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RESEARCH ARTICLE

PERCEPTION OF BUCCAL CORRIDOR SPACE ON SMILE ESTHETICS

Shraddha Gupta[1], Pradeep Tandon[2], Dipti Shastri[3], Alka Singh[4] and Gulshan K. Singh[5]

1. Junior Resident, Department of Orthodontics and Dentofacial Orthopaedics, Faculty of Dental Sciences, King George's Medical University, Lucknow, Uttar Pradesh.
2. Professor, Department of Orthodontics and Dentofacial Orthopaedics, Faculty of Dental Sciences, King George's Medical University, Lucknow, Uttar Pradesh, India.
3. Professor J Grade, Department of Orthodontics and Dentofacial Orthopaedics, Faculty of Dental Sciences.
4. Professor, Department of Orthodontics and Dentofacial Orthopaedics, Faculty of Dental Sciences, King George's Medical University, Lucknow, Uttar Pradesh, India.
5. Professor & Head, Department of Orthodontics and Dentofacial Orthopaedics, Faculty of Dental Sciences, King George's Medical University, Lucknow, Uttar Pradesh, India.

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Abstract

Objective: To evaluate the perception of Buccal corridor space on smile esthetics by different age groups.

Materials and Methods: One frontal digital photograph of both the gender displaying the left first molar to right first molar was taken. The buccal corridor was modified digitally in increments of 5%, from 0% to 25% compared with the inner commissural width. After that six photographs for each gender were obtained with decreasing width of the dental arch and increasing width of the buccal corridor. Using the Visual Analog Scale, the altered photographs were evaluated by different groups of 180 persons according to age: Group I- Adolescent (10-19 years), Group II-Young adults (18-35years), and Group III-Middle aged group (36 to 55 years) and each group consists of 60 persons. Each subject of the group was asked to score the attractiveness of each smile in different gender on the basis of mobbed Buccal corridor space.

Results: Significant difference was obtained in finding the effect of the buccal corridor on smile attractiveness between males and female by all the other groups.

Conclusion: The hypothesis was rejected. All three Groups preferred narrow buccal corridors in comparison to the broad buccal corridor in males and females, especially by Group I and Group II subjects.

Introduction:-

The quest for improved dentofacial aesthetics continues to emerge in the present modern society. Thus, with the increasing influence of beautiful faces and attractive smiles the major rationale for seeking orthodontic treatment emerged to be enhanced smile aesthetics along with improved dentofacial features.Thus, understanding the importance of the biological factors influencing the smile esthetics[1] and managing the balance between the hard and overlying soft tissue is of utmost importance to superintend the esthetic outcomes of orthodontic treatment.[2]

Corresponding Author:-Dr Dipti Shastri (drdiptishastri@gmail.com)
Address:- Professor (J) Grade, Department of Orthodontics and Dentofacial Orthopaedics, Faculty of Dental Sciences, King George's Medical University, Lucknow, Uttar Pradesh, India.

Various key components of smile esthetics have surfaced for analysis and design after the upsurge of the soft tissue paradigm in clinical orthodontics[3].The elements having received great clinical significance include the display zone of the smile determined by lip thickness, inter-commissural width, interlabial gap, smile index, gingival architecture, upper lip, smile arc, buccal corridor, and various dental and gingival components4. Among these, lateral negative spaces, otherwise known as buccal corridor space, are considered to be of high significance.

Frushand Fisher[5]defined the buccal corridor as the spaces between the facial surfaces of the posterior teeth and the corners of the lips when the patient is smiling.In other words, a smile typically includes not only the 6 anterior teeth but also the first premolars.The importance of buccal corridor space for the fabrication of life-like dentures and presence or absenceof these buccal corridors is considered to be an important aspect for the evaluation of smile analysis.Absence buccal corridor space gives an unnatural look to the smile while an excessive buccal corridor looks unaesthetic, so esthetics concern about beauty or for the appreciation of beauty buccal corridor plays a critical role. It can be defined both objectively and subjectively and hence the perception of esthetics varies from person to person.It is influenced by personal experiences and social environments[6,7], genders[8], or the age[9] of the observer. In this context, Several studies have compared the perception of smile esthetics among laypeople with different professional backgrounds[4], general dentists[5,6,7,8,9], and orthodontists[10,11,12] because the observer´s knowledge and experience is one of the most influential factors.In the literature, lots of studies agreed that observer has received more especial training to perceive the sensitivity of his/her smile esthetics.Again apart from above factors, age is dyanamic factor in the perception of smile esthetics so age related smile irregularities such as gingival smiles and black triangles are perceived differently by laypersons of different age groups[10].

To date, very few reports have evaluated the effects of buccal corridors on smile esthetics as perceived by different age groups. Thus, we evaluated the buccal corridor in nearly ideal male and female smile photographs with different buccal corridor values by showing the photographs to different age groups.

Materials & Methods:-

This study includesa sample of only one male and one female person with an attractive smile and evaluators groups of different age groups.For the sample, only one male and one female were taken having attractive smiles according to the principles of the ideal smile given in the literature[11].They were selected from among the students of Medical University. A frontal close-up smile of selected persons wasobtained, displaying left first molar to the right first molar to show only the lips, nasal tip, and mento labial fold to reduce distractions.The smile was taken to be apparently bilaterally symmetrical having a nearly optimal arrangement of teeth and the lower lip line was following the curvature of the occlusal arch form, from canine to canine.

The obtained photographic image will be cropped in Photoshop (version CS5; Adobe Systems,San Jose, Calif), and altered intentionally to produce the desired smile with specific manipulations.The buccal corridor was calculated as the difference between the visible maxillary dentition width and the inner commissural width divided by the inner commissural width and the ratio was reported as a percentage. If the width of the dental arch increased, the buccal corridor would decrease, and it would result in broad smiles and vice versa. Buccal corridor of the smile photographs of male and female were modified digitally in increments of 5%, ranging from 0% to 25% compared with the inner commissural width.Total six photographs for each gender weregenerated with decreasing width of the dental arch and increasing width of the buccal corridor[9]. As the amount of buccal corridor increases the dental arch width decreases. These obtained six photographs were arranged in the order of increasing buccal corridor space on a PowerPoint presentation (Figure 1 & Figure 2).

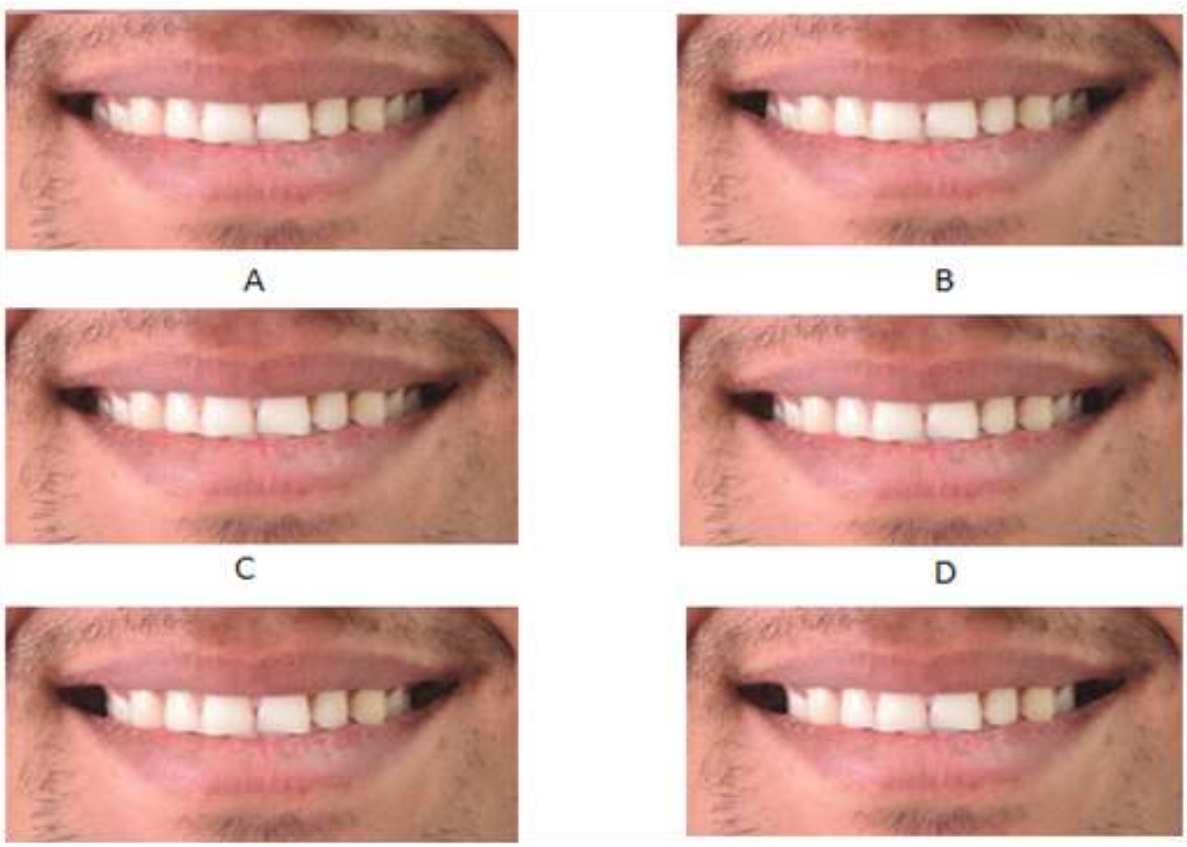

Figure 1:- Buccal corridor smile photographs of the male were modified digitally in increments of 5%, ranging from 0% to 25% compared with the inner commissural width

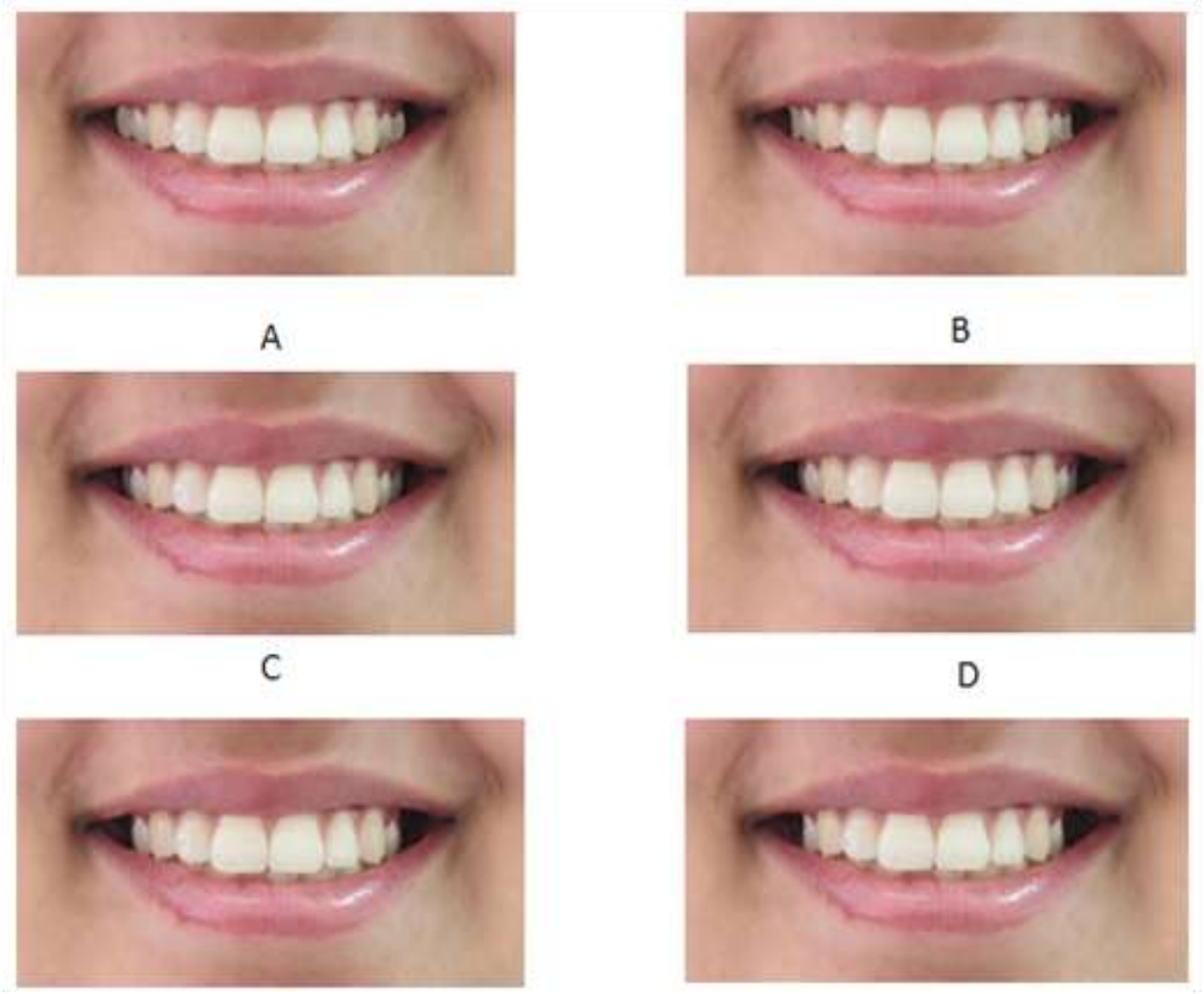

Figure 2:- Buccal corridor smile photographs of the female were modified digitally in increments of 5%, ranging from 0% to 25% compared with the inner commissural width.

Evaluators

These digitally altered photographs of smiles of both males and female were made to be evaluated by 180 Indian population.The evaluators had intermediate–level qualifications and a complete or incomplete college degree.The evaluators selected from among the patients' attendants and the workers of the Medical University. The sample was divided into three groups according to age: Group I-Adolescent(10-19years), Group II-Young adults(18-35years), and Group III-Middle-aged group (36-55 years).[12]Digitally altered photographs were shown to each group and the attractiveness of each smile in different gender ranked least attractive to most attractive with the use of Visual analogue scale. Altered photographs were evaluated twice by different groups for reliability and obtained data were analyzed statistically to compare the score given to different smiles by different age groups.

Results:-

The proportion of votes for the best and worst smile to each buccal corridor space in all three groups for the male and female samples was shown in Figures 3 and 4. The Chi-square test showed highly significant differences in the median votes for all three groups (Table 1 and Table 2). For the best male and female smile photograph, Group I,II, and III voted maximum for photographs A and C and minimum for E and F showing a preference for narrower buccal corridors where the adolescents(Group I) preferred the narrowest Buccal corridor in both and adults (Group II) preferred moderate buccal corridor.The worst voted male and female smile photograph was found to be F for all the three groups showing the least preference for the broad buccal corridor.No significant difference was seen in the

effects of buccal corridors on the smile attractiveness between the male and female raters for the Groups I, II, and III.

Table 1:- Association of Age Group with Opinion about Buccal Corridor Quality (BCQ) in Males.

Type		**A**	**B**	**C**	**D**	**E**	**F**	chi sq	p-value
Best in Male									
Group I	No.	20	10	14	10	2	4	34.628	<0.001
	%	33.3%	16.7%	23.3%	16.7%	3.3%	6.7%		
Group II	No.	18	18	20	1	0	4		
	%	29.5%	29.5%	32.8%	1.6%	.0%	6.6%		
Group III	No.	15	11	17	3	13	2		
	%	24.6%	18.0%	27.9%	4.9%	21.3%	3.3%		
Total	No.	53	39	51	14	15	10		
	%	29.1%	21.4%	28.0%	7.7%	8.2%	5.5%		
Worst in Male								chi sq	p-value
Group I	No.	9	2	3	3	18	25	27.555	0.002
	%	15.0%	3.3%	5.0%	5.0%	30.0%	41.7%		
Group II	No.	2	3	5	4	20	27		
	%	3.3%	4.9%	8.2%	6.6%	32.8%	44.3%		
Group III	No.	4	15	3	5	8	26		
	%	6.6%	24.6%	4.9%	8.2%	13.1%	42.6%		
Total	No.	15	20	11	12	46	78		
	%	8.2%	11.0%	6.0%	6.6%	25.3%	42.9%		

Table 2:- Association of Age Group with Opinion about Buccal Corridor Quality (BCQ) in Females.

Type		**A**	**B**	**C**	**D**	**E**	**F**	chi sq	p-value
Best in Female									
Group I	No.	17	11	22	7	2	1	10.973	0.360
	%	28.3%	18.3%	36.7%	11.7%	3.3%	1.7%		
Group II	No.	15	10	24	6	5	1		
	%	24.6%	16.4%	39.3%	9.8%	8.2%	1.6%		
Group III	No.	12	15	14	13	4	3		
	%	19.7%	24.6%	23.0%	21.3%	6.6%	4.9%		
Total	No.	44	36	60	26	11	5		
	%	24.2%	19.8%	33.0%	14.3%	6.0%	2.7%		
Worst in Female									
Group I	No.	3	4	1	5	6	41	27.597	0.002
	%	5.0%	6.7%	1.7%	8.3%	10.0%	68.3%		
Group II	No.	2	1	0	12	10	36		
	%	3.3%	1.6%	.0%	19.7%	16.4%	59.0%		
Group III	No.	12	3	4	11	9	22		
	%	19.7%	4.9%	6.6%	18.0%	14.8%	36.1%		
Total	No.	17	8	5	28	25	99		
	%	9.3%	4.4%	2.7%	15.4%	13.7%	54.4%		

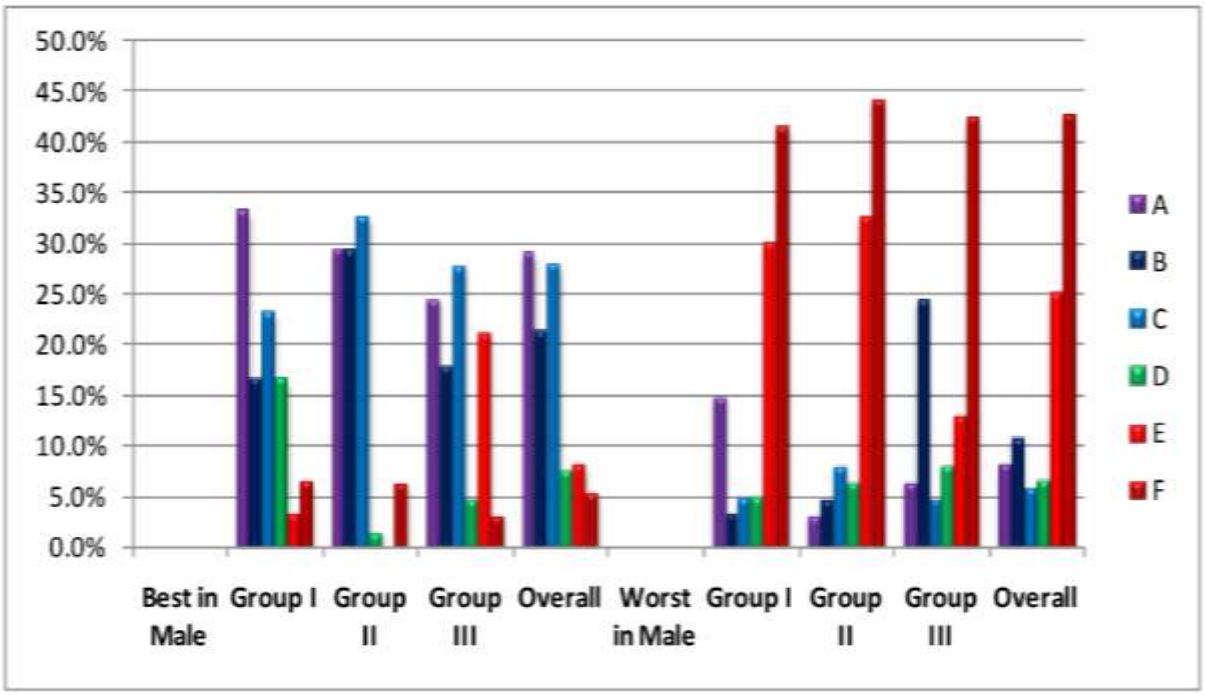

Figure 3:- Association of Age Group with Opinion about Buccal Corridor Quality (BCQ) in Males.

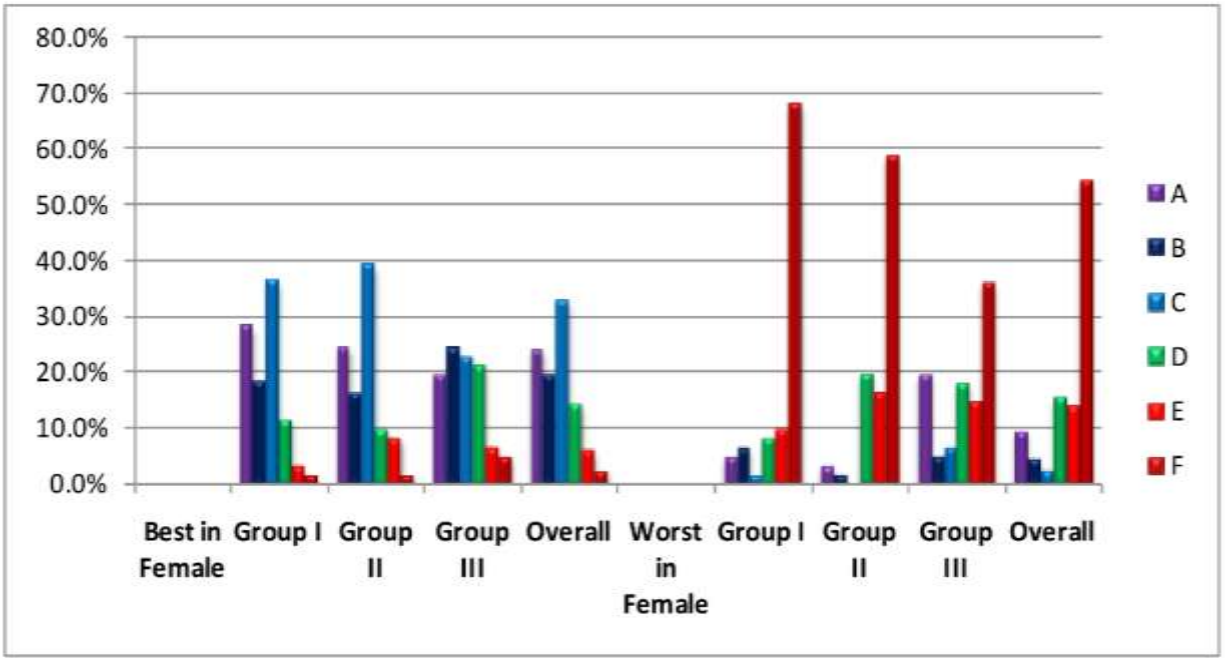

Figure 4:- Association of Age Group with Opinion about Buccal Corridor Quality (BCQ) in Females.

Discussion:-

In recent times, there has been an exponential increase in the number of adult patients receiving orthodontic treatment due to awareness of aesthetics and/or increased demand for aesthetics,average life expectancy, and annual income.Usually orthodontics deals with adolescent patients, but now extended its horizon to adult patients[13], so adult patients" has been gradually changing to include middle-aged or old adult patients[14].Thus, it would be essential to evaluate the influence of some factors, like age, sex, and area of living along with individual perceptions toward orthodontic treatment and different esthetics parameters[15].

Till date, there has been enough literature of various factors that affectthe areas of smile aesthetics have been evaluated but very less studies mentioned that relate age to the perception of smile attractiveness. Thus, in our study, we evaluated the perception of buccal corridors on smile attractiveness when judged by different age groups of the North Indian population as the older patient groups may have different subjective needs for orthodontic treatment than the younger patients.

A Visual Analogue Scale (VAS) is a measurement instrument that measuresan attitude from a range across a continuum of values and cannot easily be directly measured[16].The VAS method is commonly used to measure attractiveness, and scores obtained by the VAS method should provide simple, rapid, reliable, and reproducible results[17].

As our knowledge, there has been very little evidence to evaluate the effect of buccal corridors on smile attractiveness by different age groups in the Indian population. This study focused on the effects of buccal corridors on smile attractiveness when judged by different age groups of the North Indian population.

In our study, we did this survey on laypersons as they are the principal seekers of orthodontic treatment, rather than dentists or orthodontists who are the designers and providers of smile attractiveness[18].However many authors like Martin[19], Abu Alhaija[20], and Zange[8]have reported that the observer has received, a more sensitive is his/her perception of the buccal corridor for smile aesthetics asParekh[1] and Krishnan[7]have reported no difference in perception of the buccal corridor by layperson and orthodontist. Hulsey[21] and Elhiny[22] reported that buccal corridor space has no significance on the perception of smile esthetics for a layperson whereas Ritter[23]andRoden-Johnson[24]reported it to be nonsignificant for the layperson as well as an orthodontist.

Our study showed that the effects of buccal corridors on smile aesthetics were evaluated by different groups as done in the study of Iio[9] et al in 2009.Most of the studies showed the preference of narrower to medium buccal corridors for smile to be attractive but Moore et al stated that the buccal corridors size influences smile attractiveness when the whole face is considered.

On evaluating the male and female smile photograph the adolescent group voted maximum for photograph A showingthe narrowest buccal corridor and least preference for the broadest buccal corridor (Figure 3 & 4, Table 1 & 2). However, in males narrower buccal corridor was preferred compared to females with findings similar to the findings of Morteza[25]. Similarly in the study of Lio[9] et al the younger adult showed a preference for a broader smile which are the primary consumer of orthodontic treatment.

The other two groups (II and III) showed the most preference for moderate buccal corridor space in photographs C and B with 10-15 % negative space and the least preference for broadest buccal corridor space with 25% of lateral negative space in both genders (Figure 5 & 6, Table 3 & 4). No significant difference was found in between the male and female evaluated for all three groups (Figure 5 & 6,Table 3 &4). Morteza[25] in 2011 found no significant judging differences between male and female judges from among art and dental students.Moore[26] et al also found no significant difference in judging smile esthetics between male and female judges. Similar results were reported in the study of Martin[19] et al and Gracco[27] et al showing the rater's gender to be nonsignificant. However, it is not in agreement with Perrett[28] et al who described how females are more sensitive to changes in factors of smile attractiveness.

It is interesting to reveal that the 5% changes from 10% to 15% buccal corridor showed significant clinical changes for smile esthetics in all three groups. Clinicians should keep in mind that a minor change in buccal corridor spaces might significantly influence the perception of smile esthetics. But this does not mean that we plan for broader arches and narrower buccal corridors for all the patients as individual perception should also be considered during the diagnosis and treatment planning.

Table 3:- Association of Gender with Opinion about Buccal Corridor Quality (BCQ) in Males.

Type		**A**	**B**	**C**	**D**	**E**	**F**	chi sq	p-value
Best in Male									
Male	No.	26	18	24	7	8	4	0.542	0.990
	%	29.9%	20.7%	27.6%	8.0%	9.2%	4.6%		
Female	No.	27	21	27	7	7	6		

	%	28.4%	22.1%	28.4%	7.4%	7.4%	6.3%		
Total	No.	53	39	51	14	15	10		
	%	29.1%	21.4%	28.0%	7.7%	8.2%	5.5%		
Worst in Male									
Male	No.	8	12	4	5	19	39	3.064	0.690
	%	9.2%	13.8%	4.6%	5.7%	21.8%	44.8%		
Female	No.	7	8	7	7	27	39		
	%	7.4%	8.4%	7.4%	7.4%	28.4%	41.1%		
Total	No.	15	20	11	12	46	78		
	%	8.2%	11.0%	6.0%	6.6%	25.3%	42.9%		

Table 4:- Association of Gender with Opinion about Buccal Corridor Quality (BCQ) in Females.

Type		**A**	**B**	**C**	**D**	**E**	**F**	chi sq	p-value
Best in Female									
Male	No.	19	17	30	13	4	4	3.202	0.669
	%	21.8%	19.5%	34.5%	14.9%	4.6%	4.6%		
Female	No.	25	19	30	13	7	1		
	%	26.3%	20.0%	31.6%	13.7%	7.4%	1.1%		
Total	No.	44	36	60	26	11	5		
	%	24.2%	19.8%	33.0%	14.3%	6.0%	2.7%		
Worst in Female									
Male	No.	11	3	4	14	12	43	5.176	0.395
	%	12.6%	3.4%	4.6%	16.1%	13.8%	49.4%		
Female	No.	6	5	1	14	13	56		
	%	6.3%	5.3%	1.1%	14.7%	13.7%	58.9%		
Total	No.	17	8	5	28	25	99		
	%	9.3%	4.4%	2.7%	15.4%	13.7%	54.4%		

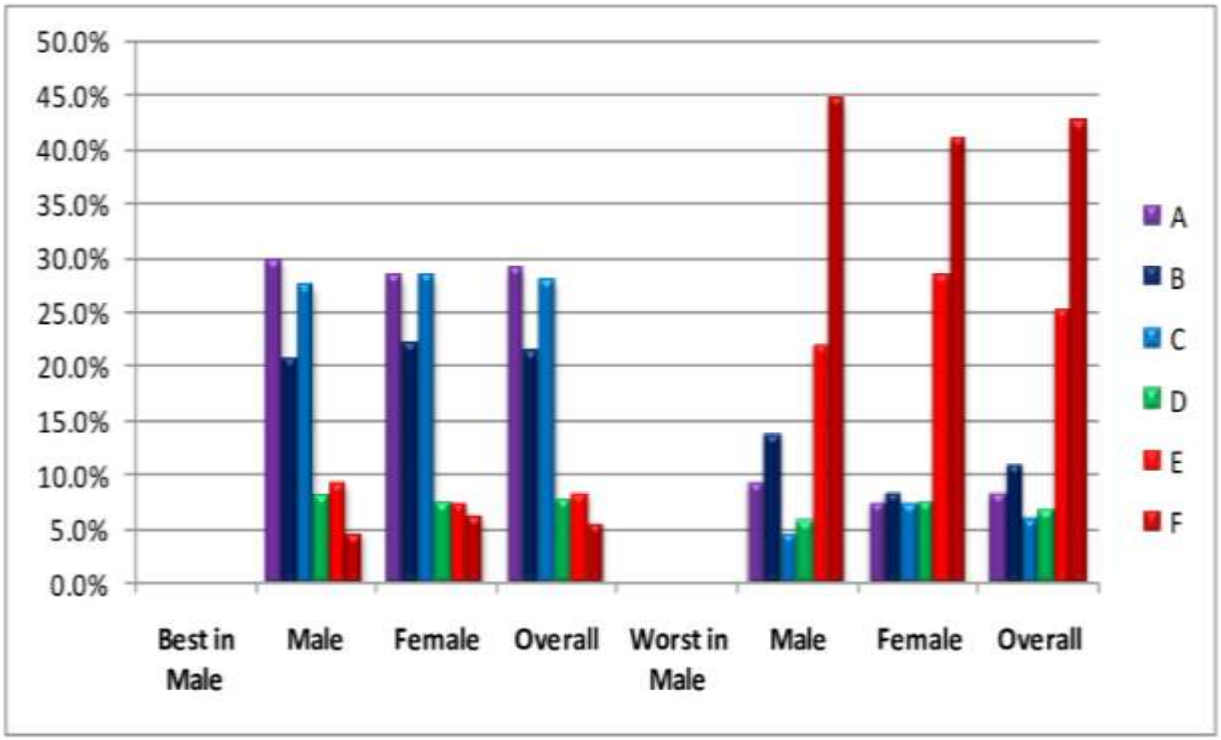

Figure 5:- Association of Gender with Opinion about Buccal Corridor Quality (BCQ) in Males.

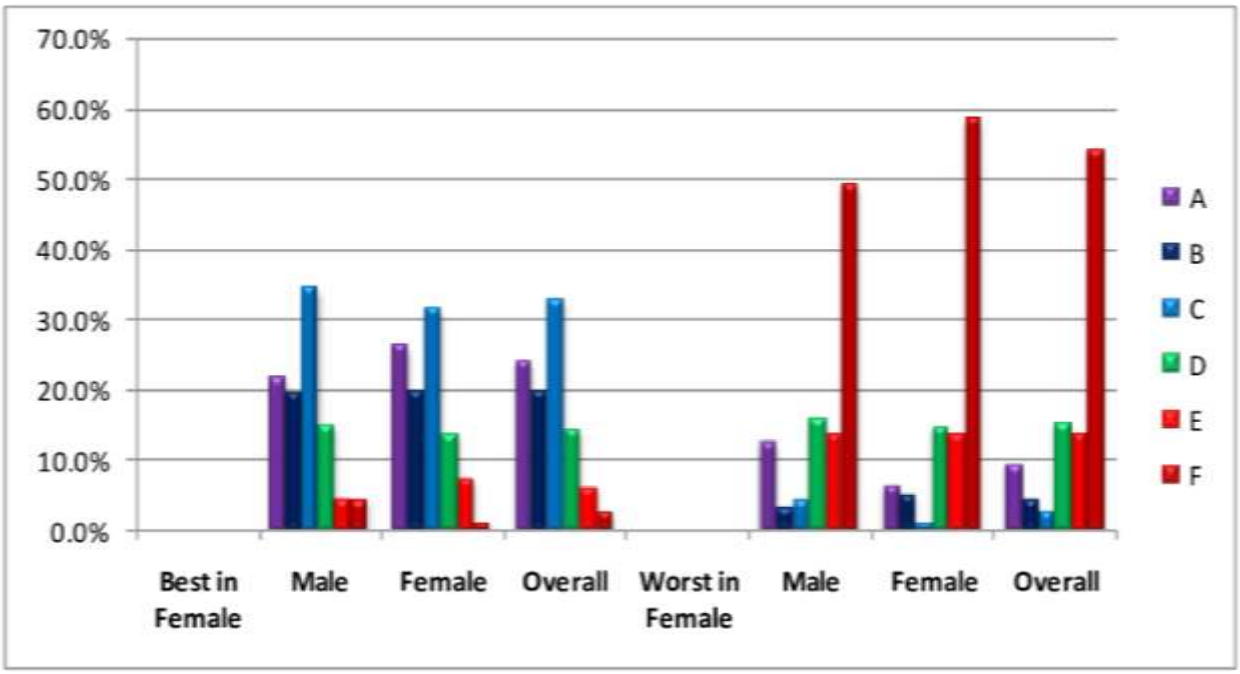

Figure 6:- Association of Gender with Opinion about Buccal Corridor Quality (BCQ) in Females.

Conclusion:-

1. In males overall narrower buccal corridor was preferred compared to females.
2. Adolescent group preferred the narrowest buccal corridor space with all groups showing the least preference to the broadest buccal corridor.
3. Not much clinically significant difference in opinion is found in all three groups.

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