

## Normal palpebral anthropometric measurements in Uygur population: A cross-sectional study

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### Abstract

**Objective:** To provide a normative palpebral database for the Uygur subjects to determine norms that may contribute to the diagnosis and prognosis of eyelid diseases.

**Method:** The cross-sectional study was conducted from March to May 2021 at the First People's Hospital of Kashi, China, and comprised Uygur subjects of either gender aged 18-70 years. The slant, height and width of the palpebral fissure, vertical brow-upper lid distance, intercanthal distance, pupillary distance, brow height, crease height and levator function were measured. Data was analysed using SPSS 22.

**Results:** Of the 335 subjects having mean age  $41.41 \pm 14.53$  years, 165(49.3%) were males with mean age  $41.08 \pm 14.23$  years and 170(50.7%) were females with mean age  $41.74 \pm 14.85$  years. There were 107(31.9%) subjects aged 18-30 years, 115(34.3%) aged 31-50 years and 113(33.7%) aged 51-70 years. Mean palpebral fissure width and margin reflex distance of the palpebrae were significantly different in terms of gender ( $p < 0.05$ ). Age was also a significant factor on several counts ( $p < 0.05$ ).

**Conclusions:** Anthropometric measurements of eyelid in Uygur subjects indicated certain peculiarities.

**Keywords:** Eyelid, Palpebral morphology, Measurement, Epicanthus, Blepharoplasty. (JPMA 73: 796; 2023)

**DOI:** <https://doi.org/10.47391/JPMA.6185>

**Submission completion date:** 11-05-2022 - **Acceptance date:** 01-12-2022

### Introduction

The factors that determine the anatomical characteristics of eyelid structure include age, gender, ethnicity and genetics. Oculoplastic surgery needs correct measurements of the eyelid structure.<sup>1-4</sup> The Uygur community is one of the most important ethnic minorities in China, and 99.4% of them live in the Xinjiang Uygur autonomous region in northwest China, mainly in the oases surrounding the Tarim Basin. Different from the Han population, the facial features of the Uygur population display a blend of Caucasoid and Mongoloid morphological characteristics.<sup>5,6</sup> Anthropometry of Asian and Caucasian eyelids has been widely reported,<sup>7-10</sup> but relevant information about the Uygur population is very rare. For blepharoplasty, including double-eyelid surgery and ptosis correction, it is inevitable to refer to previous statistics, particularly for bilateral surgery.<sup>11,12</sup> As such, normal values of the eyelid in the Uygur population is a critical factor. The current study was planned to provide a normative palpebral database for the Uygur subjects to determine norms that may contribute to the diagnosis and prognosis of eyelid diseases.

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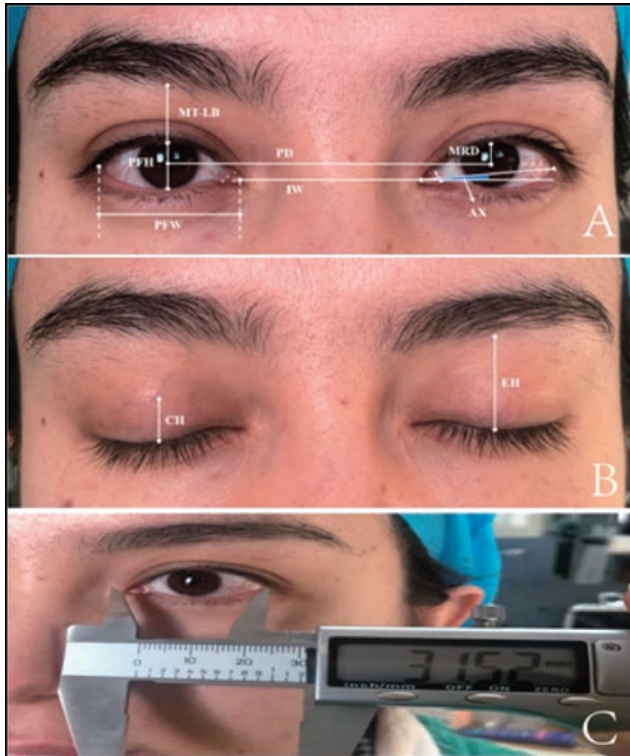
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### Subjects and Methods

The cross-sectional study was conducted from March to May 2021 at the First People's Hospital of Kashi, China. After approval from the institutional ethics review committee, the sample size was calculated in line with previous studies<sup>9,10</sup> using a two-sample t-test with power 0.80, and alpha value 0.05.

Those included were Uygur subjects of either gender aged 18-70 years. Those with congenital craniofacial abnormalities or surgical history of such abnormalities, previous ocular or periocular surgery or trauma, ptosis, eyelid tumour, orbital diseases, Graves' disease were excluded. On the base of a careful analysis of their medical records, subjects' selection was performed. The simple random sampling method without replacement was used. During the study period each subject has the same opportunity to participate in our study. Data was collected after taking written informed consent from all the subjects.

For the purpose of the study, palpebral fissure height (PFH) was defined as the vertical distance between the highest point of the upper eyelid and the lowest point of the lower eyelid; palpebral fissure width (PFW) as the horizontal distance between endocanthion and exocanthion; margin reflex distance (MRD) of the palpebrae was defined as the distance between the centre of the pupil and the highest point of the free margin of the upper eyelid; angle of acclivity (AX) as the inclination of the horizontal axis of the



**Figure:** Items Measured.  
(A: Opened; B: Closed gently; C: Digital caliper measuring the eyelid)

eye between endocanthion and exocanthion; eyebrow height (EH) as the distance between the midtarsal and the lower end of the eyebrow when the eyes of the subjects were closed gently; crease height (CH) as the vertical distance between the highest point of the upper eyelid crease and the highest point of the upper eyelid when the eyes of the subjects were closed gently; intercanthal width (IW) as the horizontal distance between binoculus of endocanthion; distance from the midtarsal to the lower end of the eyebrow (MT-LB) as the vertical distance between the midtarsal related to the lower end of the eyebrow and the highest point of the free margin of the upper eyelid; pupillary distance (PD) as the distance between the centres of the pupils of binoculus; and levator function (LF) as the distance through which the eyelid can pass when looking from downward to upward when pressure is applied over the brow.

During the measurements, the subject and the examiner sat down face-to-face. The structure of the eyelid was measured with a digital caliper. For accuracy, each subject was measured by two examiners, and the average value of the two was taken in case of discrepancy between the two readings. The face photograph was taken with a digital camera (P40, Huawei, China) and measured with a graduated ruler to measure the slant of the palpebral fissure (PF) to obtain an objective measurement (Figure).<sup>13,14</sup>

The subjects were divided into three age groups for comparisons; the youth group aged 18-30 years, the middle-aged group aged 31-50 years, and the old group aged 51-70 years.

Data was analysed using SPSS 22.0. Data was expressed as mean with standard deviation (SD) or frequencies and percentages, as appropriate. Independent t-test was used to compare gender groups, while one-way analysis of variance (ANOVA) was used to compare the age groups. Chi-square was used to analyse the distribution differences of eyelid profiles among the age groups.  $P < 0.05$  was considered statistically significant.

**Results**

Of the 335 subjects having mean age  $41.41 \pm 14.53$  years, 165(49.3%) were males with mean age  $41.08 \pm 14.23$  years and 170(50.7%) were females with mean age  $41.74 \pm 14.85$  years. There were 107(31.9%) subjects aged 18-30 years, 115(34.3%) aged 31-50 years and 113(33.7%) aged 51-70 years.

**Table-1:** Comparison between between gender groups.

	Male Mean±SD	Female Mean±SD	p-value
PFW (mm)	29.75±1.27	29.25±1.60	0.001
PFH (mm)	9.87±0.82	9.84±0.95	0.769
MRD (mm)	3.67±0.49	3.79±0.55	0.033
AX (deg)	9.38±0.51	9.32±0.54	0.311
EH (mm)	20.25±1.80	20.63±2.20	0.086
CH (mm)	7.78±1.54	7.63±1.59	0.394
IW (mm)	30.29±1.46	30.63±1.82	0.053
MT-LB (mm)	10.19±1.37	10.04±1.69	0.366
PD (mm)	61.37±2.95	61.11±2.98	0.427
LF (mm)	13.07±0.69	13.08±0.86	0.965

SD: Standard deviation, PFW: Palpebral fissure width, PFH: Palpebral fissure height, MRD: Margin reflex distance, AX: Angle of acclivity, EH: Eyebrow height, CH: Crease height, IW: Intercanthal width, MT-LB: Midtarsal to the lower end of eyebrow, PD: Pupillary distance, LF: Levator function.

**Table-2:** Comparison among age groups.

	18-30 years group-A Mean±SD	31-50 years group-B Mean±SD	51-70 years group C Mean±SD	p-value		
				A	B	C
PFW (mm)	29.67±1.54	29.49±1.54	29.33±1.30	0.345	0.089	0.438
PFH (mm)	10.17±0.80	10.04±0.90	9.35±0.72	0.236	<0.001	<0.001
MRD (mm)	3.93±0.45	3.83±0.53	3.44±0.45	0.381	<0.001	<0.001
AX (deg)	9.39±0.59	9.46±0.55	9.20±0.39	0.716	0.025	<0.001
EH (mm)	20.05±1.99	21.18±2.29	20.06±1.48	<0.001	0.879	0.003
CH (mm)	8.01±1.60	7.97±1.63	7.13±1.31	0.862	<0.001	<0.001
IW (mm)	30.60±1.70	30.77±1.72	30.03±1.46	0.446	0.010	0.001
MT-LB (mm)	9.88±1.52	10.35±1.65	10.11±1.42	0.023	0.272	0.236
PD (mm)	61.34±3.08	61.91±2.96	60.46±2.69	0.141	0.026	<0.001
LV (mm)	12.96±0.73	13.10±0.80	13.07±0.79	0.174	0.055	0.565

SD: Standard deviation, PFW: Palpebral fissure width, PFH: Palpebral fissure height, MRD: Margin reflex distance, AX: Angle of acclivity, EH: Eyebrow height, CH: Crease height, IW: Intercanthal width, MT-LB: Midtarsal to the lower end of eyebrow, PD: Pupillary distance, LF: Levator function.

Mean PFW and MRD values were significantly different in terms of gender ( $p < 0.05$ ) (Table 1). With respect to age, EH was significant in those aged 18-30 years, while values for PFH, MRD, AX, CH, IW and PD were significant in those aged 31-50 years, and PFH, MRD, AX, EH, CH, IW, and PD were significant in those aged 51-70 years (Table 2).

## Discussion

In oculoplastic surgery, normal palpebral anthropometry comprises basic anatomical parameters. Recognising growth patterns and eyelid norms of specific populations help oculoplastic surgeons determine the optimal time and the dimension for surgeries.<sup>12,15,16</sup> There are many nationalities in China. Certainly, there are some variations among different nationalities, but reports regarding anthropometry of the eyelid in the Uygur population are scarce. The current study investigated the eyelid dimensions of adults in the Uygur population. The participants were categorised by age according to age-related distinctiveness in the ocular landmarks.<sup>17</sup> A total of 335 volunteers were recruited aged 18-70 years; 170 females and 165 males, and >100 subjects in each age group. The sample was representative of the Uygur-inhabited area.

A distinctive feature of the eye morphology of Asians is the epicanthus<sup>18</sup> but in the present study, epicanthus was rarely observed in adult ages. Double eyelid crease is considered aesthetically pleasing by many. According to the morphological features of upper eyelid shape, the eyelid crease is classified into five types: the single-fold eyelid crease (type I), the parallel-fold (type II), the open-ended crescent (type III), the classic crescent (type IV), and the hidden-fold (type V) eyelid. About 40% of the Han Chinese population has type I eyelid crease.<sup>19-21</sup> But, like the Caucasians, Uygur population in the study predominantly had wider double eyelid creases, mostly type II. In addition, the study noted that CH was similar across the gender, and the changes of CH with age may affect eye morphologies.

The anthropometric values can be greatly affected by the aging of facial soft tissues during adulthood. The longitudinal anthropometric parameters, such as PFW and IW, can be partly influenced by the medial and lateral canthal tendons.<sup>4,22</sup> The shortening of PFW and the widening of IW may be due to the laxation of tendinous support, leading to the release of canthal structures. The possible loss of tensile stretch from lid retraction by the levator muscles, and the weigh-down of upper-lid tissues could have an impact on latitudinal parameters, such as PFH, MRD, EH and MT-LB.

In the current study, PFH and MRD had the greatest mean

change percentages of all parameters, and this discovery could prove that they can cause shapes and sizes of the eye to change in fissures with ages.

Compared to a study on Han population,<sup>22</sup> the majority of the eyelid linear measurements suggested that the Uygur population had greater dimensions than those in the Han population, including MRD, EH, PFW and PFH. In Han young male adults, the mean PFW was reported to be 28.24 mm,<sup>23</sup> which was shorter than the Uygur population (29.67 mm).

The AX was not significantly different between the genders in the current study, and no significant change was seen with increasing age. Compared to the Han population's measurements,<sup>22</sup> the Uygur adults had a flatter palpebral slant. The LF was similar in males and females, which remained stable with age.

The current study has limitations as it did not consider the height of the body which may have a relationship with anthropometric values. Also, the cross-sectional design of the study also limited the scope of the study.

## Conclusion

Anthropometric measurements of eyelids in Uygur subjects indicated certain peculiarities. A normative and standard palpebral database for the Uygur population maybe contribute to the diagnosis and prognosis of eyelid diseases, and can be used as an important reference for blepharoplasty in the specific population.

**Disclaimer:** None.

**Conflict of Interest:** None.

**Source of Funding:** Pearl River Scholars, Tianshan Mountain Meritocrat, Cooperative Innovation Team of the First People's Hospital of Kashi, China (KDY202018).

## References

1. Sforza C, Grandi G, Catti F, Tommasi DG, Ugolini A, Ferrario VF. Age- and sex-related changes in the soft tissues of the orbital region. *Forensic Sci Int* 2009; 185: 115.e1-8.
2. Erdoğan K, Tatlısumak E, Ovalı GY, Pabuşçu Y, Tarhan S. Age- and sex-related morphometric changes and asymmetry in the orbito-zygomatic region. *J Craniofac Surg* 2021; 32: 768-70.
3. Kiranantawat K, Suhk JH, Nguyen AH. The Asian eyelid: relevant anatomy. *Semin Plast Surg* 2015; 29: 158-64.
4. Damasceno RW, Avgitidou G, Belfort R Jr, DantaS PE, Holbach LM, Heindl LM. Eyelid aging: pathophysiology and clinical management. *Arq Bras Oftalmol* 2015, 78: 328-31.
5. Feng Q, Lu Y, Ni X, Yuan K, Yang Y, Yang X, et al. Genetic history of Xinjiang's Uyghurs suggests bronze age multiple-way contacts in Eurasia. *Mol Biol Evol* 2017; 34: 2572-82.
6. Yao H, Wang M, Zou X, Li Y, Yang X, Li A, et al. New insights into the fine-scale history of western-eastern admixture of the northwestern Chinese population in the Hexi Corridor via genome-wide genetic

- legacy. *Mol Genet Genomics* 2021; 296: 631-51.
7. Erbagci I, Erbagci H, Kizilkan N, Gumusburun E, Bekir N. The effect of age and gender on the anatomic structure of Caucasian healthy eyelids. *Saudi Med J* 2005; 26: 1535-8.
  8. Pelletier AT, Few JW. Eyebrow and eyelid dimensions: an anthropometric analysis of African Americans and Caucasians. *Plast Reconstr Surg* 2010; 125: 1293-4.
  9. Li Q, Zhang X, Li K, Quan Y, Cai X, Xu S, et al. Normative anthropometric analysis and aesthetic indication of the ocular region for young Chinese adults. *Graefes Arch Clin Exp Ophthalmol* 2016; 254: 189-97.
  10. Wu XS, Jian XC, He ZJ, Gao X, Li Y, Zhong X. Investigation of anthropometric measurements of anatomic structures of orbital soft tissue in 102 young Han Chinese adults. *Ophthalmic Plast Reconstr Surg* 2010; 26: 339-43.
  11. Chong Y, Li J, Liu X, Wang X, Huang J, Yu N, et al. Three-dimensional anthropometric analysis of eyelid aging among Chinese women. *J Plast Reconstr Aesthet Surg* 2021; 74: 135-42.
  12. Chen WP, Park JD. Asian upper lid blepharoplasty: an update on indications and technique. *Facial Plast Surg* 2013, 29: 26-31.
  13. Coombes AG, Sethi CS, Kirkpatrick WN, Waterhouse N, Kelly MH, Joshi N. A standardized digital photography system with computerized eyelid measurement analysis. *Plast Reconstr Surg* 2007; 120: 647-56.
  14. Prakalapakorn SG, Weinert MC, Stinnett SS. Photographic assessment of eyelid position using a simple measurement tool paired with cell phone photography in a pediatric population. *J AAPOS* 2021; 25: 281-9.
  15. Cai X, Chen Y, Li Q, Ma H, Tang Z, Nie C, et al. Anthropometric analysis on the ocular region morphology of children and young adults in Chinese Han population. *Ophthalmic Plast Reconstr Surg* 2019; 35: 326-32.
  16. Rhee SC, Woo KS, Kwon B. Biometric study of eyelid shape and dimensions of different races with references to beauty. *Aesthetic Plast Surg* 2012; 36: 1236-45.
  17. Akita S, Maki S, Shiko Y, Kawasaki Y, Yamaji Y, Tokumoto H, et al. Eyelid crease height affects the evaluation of age-related changes in the eyelids. *Plast Reconstr Surg Glob Open* 2021; 9: e3909.
  18. Saonanon P. The new focus on epicanthoplasty for Asian eyelids. *Curr Opin Ophthalmol* 2016; 27: 457-64.
  19. Vaca EE, Bricker JT, Helenowski I, Park ED, Alghoul MS. Identifying aesthetically appealing upper eyelid topographic proportions. *Aesthet Surg J* 2019; 39: 824-34.
  20. Hwang HS, Spiegel JH. The effect of "single" vs "double" eyelids on the perceived attractiveness of Chinese women. *Aesthet Surg J* 2014; 34: 374-82.
  21. Lee CK, Ahn ST, Kim N. Asian upper lid blepharoplasty surgery. *Clin Plast Surg* 2013, 40: 167-78.
  22. Oztürk F, Yavas G, Inan UU. Normal periocular anthropometric measurements in the Turkish population. *Ophthalmol* 2006, 13: 145-9.
  23. Ma H, Chen Y, Cai X, Tang Z, Nie C, Lu R. Effect of aging in periocular appearances by comparison of anthropometry between early and middle adulthoods in Chinese Han population. *J Plast Reconstr Aesthet Surg* 2019; 72: 2002-8.
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