

## Central Corneal Thickness in the Healthy Guinean Population

Fadima Tamim Hann<sup>1</sup>, Mahmoud Anis<sup>2\*</sup>, Bah Thierno Madjou<sup>3</sup>, Sovogui Maxime Dantouma<sup>3</sup>, and Mohamed Habib Diané<sup>1</sup>

<sup>1</sup>Medical ophthalmologic center, Manquepas, Conakry, Republic of Guinea.

<sup>2</sup>Department of Ophthalmology, Tahar Sfar University Hospital, Mahdia5100, Tunisia.

<sup>3</sup>Faculty of Health Sciences and Technology/University of Conakry.

### \*Correspondence:

Mahmoud Anis, Department of Ophthalmology, Tahar Sfar University Hospital, Mahdia 5100, Tunisia.

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### ABSTRACT

**Purpose:** The aim of this study was to describe the distribution of central corneal thickness (CCT) in healthy Guinean populations and to determine correlations with age, sex, axial length and refraction.

**Methods:** We conducted an observational study on 225 eyes of healthy Guinean patients. All patients underwent a complete ophthalmological examination and measurement of CCT by anterior segment optical coherence tomography (DRI TRITON OCT). Axial length (AL) was determined by A-mode ultrasound (NIDEK- US-4000, Tokyo, Japan).

**Results:** In all, 225 eyes were examined. Central corneal thickness was 508  $\mu\text{m}$  (ranging from 419 to 599 $\mu\text{m}$ ). There was no statistically significant correlation between central corneal thickness and age, sex, axial length and refractive error.

**Conclusions:** CCT in the healthy Guinean population was found to be lower compared with CCT values in other parts of the world. Adjustment of IOP values by a correction factor appears necessary for many Guinean patients. These results still need to be confirmed by larger-scale multicenter studies.

### Keywords

Cornea, Central corneal thickness, Optical coherence tomography, Intraocular pressure, Guinea.

### Introduction

Central corneal thickness (CCT) is an essential measure for evaluating glaucoma, the outcomes of refractive surgery, and numerous corneal conditions. Its role is particularly crucial when it comes to interpreting intraocular pressure (IOP). Despite its importance in clinical settings, there has been limited research on CCT measurements in African nations, including Guinea. This study is designed to detail how central corneal thickness is distributed in the Guinean population.

### Materials and Methods

A prospective, descriptive study was carried out on the right eyes of 225 healthy Guinean participants with normal ocular findings,

who were randomly chosen in Guinea from June 2023 to June 2024.

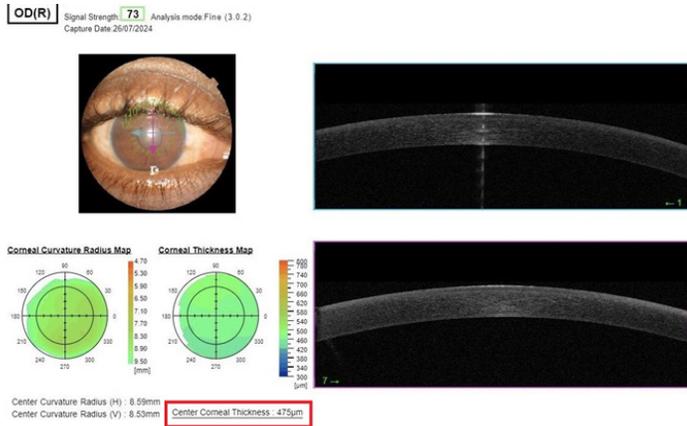
Patients with open-angle glaucoma, a history of ocular surgery, corneal ectatic disorders (such as keratoconus) or other corneal diseases, as well as individuals with past ocular trauma, were not included in the study.

Every participant underwent a complete ophthalmologic exam performed by the same specialist. This assessment included automated refraction (AR) with the calculation of the spherical equivalent, axial length (AL) measurement, and evaluation of CCT.

Central corneal thickness was assessed using the anterior segment module paired with the AA-1 attachment kit (Topcon, DRI TRITON, Tokyo, Japan), with micrometer ( $\mu\text{m}$ ) values

automatically determined via anterior radial scanning (Figure 1). Additionally, the study investigated the relationship between CCT and factors such as age, refractive error, axial length, and gender.

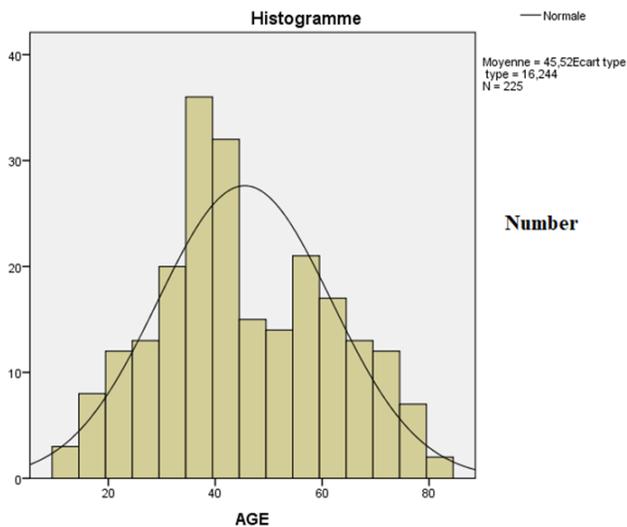
All participants were given a thorough explanation of the procedures, and oral consent was obtained before their examinations.



**Figure 1:** Photo of an optical coherence tomography cross-section of the anterior segment illustrating the measurement of central corneal thickness.

### Study Results

**Demographic Data:** The study involved 225 right eyes from 225 healthy subjects. The participants ranged in age from 12 to 84 years, with an average age of  $45 \pm 16$  years (Figure 2). The gender ratio was 0.97, with 114 women and 111 men.



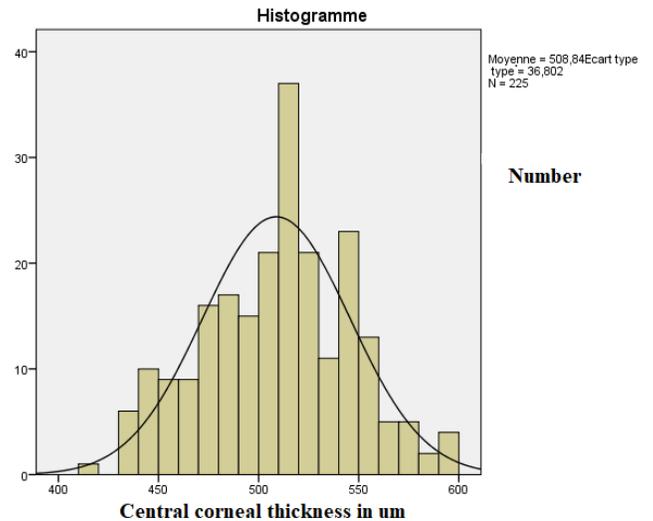
**Figure 2:** Histogram showing the distribution of patients by age.

**Refraction Study:** The subjects' average visual acuity was 7/10, with a median of 9 and a standard deviation of 3. The spherical equivalent refraction ranged from -7 diopters (D) to +5 D, with an average of -0 D and a standard deviation of 1 D. Among the participants, 156 (69%) were emmetropic, having an automatic spherical equivalent refraction between -1 D and +1 D. There were 15 myopic subjects (6%) with a refraction below -1 D, and 51

hyperopic subjects (22%) with a refraction above +1 D.

**Axial Length Study:** The axial length of the participants' eyes ranged from 21 mm to 26 mm, with both the mean and median measuring 23.51 mm, and a standard deviation of 0.9 mm.

**Central Corneal Thickness Study:** Central corneal thickness ranged from 419  $\mu\text{m}$  to 599  $\mu\text{m}$ , with a mean of 508  $\mu\text{m}$  and a standard deviation of 36  $\mu\text{m}$ . In this population, 36.5% of subjects had a central corneal thickness below 500  $\mu\text{m}$ , while 86.6% had a central corneal thickness below 550  $\mu\text{m}$  (Figure 3).



**Figure 3:** Histogram showing the distribution of central corneal thickness.

**Study of Relationships and Correlations:** Relationship Between CCT and Age: The study did not reveal any statistically significant link between central corneal thickness (CCT) and the age of the participants ( $p = 1$ ). Difference in CCT Between Sexes: The results show that central corneal thickness was greater in female subjects. On average, the CCT was 510  $\mu\text{m}$  in women compared to 507  $\mu\text{m}$  in men. This difference was not statistically significant ( $p = 0.88$ ). Relationship Between CCT, Refraction, and Axial Length: The study did not establish a significant link between CCT and the refraction parameters ( $p = 1$ , Table 1) or between CCT and the axial length of the eye ( $p = 1$ , Table 2). In summary, although the central corneal thickness is slightly higher in women, no correlation was observed between CCT and age, sex, refraction, or axial length in this population.

Refraction	N	CCT ( $\mu\text{m}$ )	Standard deviation
-7 -5,01	2	475,00	60,000
-5 -3,01	2	466,00	28,000
-3-1,01	11	493,00	35,000
-10,99	159	510,00	34,000
12,99	46	507,00	41,000
35	5	526,00	42,000
Total	225	508,00	36,000

**Table 1:** Distribution of central corneal thickness according to spherical equivalent refraction classes.

Axial length	N	CCT ( $\mu\text{m}$ )	Standard deviation
21 -21,99	8	486,00	43,000
22 – 22,99	51	512,00	34,000
23-23,99	108	508,00	37,000
24- 24,99	48	512,00	32,000
$\geq 25$	10	488,00	43,000
Total	225	508,00	36,000

**Table 2:** Distribution of central corneal thickness according to axial length classes.

## Discussion

Central corneal thickness has been examined in various studies conducted in several countries [1-7]. The average CCT values vary from one population to another, with an average of 556  $\mu\text{m}$  observed in Chinese populations [4,8], 517  $\mu\text{m}$  in Japanese populations [6], 539  $\mu\text{m}$  in German populations [9], and 518  $\mu\text{m}$  in North African populations [10]. In a study conducted by Lazreg et al. [10] on a population of 1,662 North Africans and French subjects focusing on central corneal thickness (CCT), the results showed that CCT was statistically lower in North Africans than in the French, with respective values of 518  $\mu\text{m}$  and 553  $\mu\text{m}$  ( $p < 0.0001$ ). Two similar studies [11,12] on the evaluation of central corneal thickness performed in sub-Saharan African populations revealed that this thickness was lower than that observed in other regions of the world. Eballe et al. [11] studied the distribution of CCT in 485 non-glaucomatous patients in Cameroon, finding an average of 529.29  $\mu\text{m}$ . Meanwhile, Ayena et al. [12] analyzed CCT in 1,205 individuals in Togo, reporting an average value of 532.56  $\mu\text{m}$ . Our study is the first to have been conducted in Guinea, and it revealed that the central corneal thickness ranged between 419  $\mu\text{m}$  and 599  $\mu\text{m}$ , with a mean of  $508 \pm 36 \mu\text{m}$ . This average CCT is lower than that observed in European, North African, and even sub-Saharan African populations. The implications of this difference in average CCT are considerable and important for a better evaluation of IOP. Thus, glaucoma patients in the Guinean population will need to maintain a lower IOP level. In our study, central corneal thickness was slightly higher in women, but there was no significant difference between the sexes. Likewise, no statistically significant correlation was found between CCT and age, axial length (AL), or automatic refraction (AR). These results are consistent with several previous studies that also did not establish a link between CCT and these factors [6-9].

## Conclusion

The normal value of CCT in the Guinean population was 508  $\mu\text{m}$ , which is lower than that observed in the rest of the world. In our study, we did not find a statistical association between CCT, age, sex, axial length, or refractive disorders. These findings need to be further confirmed by larger multicenter studies.

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