teeth among different ethnic groups [19,20]. Hosoya Y, evaluated the colour of primary anterior teeth of 60 Japanese children via various measuring devices and found them to be very light [21].

The present study results showed statistically non-significant variation between primary tooth shades compared to the gender. In contradiction a study by Labban N et al., reported age and gender influence on permanent tooth shade among Saudi Population [22].

In present study, between incisor, canine and molars no statistically significant variation of tooth shade was observed in both upper and lower arches. This results show that in present scenario of absence of specific shade guide available for primary teeth, we can use any of non-carious primary tooth which will be present in the child's mouth as a shade indicator for clinical shade evaluation purpose. Lee YK et al., reported that, in permanent teeth the colour for missing teeth, especially for maxillary central incisor and maxillary and mandibular canines, could be estimated based on those of the same type teeth in the opposing arch which can be applied for clinical colour selection for missing teeth [23].

Studies conducted in adult population have reported a statistically significant negative correlation between skin colour and permanent tooth shade [1,6,7]. In accordance the present study results also showed negative correlation between primary tooth shade to skin and lip colour which was statistically non-significant. When tooth shade was compared with gingival colour, a positive correlation was observed which was statistically non-significant. The association of tooth shade to skin colour, lip colour and gingival colour has not been reported in paediatric population in literature.

LIMITATION

The limitation of the present study was that we have evaluated the tooth shade with only one system of shade guide.

CONCLUSION

It was found that the shade of primary dentition among half of the children did not match with any of the shades in the Vitapan classical shade guide and there is a need for a new shade guide for primary dentition which can be used effectively and efficiently for clinical purposes. Shade variation was not observed between primary anterior and posterior teeth and between the maxillary and mandibular teeth. While restoring grossly destructed maxillary incisors in children with Early Childhood Caries (ECC), shade of mandibular anteriors can be considered as guide for shade selection. As primary tooth shade is negatively correlated with skin colour, in children with darker complexion, lighter tooth shade can be considered and vice-versa.

ACKNOWLEDGEMENTS

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FINANCIAL OR OTHER COMPETING INTERESTS: None.