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A CROSS-SECTIONAL RESEARCH TO COMPARE CENTRAL CORNEAL THICKNESS VARIATION IN 150 DIABETIC RETINOPATHY PATIENTS

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Abstract:

Objective: *This research aimed at comparing (central corneal thickness) between those patients having non-diabetics & diabetic retinopathy.*

Methods: *We held a cross-sectional research at Allied Hospital, Faisalabad from October 2016 to November 2017 on 150 patients of different ages were finalized for research. To calculate CCT, an (ultrasound pachymeter) was used. Two groups of each 75 patients for a sample in which 1 group was with (diabetic retinopathy) & other with (non-diabetic) patients.*

Results: *Patients with diabetes have the average (central corneal thickness) having value (554.93 ± 33.73) microns & it was (520.41 ± 26.06) microns with non-diabetic patients. Patients with diabetic demonstrated enhanced (central corneal thickness) in comparison with (non-diabetics) & result was significant statistically as p = 0.001.*

Conclusion: *Patients with diabetic demonstrated enhanced (central corneal thickness) in comparison with (non-diabetic patients).*

Keywords: *Diabetic retinopathy, Diabetes mellitus, Central corneal thickness.*

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INTRODUCTION:

Major health issue worldwide is (diabetes mellitus). This is linked with significant morbidity because of its (microvascular complications) as retinopathy, nephropathy
& neuropathy. Some (macro vascular complications) like peripheral vasculopathy & (ischemic heart disease) are linked with it also and may affect all ages like adults, young & children. Commonly significant complications in (diabetes mellitus) are ocular complications & are becoming now mostly the world's significant causes of (morbidity).

With early diagnosis & timely cure, many complications can be avoided [1]. The (diabetes mellitus) is severe (metabolic disease) & is spreading speedily because of increase in physical inactivity, an incidence of obesity, urbanization, population size & ageing [2]. Diabetes patients (develop complications) in all parts of an eye but usually with (diabetic retinopathy) with (keratoepitheliopathy) & (corneal endothelial damage) like superficial punctate keratitis, (recurrent corneal erosions) & (persistent epithelial defects) [3, 4].

This disease regularly harms (corneal sensitivity) in diabetic patients & almost twenty per cent of patients suffer a degree of decreased (corneal sensations) [5]. In increasing in thickness of (corneal epithelial basement membrane), (corneal morphological) changes involve (stunting of surface cell microvilli), irregular cellular distribution, polymegethism & polymorphism [6, 7].

Changes lead to loss of (epithelial barrier function) resulting to a five-fold enhance in (corneal epithelial permeability) & also a loss of (a function of corneal endothelium) [8, 9, 10]. Many alterations are found in (corneal endothelial) cell morphology in all patients of (diabetic retinopathy). It is considered as linked to (chronic metabolic) changes at cellular level resulting in abnormalities in (endothelial cell layer). By losing these (endothelial cells) leads to enhance (stromal hydration) which may lead to enhanced (central corneal thickness) [11].

The (massive thickening) of all basement membranes have its link with long-term (diabetic retinopathy). Due to these morphological variations, a frequency of success of (corneal transplant) in (diabetic patients) is adversely affected [12]. As they have lower (corneal healing), so refractive surgery is of large importance for diabetic patients [13].

For patients of (diabetes mellitus), refractive surgery in which (LASIK) is included is presently a (relative contra-indication). Delay in wound healing & weak immune response with many (pathologic-changes in the cornea) in diabetic patients resulted in reservations of doing (refractive surgery) in such patients [14].

Measurement of CCT i.e. (central corneal thickness) presently needs (glaucoma management). This is obvious that the danger of (intraocular pressure) & (glaucomatous optic neuropathy) levels are influenced by (CCT) [15]. Our study aimed at enhancing awareness in (eye-care professionals) regarding the strong link in (increased corneal thickness) & (diabetic retinopathy) which can badly affect the wrong estimation of (intra-ocular pressure).

It then results in the inaccurate interpretation of the patient with (glaucoma) which leads to unnecessary treatment & investigations of patients. The study aimed at comparing (central corneal thickness) among patients for (diabetic retinopathy) & (non-diabetics). It also determines whether it is enhanced in case of diabetic retinopathy so that a (correction factor) may be used in (thicker corneas) to have an accurate estimation of (intra-ocular pressure).

MATERIAL AND METHODS:

We held a cross-sectional research at Allied Hospital, Faisalabad from October 2016 to November 2017 on 150 patients of different ages were finalized for research. Total 150 patients both female & male of age between (20 – 80) years were included in the research. WHO (sample size calculator) as 7.4 was used for significance level five per cent, the anticipated population mean (518.4116), population (SD 28.505), test value of the population mean (541.61) & 95% power of the test.

Seventy-five patient was taken as a sample size in every group. Following patients were excluded: (history of contact lens use), (ocular trauma), (corneal or media opacity) & with a history of recent (eye surgery). Both patients with (diabetic retinopathy) & (non-diabetics) were included who have (intraocular pressure) & (reliable visual fields).
All patients were put to auto-refraction & (measurement of eyes with visual acuity) as a protocol were taken by a (random masked examiner). Patients underwent anterior segment, fundus examination & history after informed consent. Two groups were made in that group one was a control group having no diabetes & (normal healthy eyes). Group two comprised those patients having eyes with (diabetic retinopathy) in which (proliferative diabetic retinopathy) i.e. PDR & (non- proliferative diabetic retinopathy) i.e. NPDR.

The patients were put to (Quantal-Ultrasonic pachymetry) of (model class-II), (type BF) & it was made in France. To avoid transferring (infectious diseases), the probe was disinfected for each patient with (alcohol swab). The (CCT) was calculated in the only right eye for easy analysis, standardization & to minimize chances of bias. Average of 10 readings were measured for every subject & (CCT) values were taken by (trainee researcher).

The SPSS software was used for analysis. For the age of the patient, (mean ± standard deviation) was measured. (CCT), difference of mean CCT among (diabetic patients) & 2 sample t-test were used for assessing controls & ($p < 0.05$) was thought significant.

RESULTS:

In the control group, the average age was (34.07 years) & in (diabetic retinopathy) group it was (57.21 years) as Table – I. Same way there were 34 females & 41 males were in (control group) & 25 females and 50 males were in (diabetic retinopathy group) as Table – II.

Standard deviation & mean for (CCT) in micro-meter in the first group was (520.41 ± 26.06 µm) & standard deviation & mean for CCT in micro-meter in the second group was (554.93 ± 33.73 µm) as table-3. The diabetic retinopathy patients have increased in (central corneal thickness) was compared to (non-diabetic patients) was significant statistically.

Table – I: Age distribution in control and study group

Group Age in Years	Mean	± SD
Control (non-diabetic)	34.07	10.94
Cases (diabetic)	57.21	8.53

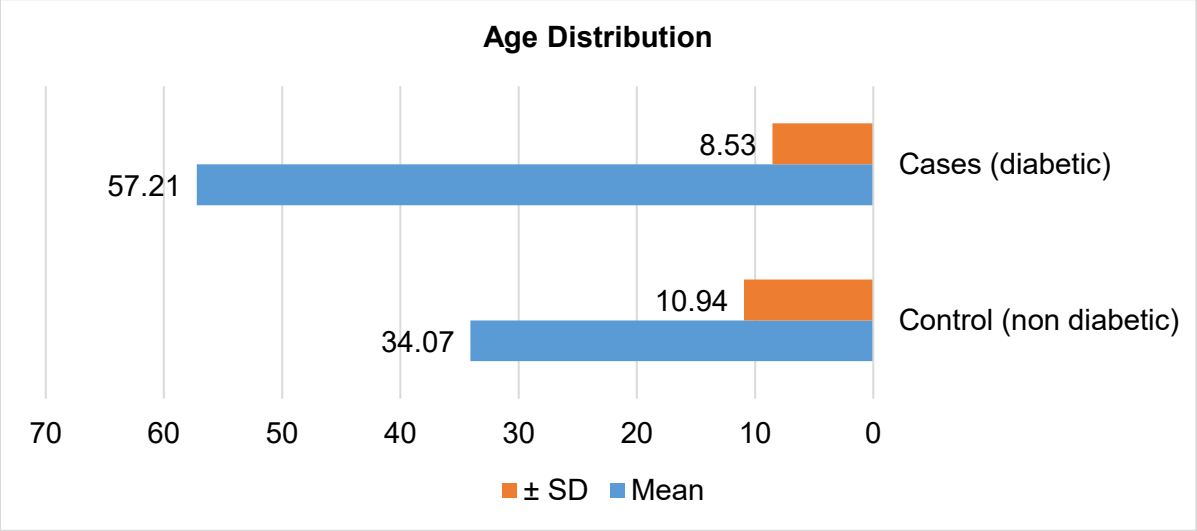


Table – II: Gender distribution in control and study group

Group	Male		Female	
	Number	Percentage	Number	Percentage
Control	41	54.7	34	45.3
Study	50	66.7	25	33.3
Total	91	60.7	59	39.3

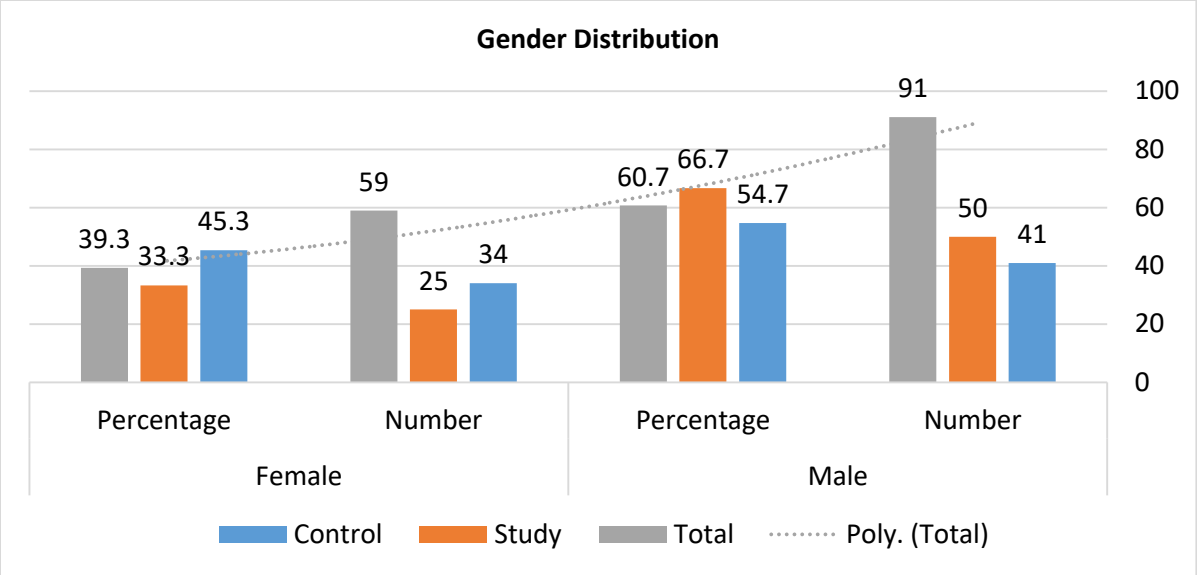
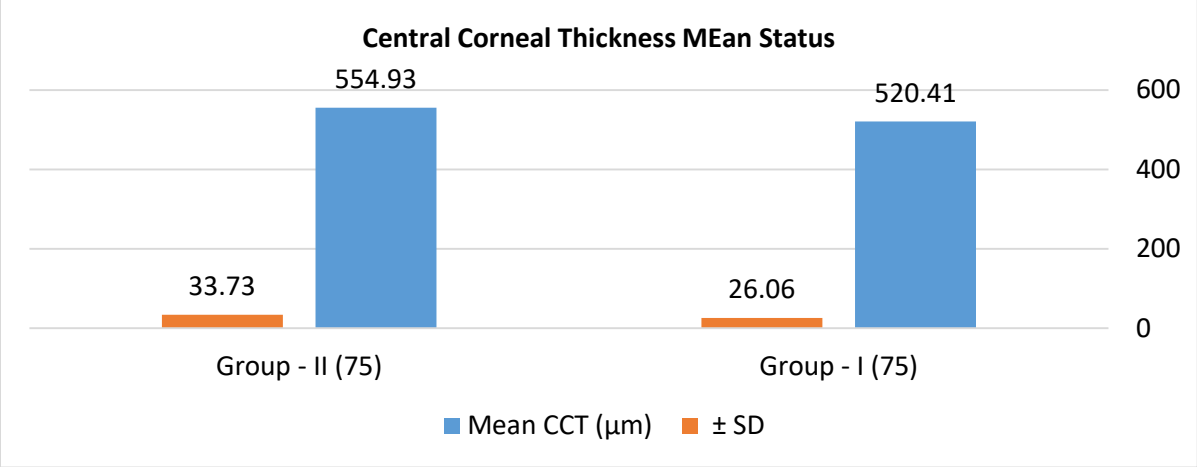


Table – III: Mean status of central corneal thickness in both groups

Groups	Mean CCT (µm)	± SD	*p*-value
Group – I (75)	520.41	26.06	*0.001*
Group – II (75)	554.93	33.73	



DISCUSSION:

Diabetes mellitus is spreading worldwide which is causing a serious burden on health & is reported presently up to (56.9%) [17]. Our present study does not recognize the reason for its spreading while we can guess the reason for it like obesity, lack of regular screening of diabetic, smoking, hyperlipidemia, long duration of diabetes, (low compliance to treatment), (lack of patient education), (poor diabetic control) & retinopathy.

In the diabetic population, the main cause of (visual impairment) is (diabetic retinopathy) which is a basic reason for blindness in (adults) [18]. Diabetes is affecting all eye tissues badly so it is important to diagnose early changes in (ocular tissue) for its suitable management.

The effects of (diabetic retinopathy) on (thickness of cornea) & its implications are investigated in this research. There is an increase in (corneal thickness) in patients having (diabetic retinopathy). This research demonstrates a contrast among (CCT) of patients having (diabetic retinopathy) with patients having no diabetes & is free from IOP, age & other factors.

Patients having (diabetic retinopathy) had (central corneas) on average & (34.52 microns). It is much thicker as compared to those having no (diabetes mellitus) & average CCT was enhanced positively

with (diabetic retinopathy) & also it was the same in both genders.

Diabetics have changed (corneal structure) & (corneal hydration) is affected by (hyperglycaemia) resulting in changes in (corneal thickness) was shown by McNamara et al. [19]. Other research by (Sonmez et al.) found (hyperglycaemia) causing a refractive change in diabetic patient's cornea identified by (corneal topography) [20]. Patients having diabetes ten or more years have advanced (corneal morphological abnormalities) found by (Lee et al.) [21]. He observed that the duration of a disease has a correlation with (central corneal thickness). (Busted et al) observed diabetics having increased (thickness of corneas) as compared to normal people [10].

(Abdul Ghani) & co-workers made an important correlation between (central corneal thickness) & duration of (diabetic retinopathy) & found that (CCT) had grown as (diabetic retinopathy) grows [16]. (Zaidi et al) showed that it took a long time for (damaged-corneal tissue) to recover than (normal population) [22].

As there is already (structural damage) in (corneal endothelium) in patients so a more (functional disorder) can be induced by less oxygen supply or dangerous stimulus as trauma & stress.

Another study by (Skarbez et al) found that enhancement in (central corneal thickness) can be a first detectable (corneal change) in patients having (diabetic eye disease) & results were consistent with past studied conducted internationally [16, 23]. Link among glaucoma & (central corneal thickness) is established already.

Day et al. observed that IOP & age are clearly linked with (CCT) & (central corneal thickness) must be considered as a risk factor in the identification of glaucoma. (Sng et al.) showed the (central corneal thickness) can damage accuracy of (IOP) calculations & should be considered in management & identification of glaucoma [24].
Much thicker corneas in diabetes are one of (un-noticed signs) of (diabetic retinopathy).

Our research has lesser patients from an urban area so studies on a bigger scale including (rural people) are needed for spreading awareness among people about (diabetic retinopathy). It will also discuss the side effects of (ocular tissues) with the potential advantages of managing it successfully.

CONCLUSION:

As compared to (non-diabetic), diabetic patients demonstrated an increased (central corneal thickness).

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