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Original Research

Evaluation and comparison of different smile characteristics among males and females of Kashmiri population: A cross sectional study

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ABSTRACT:

Background: in the contemporary era of dental practice, facial along with dental aesthetics has become the key element playing a predominant role in diagnosis and treatment planning over the last few decagons. Smile examination, smile plans, dynamic lip-tooth relationshipallows the clinician to meet the increasing aesthetic and gratuitous demand of the patients. Thus, the main **aim** of the study was to investigate possible gender dissimilarities in definite aesthetic parameters including curve of upper lip, maxillary midline, tooth shape, smile line, smile arc, labio-dental relationship and number of teeth displayed. **Material and methodology**: randomized 100, both under and postgraduate dental students of the college and attendant of the patients who were willing to participate in the study were selected from the department of Prosthodontic, GDC Srinagar. Frontal view photographs using digital camera with posed smile both under rest and forced smiling condition were obtained and assessed using Adobe Photoshop 7.0. **Results**: highly statistically significant results were obtained when a comparison of parameters like smile arc and curve of upper lip was done with that of gender with a p value of 0.000, while significant results were obtained in parameters with smile line, tooth shape and tooth displayed while smiling. Non significant results were obtained with labio-dental and maxillary midline relationship when compared with gender. **Conclusion**: within the limitations of the study, it can be concluded that smile characteristics integrated with dental and aesthetic standards should be considered in order to assure a satisfactory and predictable dental treatment outcomes before the beginning of any prosthetic treatment.

Keywords: Aesthetics, Dento-Facial, Gender, Photographs, Rehabilitations, Smile Line

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INTRODUCTION

An aesthetic smile is formed as a result of the interaction between different smile components and also requires an understanding about various principles which manage the balance between teeth and soft tissues[1]. In this manner the Smile aesthetics are characterized by the teeth, framed by the lips, the contour of the gums, and the number of gaps and spaces.

When described more precisely, the harmony and symmetry of an aesthetic smile thus determined by the extent of exposure of the gingiva while smiling, the proportions of the teeth,the arc of the smile, the presence of a midline shift and also the changes in axial inclination, buccal corridors, gingival height and contours, presence of a diastema, and the colour of the teeth. Although each factor may be considered individually, all components must act in concert to create an integrity that produces the final aesthetic effect[2].Smile can broadly be divided by neurological control into involuntary i.e. spontaneous and voluntary i.e. posed smile, while describing these smiles an involuntary smile is particularly related to emotion, while as the posed / voluntary social smile is an intentional act and particularly not related with an emotion. There are various parameters present that help in constituting the natural smile of an individual. These parameters include the smile line, smile design, smile arc, curvature of the upper lip, labiodental relationship, teeth display, buccal corridor, and finally the position of incisal edge[3]. Dentalexperts and laypersons had various impression of smile esthetics and were able to distinguish qualities that both enhanced and detracted from smile

esthetics[1]. Different methods are available for analysis of the smile, including photographs, videos or the use of three-dimensional stereo-photogrammetric images[4]. In facial analysis we have a number of horizontal reference lines and the vertical midline located by two anatomical reference points: the nasion and the filtrum which helps in determining the smile design[5]. Thus each case must be assessed individually along with the consideration of the expectations and preferences of the patient to obtain adequate results in oral rehabilitation. Furthermore there is abundant data available regarding the factors contributing to the smile in the western populations but there is an insufficient data regarding these aesthetic norms among kashmiri population. Thus present study was conducted to evaluate the components of smile with respect to gender in Kashmiri population visiting government dental college Srinagar as well as Kashmiri dental students of same institution.

MATERIAL AND METHODOLOGY

Systematically healthy 100 subjects, 50 males and 50 females were selected from the general population of the Srinagar, specifically the attendants of the patients visiting the department of Prosthodontic and Crown and Bridge, GDC Srinagar, Jammu and Kashmir for any rehabilitation. Both under and post graduate students who were willing to participate in the study were also selected from the department only. A four month long cross-sectional study was conducted from the month of February 2022 till May 2022in the department. Ethical approval was obtained from the ethical committee of the college and department before starting the study. A short description about the study was given to the participants and only after their complete willingness and signature on the informed consent, they were further enrolled. No participants were compelled for their involvement and were free to leave the study at any point of time.

Subjects with healthy dentition, no congenital defect, facial asymmetry, maxillofacial trauma, prior history of any orthodontic treatment, crowding or severe tooth wear, without any sign of active caries in the anterior teeth and with complete and fully erupted permanent dentition were included in the study. A single trained examiner recorded all the parameters of the subject's in-order to avoid any biasness in the study.

The subjects were seated comfortably on a chair around 15 cm away from the wall in order to avoid any shadow effect with natural head position and the stare focused on an external point at the eye level, in-order to obtain a parallel axis of the Frankfort and inter-pupillary line to the axis of the camera placed in the same plane for obtaining a clear frontal extra-oral photograph of the subjects. Standardized posed smile photograph in natural and forced manner were taken using a digital Nikon camera with an exposure time of 1/200 fixed at a position with a tripod stand 50 cm away from the subject, so that the position of camera remains constant in every patient. While obtaining these images, the investigator was instructed to maintain parallelism through the guiding references which was the line in the visor of the camera along with the millimeter scale placed on one side of the head of the patients. This was done to calibrate the real dimensions of the photograph while analyzing.The center of the image was the intersection between the Frankfort horizontal line and the midline of the face. Each image was then assessed accordingly using an Adobe Photoshop Version 7.0.

PARAMETERS ASSESSED[3, 4]

Following parameters were assessed using the photographs:

1. **CURVE OF THE UPPER LIP**: the curvature of the lip was assessed by drawing a straight line through the midpoint of the inferior border of the upper lip and its contact with the corner of the mouth was then evaluated. Three groups were distinguished as straight with the edges/corners of mouth at or within 1mm of the line, upward with the corner of the mouth above the horizontal line and downward with the corners below the horizontal line.
2. **MAXILLARY MIDLINE**:this parameter was measured using the midline of the face and the inter-incisal midline. A line was drawn from the nasion to the filtrum extra-orally and another line drawn from the frenum to the maxillary interincisal midline. The two lines were compared and were classified either as centered or deviated in relation to the facial midline.
3. **TOOTH SHAPE**: the shape of the tooth was evaluated as ovoid, triangular and square based on the relationship between the proportion and shape of central incisor and calculated using the formula, where dental proportion percentage (DP%) is equal to maximum width by length in millimeter multiplied by 100.
4. **SMILE LINE**: represents the extent of tooth displayed vertically while smiling or elevating the upper lip in relation to maxillary incisor. These have been described as high smile line where a significant amount of gingival along with the maxillary anterior teeth are visible, average where only interproximal gingival along with anterior maxillary teeth are apparent and low smile line where just less than two third of the maxillary front teeth were noticeable.
5. **SMILE ARC**: it is measured by drawing a line along the incisal edges of the maxillary incisors to the cusp of maxillary canine. Another line was drawn across the superior border of the lower lip and the relationships between the two lines were evaluated. In subjects where teeth were covered by lower lip, the smile arc was considered to be

not available. The categories forms were, parallel to the teeth when the two lines follow the same curvature and non consonant when the lines were non-parallel. A non-consonant smile can be considered to be straight when there is a flat curvature of teeth in relation to lower lip and reverse when maxillary teeth form a reverse curve in relation to the lower lip.

6. **LABIO-DENTAL RELATIONSHIP**: this parameter was evaluated by identifying the distance between the inferior border of maxillary anterior teeth and superior border of lower lip. The relationship was considered to be non-touching or slightly touching when the lower lip touched the lower border of maxillary anterior teeth.
7. **NUMBER OF TEETH DISPLAYED**: smile was considered as displaying when the teeth up-to canine or till first molars were visible. The tooth was included only when the half of its surface was visible.

SAMPLE SIZE DETERMINATION

The sample size of the study was evaluated using the formula of $n=z^2*p*(1-p)/e^2$ where z=1.96 for confidence of interval (α) as 95% expressed in decimal form with 'e' as margin of error. The sample size was found to be equal to 87, but in-order to increase the strength of the study the sample size was increased to 100.

STATISTICAL ANALYSIS

The data was measured, recorded and entered on a spread sheet for further analysis. The data was investigated using SPSS software version 20.0. The descriptive analysis of the study was done using frequencies, percentages, mean and standard deviation and further stratification done according to the gender. Chi-square test was employed to assess the degree of association between the gender and different parameters. A p-value under 0.05 was considered to statistically significant.

RESULTS

On evaluating the results of the study, highly statistically significant results were obtained when a comparison on the basis of gender was done in cases of parameters including curve of upper lip and smile arc. On an average 66% (n=33) of the total females had a consonant smile while only 52% (n=26) of the males had this smile arc. In case of the upper lip curve, males with 86% (n=43) had a straight line while 50% (n=25) of females belonged to this category.

In cases of tooth shape, smile line and number of teeth visible while smiling, statistically significant differences were observed between the two genders. Maximum of number of males (82%) and females (90%) had oval shaped teeth while only 2% of males and 6% of females had triangular shaped teeth. With regard to smile line, the maximum number of males presented with an average smile line reflecting only interproximal gingival while smiling. A high smile line was predominant in females with around 64% of them belonging to this category while only one third of males i.e. 12% had a high smile line. In cases of females, around 66% of had a visible first premolar while smiling while 62% of males belonged to this category. On an average more females presented to the groups where canine, second premolar and first molar was visible while smiling then males.

When analysis of maxillary midline and labio-dental relationship was done in males and females no statistically significant results were obtained thus making these two parameters non comparable in cases of both the genders.

Table1: Socio-demographic characteristics of the study subjects

VARIABLE		FREQUENCY	PERCENATGE	MEAN±SD
Age (in years)	20-30	31	31	37.52±34.050
	31-40	40	40	
	41-50	29	29	
Gender	MALE	50	50	1.500±0.503
	FEMALE	50	50	

Table 2: Representing the smile characteristics of the study subjects

S.NO	VARIABLE	CATEGORIES	FREQUENCY	PERCENTAGE	MEAN±SD
1.	Curve of upper lip	Straight	68	68	1.460±0.731
		Upward	17	17	
		Downward	15	15	
2.	Maxillary midline	Centered	92	92	1.080±0.273
		Deviated	8	8	
3.	Tooth shape	Oval	86	86	1.240±0.622
		Triangular	4	4	
		Square	10	10	
4.	Smile line	Low	10	10	2.080±0.526
		Average	72	72	

		High	18	18	
5.	Smile arc	Consonant	59	59	1.580±0.768
		Straight	22	22	
		Reverse	17	17	
		Not available	2	2	
6.	Labio-dental relationship	Non-touching	97	97	1.030±0.171
		Slightly touching	3	3	
7.	Number of teeth displayed	Canine	9	9	2.240±0.668
		First premolar	62	62	
		Second premolar	25	25	
		First molar	4	4	

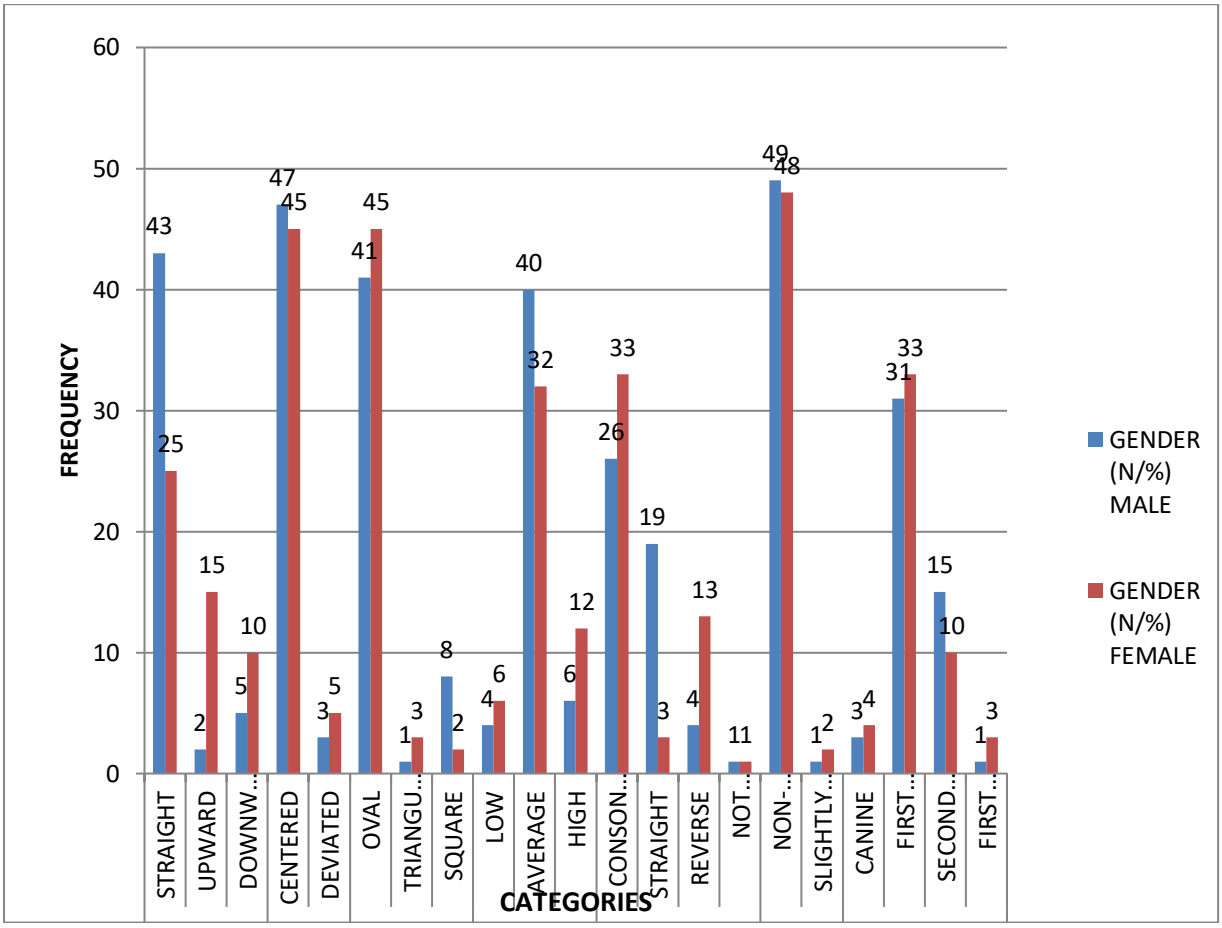

Table 3: Representing the correlationsgip of smile characteristics with that of the gender

S.NO	VARIABLE	CATEGORIES	GENDER (N/%)		CHI-SQUARE VALUE	P-VALUE	SIGNIFICANCE
			MALE	FEMALE			
1.	Curve Of Upper Lip	Straight	43/86	25/50	16.37	0.000	HS*
		Upward	2/4	15/30			
		Downward	5/10	10/20			
2.	Maxillary Midline	Centered	47/94	45/90	0.54	0.460	NS*
		Deviated	3/6	5/10			
3.	Tooth Shape	Oval	41/82	45/90	14.76	0.002	S*
		Triangular	1/2	3/6			
		Square	8/16	2/40			
4.	Smile Line	Low	4/8	6/12	13.29	0.001	S*
		Average	40/80	12/24			
		High	6/12	32/64			
5.	Smile Arc	Consonant	26/52	33/66	17.23	0.000	HS*
		Straight	19/38	3/6			
		Reverse	4/8	13/26			

		Not Avaliable	1/2	1/2			
6.	Labio-Dental Relationship	Non-Touching	49/98	48/96	0.343	0.557	NS*
		Slightly Touching	1/2	2/4			
7.	Number Of Teeth Displayed	Canine	3/6	4/8	12.20	0.004	S*
		First Premolar	31/62	33/66			
		Second Premolar	15/30	10/20			
		First Molar	1/2	3/6			

S*=Significant, HS*=Highly Significant and NS*=Non Significant.

DISCUSSION

One of the major key elements in diagnosis and prosthetic rehabilitation is analysis of smile and its design. Not only in prosthodontic but periodontics, endodontics and orthodontics also aim in providing an appealing aesthetic appearance of the patients. Recent advancements in technology and better understanding of the aesthetic relationship of the patient has now permit the clinician to measure such parameters and include the information into biomechanical and treatment plan.[5]A detailed evaluation and recording of smile parameters is essential especially when anterior dentition is to be restored and the patient has a high aesthetic demand.[6] Smile designing thus becomes an essential and multifactorial process where the clinical success is determined only by understanding the patient's soft-tissue treatment limitations along with the extent to which prosthodontics or multidisciplinary treatment can satisfy patient's esthetic goals.[7]

The present study was conducted on the subjects from the general population of Kashmir, Jammu and Kashmir. The main aim of the study was to evaluate the smile characteristics and its correlation with that of gender. An easily reproducible parameter i.e. 'posed smile' was made only inclusion criteria to conduct the study. The main conditioning factors of smile are age and race, which becomes the main reason of their clear definition in our study. The mean age of our study was 37.52±34.050 which was in consistent with the study conducted by **Melo *et al***.[4]The ideal smile line is considered to be a point where the maxillary interincisial midline is said to coincide with that to the facial midline, with around 1 mm of visible gingival tissue and fully exposed teeth. Based on this criterion, a smile with exposure of 2-3 mm of gingival tissue is considered to be aesthetically pleasing.[8] In our study statistically significant results (p=0.001) were obtained when a comparison with respect to gender was done. The results of our study were similar to the results of the study conducted by **Melo *et al,*** where a similar high smile line was found to be common in females, while average and low smile lines were common in males.[4] Many more studies conducted by authors like **Peck *et al*[5], Zarone*et al*[9]**and **Nold*et al*[10]**were of the same thinking and the results obtained were similar to the results of our study. Age and loss of supporting tissues are two main confounding factors which decreases the height of the smile line. A high smile line usually poses a great challenge in aesthetic restoration when combined with different multidisciplinary approaches.[9]

In relation to smile arc, highly statistically significant results were obtained a gender correlation was done. A maximum of 69% of the total population were among the category of consonant arc. This arc is considered to be more attractive and appealing than the non-consonant arc. Females were higher in the group of consonant smile and least number was found in not available group where maxillary anterior teeth were covered by the lower lip. This was followed by straight smile arcs and a least number of patients were included in the reverse smile arcs, with similar results of the studies conducted by **Khan *et al*[3], Meyo*et al*[4]**, **Nold*et al*[10]**, and **Desai *et al*[11]**. On the contrary, **Maulik and Nanda** in the year **2007,** reported straight smile arc as the most common finding followed by consonant and reverse smile arcs.The arc of the smile is mainly dependent upon age, in younger age the central incisors are more prominent giving rise to a curve which is usually consonant and parallel to the lower lipand eventually turns to straight as a result of tooth wear.[11, 13]

On evaluating the results in consideration with that of maxillary midline, around 92% of the total sample size had coincided midline with statistically non-significant results. Studies conducted by various authors like **Al-Johany *et al*[15]**and**Owens *et al***[16]had similar results as obtained by our study. Maxillary midline should always be considered in the prosthetic treatment in order to ensure an aesthetically appealing outcome. Any erroneous inclination in case of maxillary and facial midline is immediately identified by the observer as less aesthetic and attractive. An angulation of about 10 ± 6° was considered to a tolerance limits in cases of layman (**Thomas *et al***).[16]

Wolfart *et al*[17]and**Brunetto *et al*[18]** in their studies concluded that the maximum population included had oval shaped teeth which were similar with the results found in our study. 86% of the total population in our study presented with oval teeth while only 4% had triangular teeth followed by square. Statistically significant results were found among the two genders where females had more of the oval teeth. This made to conclude the study with the conclusion that whenever a prosthetic rehabilitation is to be done in any patient, oval prosthetic teeth in the maxillary anterior teeth are to be preferred. According to **Alvarez** and **Alvarez *et al*[19]** both patients and

dentists should consider the proportion of central and lateral incisors to be most aesthetic.

Maximum (97%) of the population in our study presented with a non-touching labio-dental relationship with statistically no significant difference among males and females which was in accordance with the study conducted by **Nold*et al*[10].** Contrary results were obtained by **Tjan*et al*[20]** in their study where they obtained a higher percentage of the population with touching labio-dental relationships. An interesting fact was proclaimed by **Desai *et al*** in their study where they reported that subjects with increasing age tends to hid their maxillary incisors with their lower lip on smiling.[11]

When teeth displayed while smiling were compared statistically significant results were obtained with maximum exposure till first premolar followed by second premolar, canine and molars. The results were in consistent with the studies conducted by **Tjan and Miller,** who found a higher prevalence of first premolar exposure.[20] For a harmonious outcome aesthetic restoration of posterior teeth is also required. A wider smile with exposure till second premolar was prominent in males when compared to female. Similar results were showed by the study conducted by **Khan *et al***.[3] Hence, greater and wider smile consideration are to be done for males rather than females during the treatment planning of anterior teeth.

LIMITATION

First of its kind, the study included a small sample of only100 kashmiri people. Much more studies needed to be conducted where the sample size and smile parameters are needed to be increased.

CONCLUSION

Within the limitation of this study, it can be concluded that different smile parameters should be incorporated in clinical practice efficiently and its integration with different disciplines should to be done to achieve an aesthetic appearance. Statistically significant differences were observed among the males and females in maximum of the parameters like smile line, smile arc, curvature of the upper lip and teeth displayed while smiling which should be considered whenever fabrication of any restoration is to be done.

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