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ORIGINAL ARTICLE

Padamjeet Panchal et al., Morphometric and volumetric analysis of maxillary sinuses

Three-dimensional morphometric and volumetric analysis of maxillary sinuses

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ABSTRACT

Background: The maxillary sinus is a pyramid-shaped cavity with varying shapes, sizes, and capacities. Its dimensions grow gradually and develop until early adulthood. Anatomical knowledge of the maxillary sinus is essential to understanding sinonasal disorders, planning surgical procedures and preventing complications. Awareness of the sinus's proximity to critical structures helps avoid injuries during surgery. The European, Korean, and Sri Lankan population study parameters show varying results and do not necessarily apply to the Indian population. The standard morphometric data of the maxillary sinus is scanty in the Indian population. The study aimed to determine the volume and morphometry of the maxillary sinus along with gender differences in the Eastern population of the Indian.

Materials and methods: A retrospective cross-sectional study was conducted using cone beam computed tomography data of maxillary sinuses of 100 normal individuals. The data were analysed after the three-dimensional reconstruction of digital imaging and communications in medicine (DICOM) images with the help of DICOM to print and Geomagic freeform software in the Anatomy department. The different linear morphometric variables and volume of the maxillary sinus were studied. SPSS version 27.0. was utilised for statistical analyses.

Results: The mean values of Antero-posterior diameter, Transverse diameter, Craniocaudal diameters, the height of ostium from the floor and volume of the maxillary sinus in males on the right side are 36.61 mm, 20.7 mm, 40.31 mm, 26.02 mm and 16055.24 mm^3 and on the left side are 37.17 mm, 20.17 mm, 40.73 mm, 26.91 mm and 15712.66 mm^3 whereas in females the values on the right side are 38.10 mm, 21.56 mm, 38.96 mm, 25.81 mm and 14687.78 mm^3 and on left side are 38.23 mm, 21.53 mm, 38.48 mm, 25.28 mm and 14203.13 mm^3 respectively. The side-to-side parameter differences were non-significant within the male and female groups, respectively. The females had significantly ($p < 0.05$) larger transverse diameters than males in both the right and left maxillary sinuses. The males tend to have a slightly larger mean craniocaudal diameter than females, but the difference was found statistically significant ($p < 0.05$) only in the left maxillary sinus. The gender differentiation based on the measured parameters of bilateral maxillary sinus accuracy rate was 89.4% in males and 61.8% in females.

Conclusions: These parameters serve as a standard or reference point, allowing radiologists and surgeons to compare individual patient scans to population averages and aid in better clinical outcomes. The mean values of different parameters of the maxillary sinus may be utilised to differentiate various suspected sinus pathologies, which is helpful for functional endoscopic sinus surgery. Gender differentiation can be done more accurately by forensic experts using Maxillary sinus transverse diameter bilaterally, followed by craniocaudal diameter of the left side sinus for predicting the gender of an unknown maxilla.

Keywords: maxillary sinus, computed tomography, morphometry, Discriminant analysis

INTRODUCTION

The maxillary sinuses in the maxillary bone are a pair of pyramid-shaped cavities, which can vary in shape and size. It is one of the most prominent paranasal air sinuses. It is the largest of all paranasal sinuses and is also named the “antrum of Highmore”. Knowledge of the maxillary sinus anatomy is essential, aids in interpreting radiographic imaging, and enables clinicians to accurately diagnose various sinonasal disorders, including sinusitis, polyps, tumours, and cysts. For surgeons, knowledge of the maxillary sinus anatomy is indispensable for planning and executing procedures involving the maxillary sinus and can prevent complications. Understanding the proximity of the maxillary sinus to the orbit, ethmoid sinuses, and infraorbital nerve can prevent complications such as orbital hematoma and iatrogenic injuries to the optic nerve or infraorbital nerve. Maxillary sinuses are present but not fully developed at birth. The dimensions of the maxillary sinuses grow slowly and develop till early adulthood. The developmental influential effects are associated with varying degrees of pneumatisation of sinuses [1, 7] and result in variability in shapes, sizes and capacity [5, 7]. During the intra-embryonic period, genetic and environmental factors also impact bone and cartilage formation in the facial region [10, 15]. The maxilla bone contributes to the lateral wall, floor of the nose, and orbit and forms one of the boundaries of the infratemporal and pterygopalatine fossa [1]. Gender differentiation can be done more accurately by forensic experts using maxillary sinus for predicting the gender of an unknown maxilla.

In the Turkish population, maxillary sinus dimensions have shown significant gender differences [4], while others could not find any differences [5, 9]. A study done in the Sri Lankan population found the height of the sinus to be a significant factor in gender differentiation. The sizes of the right and left sinuses were almost identical, with males exhibiting larger sinus dimensions compared to females [6]. In normal adult Koreans, males have larger maxillary sinus dimensions than females. A significant difference in maxillary sinus volume was observed across gender [12]. The maxillary sinus height is the most reliable discriminant parameter for sex determination in the western Indian population [16]. In a South Indian study, maxillary sinus width in females showed significantly higher values than males [18]. In north India, the maxillary sinus mean dimensions in females were smaller compared to males [2, 9]. Only a few studies from India have used cone beam computed tomography (CBCT) imaging to examine the maxillary sinuses. The study parameters of European, Korean, and Sri Lankan populations show varying results and cannot directly apply to the Indian population. There is a knowledge gap, emphasising the need for more studies to understand anatomical variations and their clinical implications within the Indian population. The study aimed to determine the volume and morphometry of the maxillary sinus and the gender differences in the eastern population of India.

MATERIAL AND METHODS

Subject selection

This retrospective study was done in the Department of Anatomy, adhering to the fundamental principles outlined in the Declaration of Helsinki (2013). This study was conducted after clearance from the Institutional Ethics Committee (ref no. IEC/2020/689, dated April 1, 2021). It was an institution-based study conducted over a period of one year (April-March 2021-22). The CBCT data in DICOM format were obtained using a 3D CT scanner (SOMATOM® Definition Flash, Seimens, Vietnam) within 120 KV, 350 mAs from the Department of Radiology, AIIMS, Patna. The CBCT data acquisition was done in a supine position. The study included CT images of adult heads aged 18–50 years with no pathology or deformity in the maxillary sinus. The maxillary sinus with tumour, polyp, upper jaw tooth extraction, chronic sinusitis, facial deformation, fracture, antrostomy, antral maxillectomy, and hypoplastic sinus was excluded from the study. The radiologist conducted a retrospective review of the CBCT DICOM images of the maxillary sinuses stored in the radiology archive. The sampling was done to select the DICOM data of normal maxillary sinuses of 100 individuals (66 males and 34 females) using a convenience method. The study population comprised individuals aged between 18 and 50 years who demonstrated normal bilateral maxillary sinus anatomy.

3D image reconstruction

The CBCT data was transferred into the computer system to convert the DICOM format to stereolithography (STL) file format using D2P version 1.0.2.2043 software (3D Systems Inc., HQ Rock Hill, SC, USA) for 3-D reconstruction of images at the department of Anatomy. Both linear and volumetric measurements were taken by using D2P software and Geomagic Free Form Plus version 2019.0.61 (3D Systems Inc., HQ SC, USA), respectively.

Data collection

The study parameters and variables of maxillary sinuses are described below.

A. **Linear parameters measurement:** It was measured with the help of D2P software (Fig. 1).

i. Antero-posterior diameter (APD): in axial images, the maximum anteroposterior diameter is the distance between the longest anterior and posterior inner bony walls of the sinus.

ii. Transverse diameter (TD): in axial images, the maximum distance between the medial and lateral bony walls of the maxillary sinus.

iii. Cranio-caudal diameter (CCD): in coronal images, the maximum craniocaudal diameter has been measured from the roof to the bottom of the sinus.

iv. Height of Ostium from the floor of sinus (HO): in coronal images, the maximum distance from the floor to the lower margin of the opening of the ostium is present on its medial wall.

B. **Volumetric analysis:** The volume of the right maxillary sinus (RMSV) and left maxillary sinus (LMSV) was measured using Geomagic Free Form Plus software (Fig. 2).

Data analysis: the statistical analyses was carried out using SPSS version 27.0. software (SPSS Inc., Chicago, IL, USA). The Kolmogorov-Smirnov test was done to examine the normal distribution of the variables. The homogeneity of variance was examined by performing Levene's Test. An independent t-test was utilised to compare means of the linear and volumetric variables of both sides of the maxillary sinus and also to compare across genders with a level of significance of 5% (p-value ≤ 0.05). The various maxillary dimensions were utilised to forecast gender (male or female) by stepwise discriminant analysis. Each measurement was obtained three times, and their mean values were considered for further analysis.

RESULTS

This research study was conducted on 100 individuals who came for a CT scan head other than maxillary pathology (66 males and 34 females, ages ranging from 18–50 years). The study parameters were compared for the right and left sides, gender-wise. The measurements taken for the study parameters indicated that the data was normally distributed and demonstrated homogeneity of variances. The side-to-side differences in study parameters were non-significant within the male and female groups, respectively.

APD of maxillary sinus: In the right maxillary sinus, males had a mean APD of 36.61 mm, while females had a slightly larger mean APD of 38.10 mm (Table 1). Similarly, in the left maxillary sinus, males had a mean APD of 37.17 mm, comparatively slightly less than females, having a mean of 38.23 mm (Table 2). Females tend to have slightly larger AP diameters in both the right and left maxillary sinuses than males, but the differences are statistically insignificant ($p > 0.05$).

TD of maxillary sinus: The males had a mean TD of 20.27 mm (right side) and 20.17 mm (left side), while females had a mean TD of 21.56 mm (right side) and 21.53 mm (left side). The females have significantly ($p < 0.05$) larger transverse diameters compared to males in both the right and left maxillary sinuses (Table 1, 2).

CCD of maxillary sinus: The mean CCD in males and females is 40.31 mm and 38.96 mm, respectively, for the right-side sinus, while the mean CCD for the left-side sinus is 40.73 mm and 38.48 mm, respectively, in males and females. Males tend to have slightly larger mean CCD compared to females, but the difference is statistically significant ($p < 0.05$) only in the left maxillary sinus (Table 1, 2).

HO of maxillary sinus: There is no significant difference in the HO between males and females in either the right or left maxillary sinuses ($p > 0.05$) (Table 1, 2).

Volume of maxillary sinus (MSV): There is no significant difference in the RMSV between males and females ($p > 0.05$). Similarly, gender difference were statistically insignificant in the LMSV ($p > 0.05$). (Table 1, 2).

The classification function coefficients of the study parameters used for discriminant analysis to classify gender for the right and left maxillary sinuses are shown in Table 3. These coefficients are used in a discriminant analysis algorithm to calculate a discriminant score for each individual based on their APD, TD, CCD, HO, and MSV measurement values of each side. Based on the maxillary sinus measurements, the discriminant scores help determine the likelihood of the individual being classified as male or female.

Table 4 shows the classification results of each maxillary sinus parameter in determining gender. The effectiveness of the classification model was evaluated in predicting gender based on both the original data and a cross-validated approach in the discriminant analysis. In group of centroids, females had a mean discriminant score of 0.991, while males had a mean discriminant score of -0.511 on the first discriminant function. In the Original Data, females were correctly classified as females at 61.8% and as males at 38.2%, while males were correctly classified as males at 89.4% and females at 10.6%. A cross-validated approach was used to evaluate the predictive performance of a statistical model. The cross-validated data showed a modest drop in female accuracy, with females correctly classified at 52.9% (down from 61.8%) and males correctly classified as male at 81.8% (a slight decrease from 89.4%) (Table 4). The model is more effective at classifying males compared to females.

DISCUSSION

The maxilla is a complex structure and one of the most prominent sinuses in the facial region. It is a key structure in the facial skeleton, supporting the upper teeth, forming part of the orbit, and contributing to the nasal cavity and hard palate. Any alteration to its integrity can lead to several complications. Disruption of the maxilla's three-dimensional walls may result in altered dental occlusion, and a displaced maxilla may lead to facial asymmetry. Compromised structural integrity can lead to sinusitis, impaired drainage, and chronic sinus infections. The altered maxillary sinus anatomy can complicate endoscopic sinus surgery and other procedures to treat sinus conditions. During surgical fixation of fractures involving the middle third of the facial skeleton, achieving the correct three-dimensional position of the maxilla is accomplished through perfect reduction and fixation along the anatomical buttresses using dental occlusion as a guide [7].

The knowledge of normal baseline sinus parameters will be helpful for the reconstruction of the maxilla in traumatic injury. Numerous researchers have conducted radiological investigations into maxillary sinus anatomy. Mishra AP, Kumar K and Babu CSR [9], Paknahad M, Shahidi S, and Zarei Z [11], and Teke HY et al. [17] observed that the APD, CCD, TD parameters in females are generally smaller than in males. Contrary to this prevailing trend, our study reveals a nuanced scenario wherein specific parameters such as CCD, HO, and MSV exhibit greater magnitudes in males while APD and TD values were larger in females.

Comparison of APD with other studies

In several studies conducted by Bhusal et al. [2], Ekizoglu et al. [4], Kiruba LN et al. [8], Mishra AP, Kumar K, and Babu CSR [9], Sharma SK, Jehan M, and Kumar A [14], Souza AD et al [15], Tambawala et al. [16], and Urooge, and Patil BA [18], found that the mean anteroposterior diameter (APD) of the right maxillary sinus was greater than that of the left side in both males and females (Fig. 3). A significantly higher APD value was found in males than in females in prior studies done by Ekizoglu et al. [4], Sharma SK, Jehan M, and Kumar A [14], Tambawala et al. [16], Teke HY et al. [17], and Uthman AT et al. [19]. In contrast, Kumar K, and Babu CSR [9], and Urooge and Patil BA [18] estimated that the mean APD of the right maxillary sinus was larger than the left side among females but with insignificant gender variation and obtained almost identical results as our study. The studies conducted by Bhusal et al. [2] and Urooge A, Patil BA [18] on the APD of the left maxillary sinus in males yielded results broadly consistent with our research findings.

Comparison of TD with other studies

Mishra AP, Kumar K, and Babu CSR [9] estimated the mean TD of the right and left maxillary sinuses and found that males exhibited higher values than females, demonstrating significant gender differences in both the right and left maxillary sinuses. In contrast, the present study revealed that females had significantly higher bilateral values than males. Teke HY et al. [17], and Urooge A, Patil BA [18] identified the TD of the left maxillary sinus as the sole significant determinant of gender. Ekizoglu O et al. [4], and Paknahad M, Shahidi S, and Zarei Z [11] studies demonstrated insignificant sexual dimorphism when comparing the mean TD values of the right and left maxillary sinuses (Fig. 4).

Comparison of CCD with other studies

According to a literature review, Ekizoglu O et al. [4], Mishra et al. [9], Tambawala et al. [16], Urooge A, and Patil BA [18], and Uthman AT et al. [19] have suggested that the estimated mean CCD of the right and left maxillary sinuses among males and females is the best discriminant parameter for studying sexual dimorphism.

Mishra AP, Kumar K, and Babu CSR [9] found a unilaterally significant higher CCD in males on left-side maxillary sinuses compared to females, yielding results that are almost equivalent to those of our study. Uthman AT et al. [19] measured the mean CCD of both sides of the maxillary sinuses and found significantly higher CCD values in males than females and obtained a value closely related to our study (Fig. 5).

Comparison of HO with other studies

Souza et al. [15] studied the HO of the left maxilla in males, and their data were almost similar to our study (Fig. 6). El-Anwar et al. [3] also examined the HO of maxillary sinus, finding that the mean HO on the right side was 28.6 ± 6.7 mm and 28.8 ± 6.2 mm on the left side, irrespective of gender differentiation. The medial wall is a broad maxillary sinus area that must be thoroughly visualised for pathology during endoscopic maxillary surgery. The maxillary sinus ostium is mainly located in the upper third of the medial wall [3, 15]. The transnasal maxillary balloon catheter dilatation technique cannot be used efficiently unless the ostium's placement in relation to anatomical landmarks is precisely identified. This method aims to restore maxillary sinus ostium drainage without necessitating the removal of the uncinate process. [15].

Comparison of maxillary sinus volume with other studies

Urooge, and Patil BA [18] estimated the mean RMSV of 16.74 ± 5.28 cm^3 in males, obtaining results almost identical to those of the present study. Ekizoglu et al. [4] assessed the mean LMSV in females and found a very similar result to that of the current study. Park CH, Kim KD and Park C [12] determined a mean MSV of 21.90 cm^3 in normal Korean adults, serving as a benchmark for comprehending their volume. Numerous prior studies conducted by Gulec et al. [5], Hettiarachchi PVKS et al. [6], Saccucci M et al. [13], and Urooge, and Patil BA [18] found no significant changes in maxillary sinus volume across genders, which is consistent with our findings. In contrast to our findings, multiple prior studies undertaken by Bhusal D et al. [2], Ekizoglu O et al. [4], Park CH, Kim KD and Park C [12], and Sharma SK, Jehan M, and Kumar A [14] have shown significant differences in maxillary sinus volume across genders. Proper assessment of the MSV and pneumatisation level enables clinicians to locate the surgical site for surgical intervention precisely. In maxillary sinus floor augmentation, while accessing from the lateral aspect, accurate placement of the bone window and confirmation of the enormous sinus size is adequate for efficient elevation or removal [6] (Fig. 7).

Paknahad M, Shahidi S, and Zarei Z [11] evaluated 100 individuals to determine the applicability of maxillary sinus measurements on CBCT scans for gender identification. They discovered that the correct predictive accuracy rate for sex determination was 78% in females and 74% in males, with an overall accuracy of 76% [11]. Teke et al. demonstrated that the accuracy of maxillary sinus measurements on both sides for gender identification is 69.4% in females and 69.2% in males [17]. Uthman AT et al. discovered that maxillary sinus height was the most effective discriminant characteristic for examining sexual dimorphism, achieving a total accuracy of 71.6%. Using multivariate analysis, they accurately identified the sex of 74.4% of male sinuses and 73.3% of female sinuses [19]. These gender-specific variations highlight the importance of individualised anatomical considerations in sinus evaluation and surgical planning and emphasise the need to further explore the complexities of maxillary sinus anatomy.

Limitations

A convenient sampling methodology was adopted, but randomised sampling could not be done. The standard parameters could not be correlated for age due to the unavailability of data within the time limit. The paediatric age group was not a part of the study. Overall, the model seems to have moderate effectiveness and better performance in predicting male gender. Further improvements might be needed for female classification, possibly by exploring additional parameters or refining existing ones.

CONCLUSIONS

The right and left side maxillary linear and volumetric parameters showed statistically insignificant differences within the male and female groups, respectively. The mean TD of the maxillary sinus in males were 20.7 mm (right side) and 20.17 (left side) as compared to 21.56 mm (right side) and 21.53 mm (left side) in females ($p < 0.05$). The CCD on the left side in males is 47.73 mm and 38.45 mm in females ($p < 0.05$). Gender differentiation can be done more accurately by forensic experts using maxillary sinus TD bilaterally, followed by CCD of the left side maxillary sinus. Variability in the morphology of the maxillary sinus is of clinical significance during surgical procedures in the maxillofacial area, including dental prosthesis implantation. Knowledge about the precise location of the maxillary sinus ostium is helpful for functional endoscopic sinus surgery. The gender identification accuracy rate from the measured parameters of the bilateral maxillary sinus was 89.4% in males and 61.8% in females. This study offers important insights into the anatomical dimensions of the maxillary sinus, which may assist clinicians in planning treatments.

ARTICLE INFORMATION AND DECLARATIONS

Data availability statement

The data that support the findings of this study are available upon reasonable request from the corresponding author. Any restrictions to the availability of the data will be disclosed at the time of request.

Ethics statement

The study was reviewed and approved by an Ethics Committee, and it was conducted retrospectively using the data of patients/participants who attended the radiology department. So, the patient's written informed consent cannot be obtained to participate in this study.

Author contributions

Padamjeet Panchal — contributions to the conception or design of the work; analysis, or interpretation of data for the work; critically reviewing and final approval of the version to be published. **Rajeev Nayan Priyadarshi —** the acquisition of data, critically reviewing and approving the final version. **Abhigyan Satyam —** Drafting the work, critically reviewing. Binita Chaudhary — critically reviewing and approving the final version.

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Conflict of interest

The authors declare that they have no conflicts of interest to disclose regarding this research.

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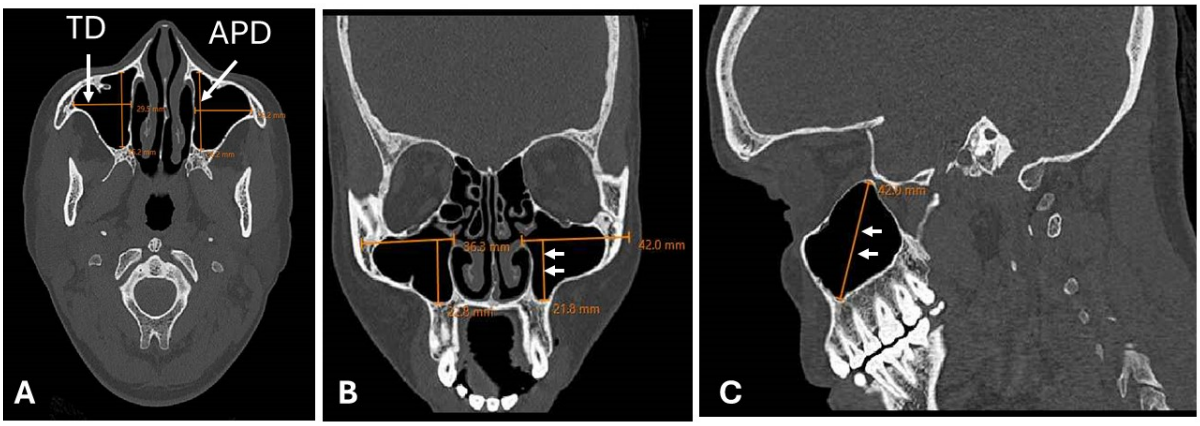

Figure 1. Morphometric measurements of the maxillary sinus. **A.** Axial image of maxillary sinus showing the Antero-posterior diameter (APD) and Transverse diameter (TD). **B.** white arrow indicates the height of the ostium (OH). **C.** white arrow coronal image showing the Cranio-caudal diameter (CCD).

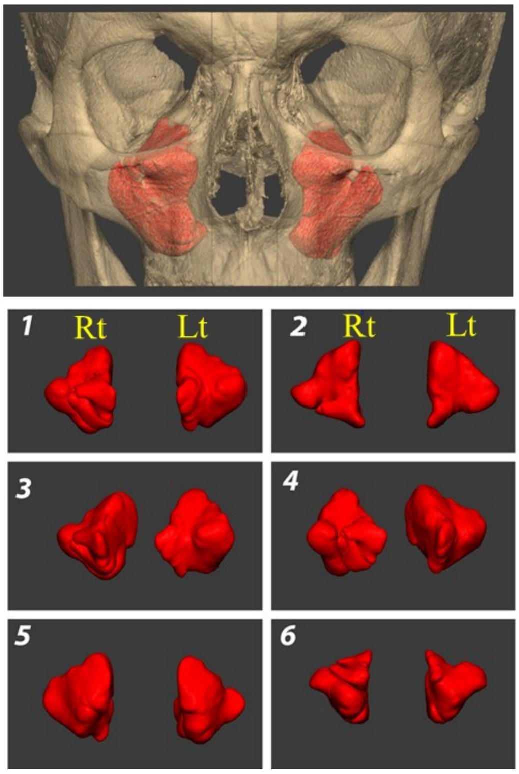

Figure 2. Outline of the maxillary sinus. The shape of maxillary sinus after three-dimensional reconstruction of CBCT data in different views. 1-Anterior view; 2- Posterior view; 3- right maxillary sinus showing medial view and left maxillary sinus showing lateral view; 4- left maxillary sinus showing medial view and right maxillary sinus showing lateral view; 5- superior view of maxillary sinus; 6- Inferior view of maxillary sinus.

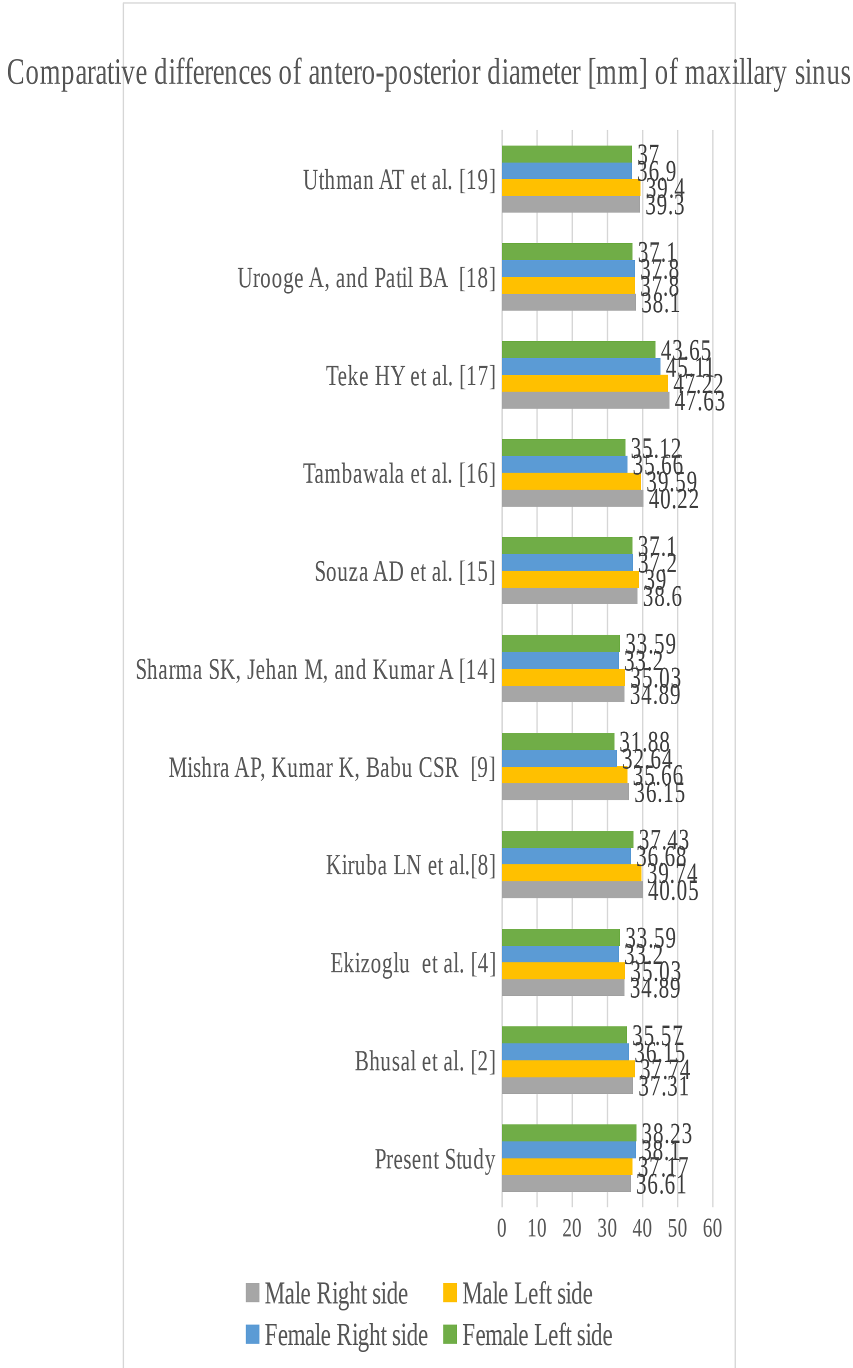

Figure 3. Comparative gender differences of the anteroposterior diameter of maxillary sinus of both sides.

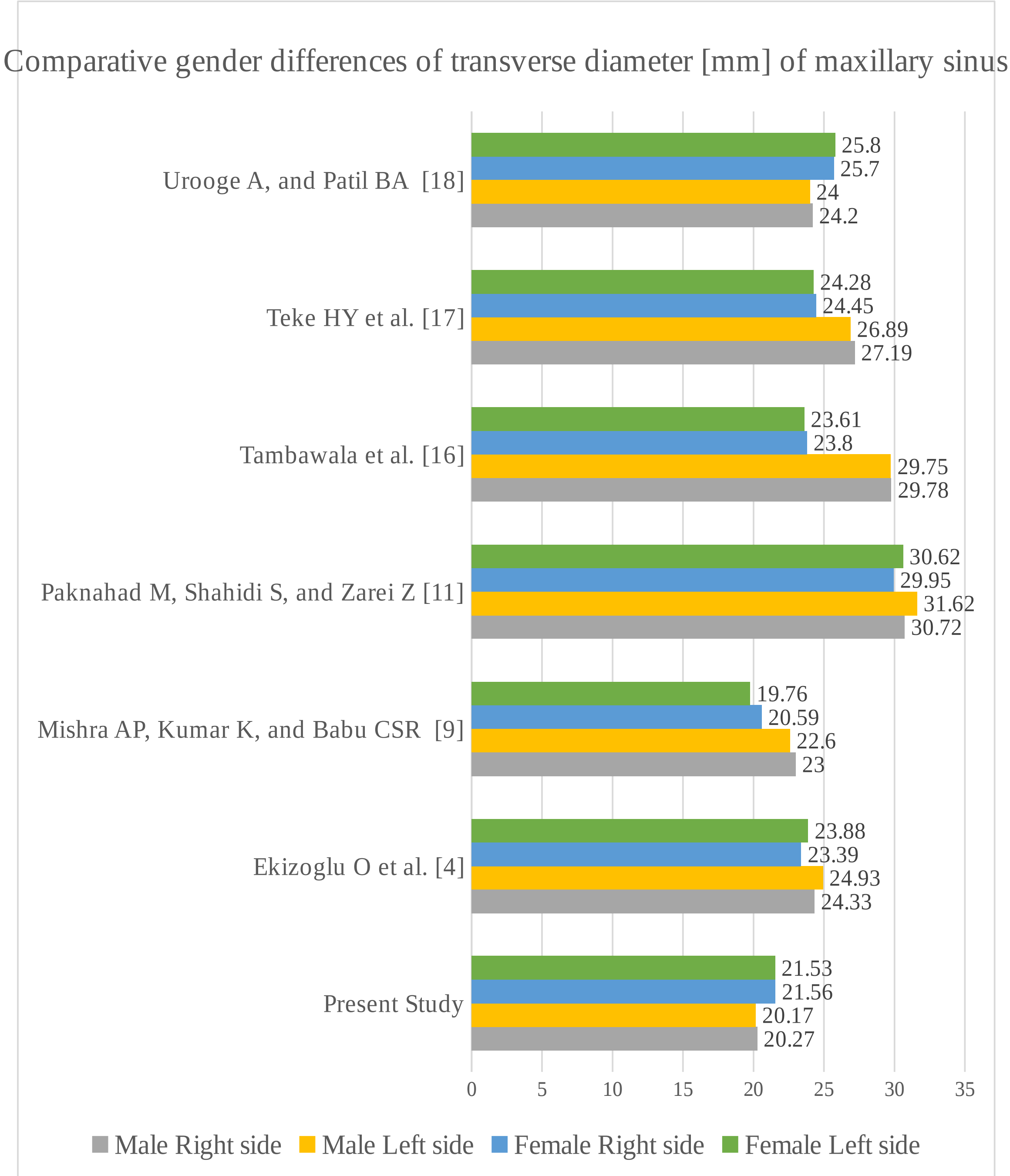

Figure 4. Comparative gender differences of the transverse diameter of maxillary sinus of both sides.

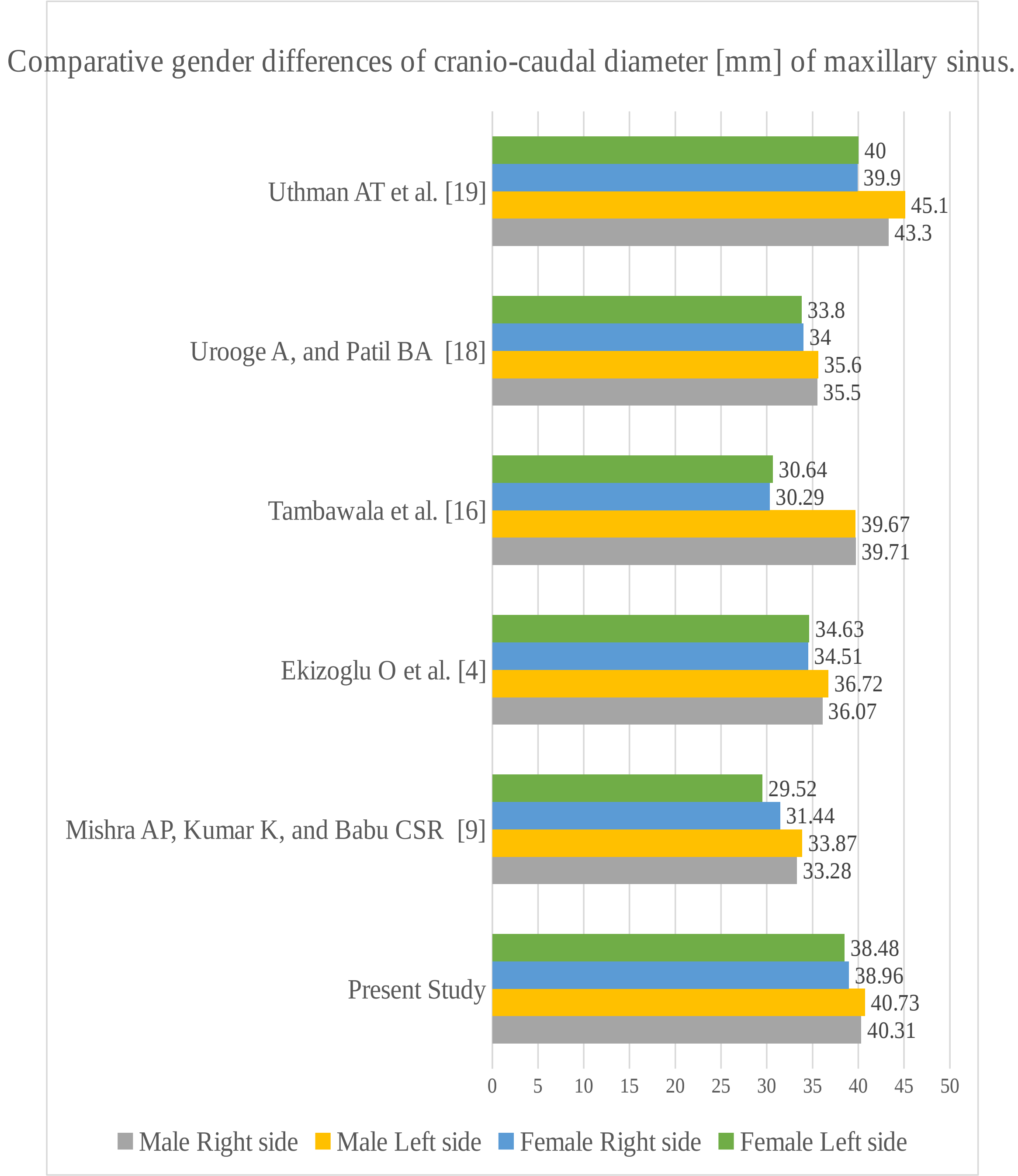

Figure 5. Comparative gender differences of cranio-caudal diameter of maxillary sinus of both sides.

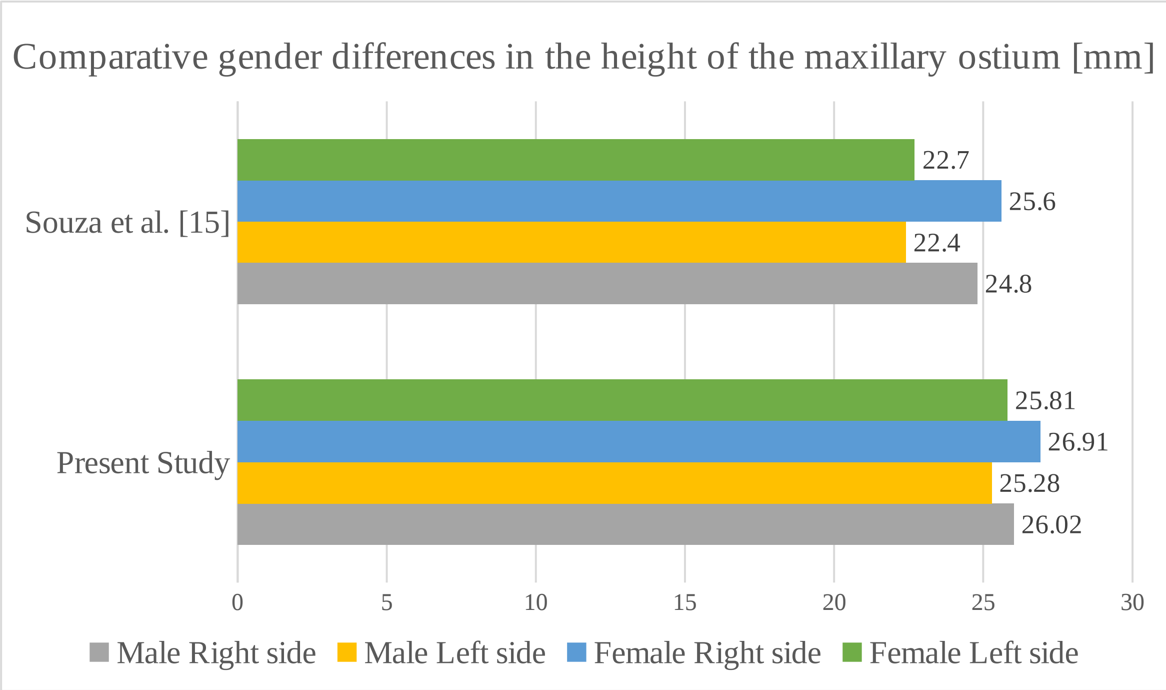

Figure 6. Comparative gender differences in the height of maxillary ostium of both sides.

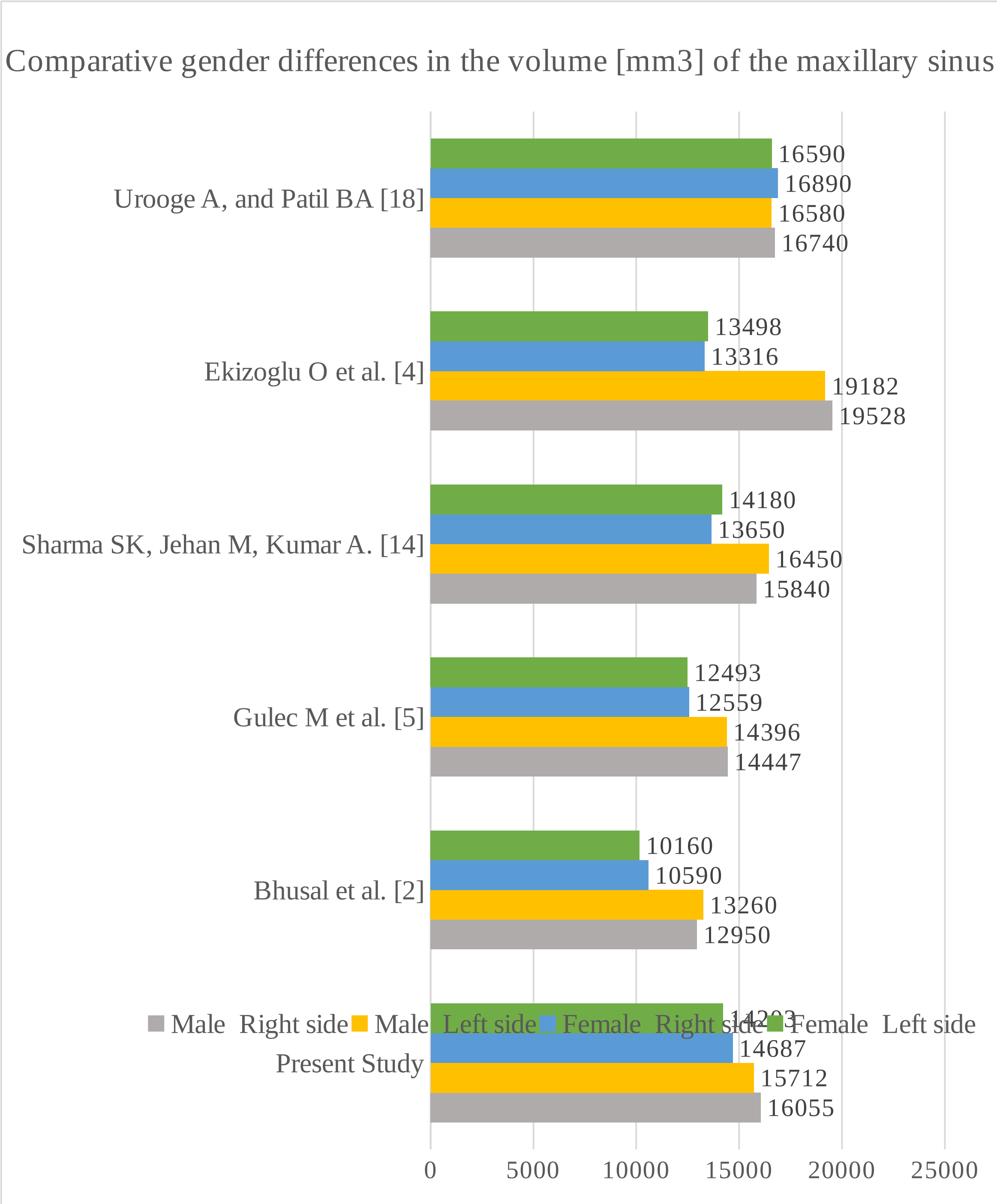

Figure 7. Comparative gender differences in the maxillary sinus volume on both sides.

Table 1. Comparison of different parameters of right maxillary sinus across genders

Parameters	Gender	N	Mean	SD	SEM	MD	P-value
RIGHT APD [MM]	Male	66	36.61	4.04	0.497	1.49	0.068
	Female	34	38.10	3.69	0.633		
Right TD [mm]	Male	66	20.27	2.95	0.363	1.28	0.014*
	Female	34	21.56	2.13	0.366		
Right CCD [mm]	Male	66	40.31	5.81	0.716	1.35	0.292
	Female	34	38.96	6.11	1.04		
RIGHT HO [MM]	Male	66	26.02	4.92	0.606	–0.20	0.833
	Female	34	25.81	4.46	0.766		
RIGHT MSV [MM^3]	Male	66	16055.2	4997.7	615.18	–1367.45	0.237
	Female	34	14687.7	5635.6	966.50		

APD — antero-posterior diameter; CCD — cranio-caudal diameter; MD — mean diameter; MSV — volume of the maxillary sinus; N — number; OH — height of Ostium from the floor of the maxillary sinus; p — probability; SD — standard deviation; SEM — standard error of mean; TD — transverse diameter; * p-value < 0.05 statistically significant.

Table 2. Comparison of different parameters of left maxillary sinus across genders

Parameters	Gender	N	Mean	SD	SEM	MD	P- value
Left APD [mm]	Male	66	37.17	3.68	0.453	1.06	0.12
	Female	34	38.23	2.91	0.500		
Left TD [mm]	Male	66	20.17	3.12	0.384	1.35	0.028*
	Female	34	21.53	2.73	0.468		
Left CCD [mm]	Male	66	40.73	5.12	0.653	–2.25	0.043*
	Female	34	38.48	5.81	0.879		
Left HO [mm]	Male	66	26.91	4.96	0.611	–1.63	0.10
	Female	34	25.28	4.62	0.792		
Left volume [mm^3]	Male	66	15712.6	4970.3	611.80	–1509.5	0.137
	Female	34	14203.1	4643.8	796.41		

APD — antero-posterior diameter; CCD — cranio-caudal diameter; MD — mean diameter; MSV — volume of the maxillary sinus; N — number; OH — height of Ostium from the floor of the maxillary sinus; p — probability; SD — standard deviation; SEM — standard error of mean; TD — transverse diameter; * p-value < 0.05 statistically significant.

Table 3. Classification Function Coefficients and constants across genders

Parameters	**Gender**			
	Female		**Male**	
	Right	**Left**	**Right**	**Left**
APD	3.103	3.336	2.749	3.297
TD	–0.265	5.357	–0.216	4.723
CCD	–0.289	2.560	–0.287	2.608
HO	0.668	0.620	0.602	0.664
MSV [mm^3]	0.000	–0.007	0.000	–0.006
Constant	-187.598		–168.665	

APD — antero-posterior diameter; CCD — cranio-caudal diameter; MSV — volume of the maxillary sinus; OH — height of Ostium from the floor of the maxillary sinus; TD — transverse diameter.

Table 4. Classification Results of discriminant function analysis of study parameters

		Gender	Predicted Group Membership		Total
			Female	Male	
Original	Count	Female	21	13	34
		Male	7	59	66
	%	Female	61.8	38.2	100.0
		Male	10.6	89.4	100.0
Cross-validated	Count	Female	18	16	34
		Male	12	54	66
	%	Female	52.9	47.1	100.0
		Male	18.2	81.8	100.0

% — percentage