



Incidence of Corneal Hypoesthesia in Diabetic Patients of Governorate of South Batinah, Oman

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Abstract

Background: *The incidence of diabetes mellitus and its complications have increased considerably worldwide including Oman. Diabetic keratopathy is a common, but underdiagnosed, ocular complication of diabetes mellitus that has a significant ophthalmic load everywhere. It is characterized by progressive damage of corneal nerves, due to diabetes-induced chronic hyperglycemia*

Methods & Materials: *Approval was taken from local ethical committee. In this prospective study, we assessed the corneal sensations of 175 patients [350 eyes] in both, type one as well as type two diabetes. Patients were then divided in three groups, with normal corneal sensations, with reduced corneal sensations and lastly with absent corneal sensations.*

Result: *40% of the eyes with mean diabetic age of seven years showed normal corneal sensation, 56% of the patients with mean diabetic age of 13.4 years showed reduced sensation, while six percent of the patients with mean diabetic age of 20.17 years showed absent corneal sensation.*

Conclusion: *We have shown a significant association between the duration of diabetes and reduced or absent corneal sensitivity. Another association we could co-relate is higher the incidence of proliferative or non-proliferative diabetic retinopathy, higher the chances of corneal hypoesthesia.*

Key Words: *Diabetes mellitus, Diabetic keratopathy, Diabetic retinopathy, Esthesiometry, Corneal sensation, Corneal Neuropathy.*

Background

Diabetes mellitus is a major disease worldwide, and the incidence of diabetes has risen markedly in the past few decades in Oman. According to one study (1) done in Oman, prevalence of Type two Diabetes Mellitus in Oman varied from 10.4% to 21.1%. Diabetic neuropathies characterized by a progressive loss of nerve fibers are common complications affecting about fifty percent of patients with diabetes (2)

Cornea is extremely sensitive ocular tissue because of innervation derived from the ophthalmic division of the trigeminal nerve; this provides the cornea with a density of corneal epithelial nerves three hundred

to six hundred times higher than that of the skin with approximately 7000 nociceptors/mm sq (3). Corneal sensitivity is most acute in the central cornea and along the horizontal meridian, least sensitive along the vertical meridian (4)

A decrease in corneal sensitivity may cause a delay in epithelial wound healing and be the cause of recurrent erosions. This is because the corneal nerves release epitheliotropic substances that promote the maintenance of the integrity of corneal surface (5). The maintenance of the corneal sensitivity, blink reflex, and the regulation of corneal wound healing is led by corneal innervation.

It is generally agreed that diabetic patients have reduced corneal sensitivities as part of a polyneuropathy, and if severe enough, the condition may become manifest as diabetic keratopathy. The literature, however, is full of conflicting reports with regards to predictive factors such as duration of disease and degree of corneal hypoesthesia. We therefore sought to evaluate the corneal sensitivities of a cohort of diabetic patients at our institution to determine whether there is a relationship between the degree of corneal hypoesthesia and duration of diabetes.

Methods & Material

In this prospective study, approval was taken from local ethical committee of Governorate of South Batinah, Oman. 175 diabetic patients underwent assessment for the corneal sensation and were divided into three groups: Normal sensation, Reduced sensation, and Absent sensation. Corneal sensation was analyzed according to corneal touch and resulting blink reflex response. Normal corneal sensation was recorded when there was immediate blink response on corneal touch, reduced corneal sensation was considered when there was delayed blink reflex upon corneal touch, while absent corneal sensation was considered when there was no blink reflex upon corneal touch. Due to non-availability of the Cochet-Bonnet esthesiometer traditional method with cotton tip applicator [Figure-one] was used to check the corneal sensation in central part of the cornea after asking the patient to look up.

Out of these 175 patients six had type-one diabetes while remaining 169 had type-two diabetes. Exclusion criteria for the study group was One: Diabetic duration less than one year, two: past corneal surgeries including cataract surgery, corneal transplant, and refractive surgeries, Three: past history of corneal injury, Four: macular or leucomatous corneal opacity and Five: History of viral keratitis in any eye. All diabetic patients were selected randomly and were evaluated with the cotton tip applicator. The average age of all the patients selected was 54.92 years [with standard deviation of 11.7 years]. All the patients have the confirmed history of diabetes of more than one year duration. Verbal consent was taken from each patient.



Results

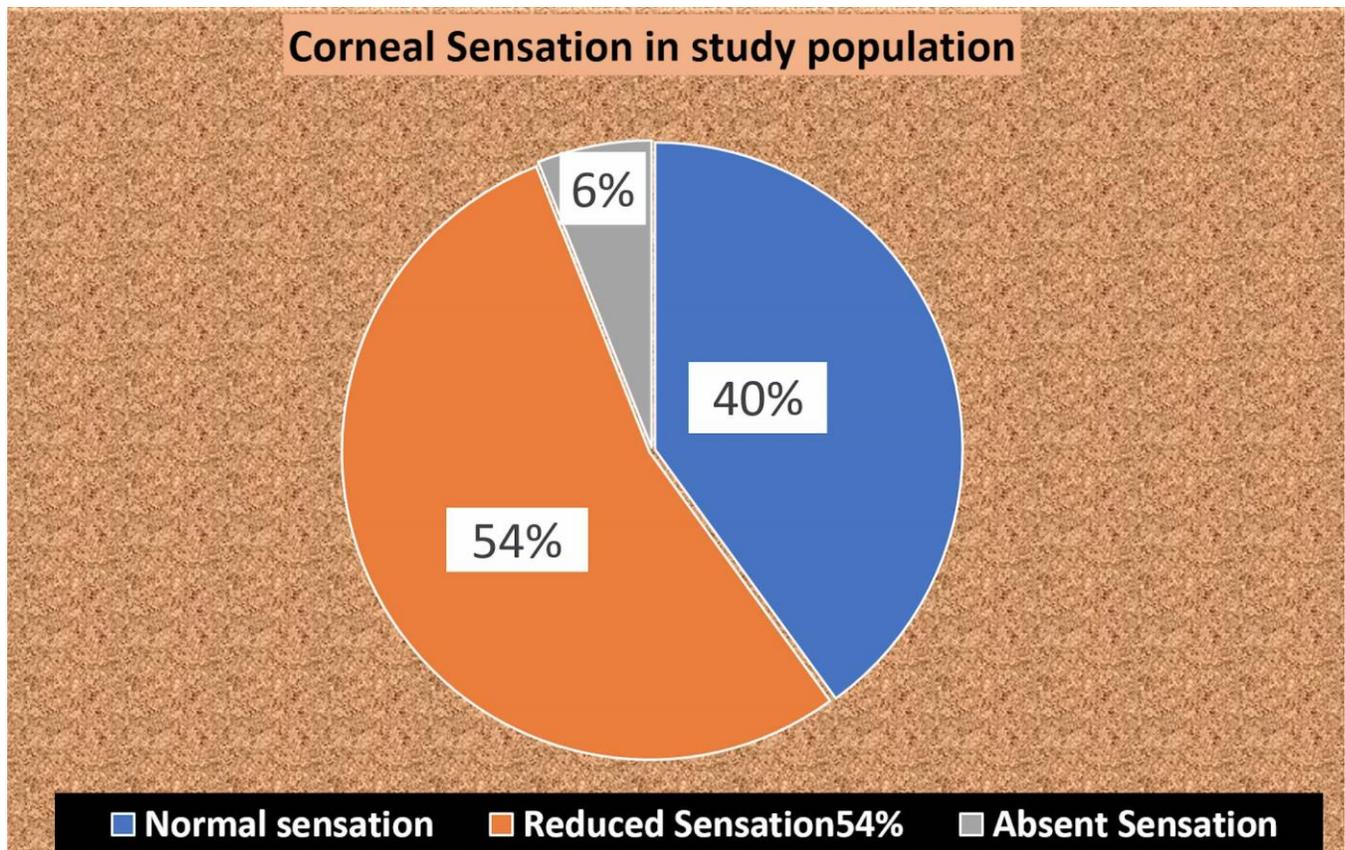
One hundred & seventy-five diabetic patients [350 eyes] were evaluated for status of corneal sensation. Corneal esthesiometry was done using cotton tipped applicator.

Normal sensation was seen in 141 eyes [40%] [Figure-two], Mean diabetic duration in this group was seven years [standard deviation of 5.9] [Figure-three].

Reduced corneal sensation was seen in 190 eyes [54%]. [Figure-two] Mean diabetic duration in this group was 13.4 years [with SD of 7.6] [Figure-three]. In 19 eyes [6%] corneal sensations were absent [Figure-two] Mean diabetic duration in this group was 20.17 years [with SD of 10.25] [Figure-three].

In a group of patients with normal corneal sensation [67 patients], eight had proliferative diabetic retinopathy, 13 had non proliferative diabetic retinopathy while remaining 46 patients had no diabetic retinopathy [Figure-four].

In a group with reduced corneal sensations [89 patients], 33 had proliferative diabetic retinopathy, 34 had non proliferative diabetic retinopathy while remaining 22 patients had no diabetic retinopathy [Figure-four]. In a group with absent corneal sensations [Seven patients], Three had proliferative diabetic retinopathy, two had non proliferative diabetic retinopathy while remaining two patients had no diabetic retinopathy [Figure-four].

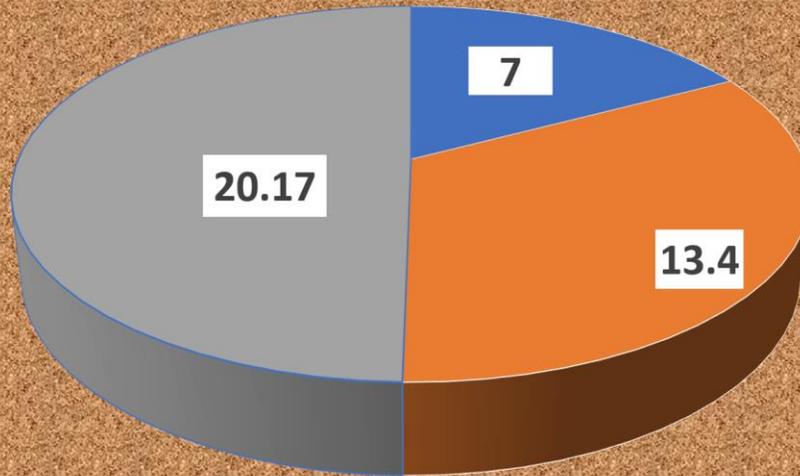


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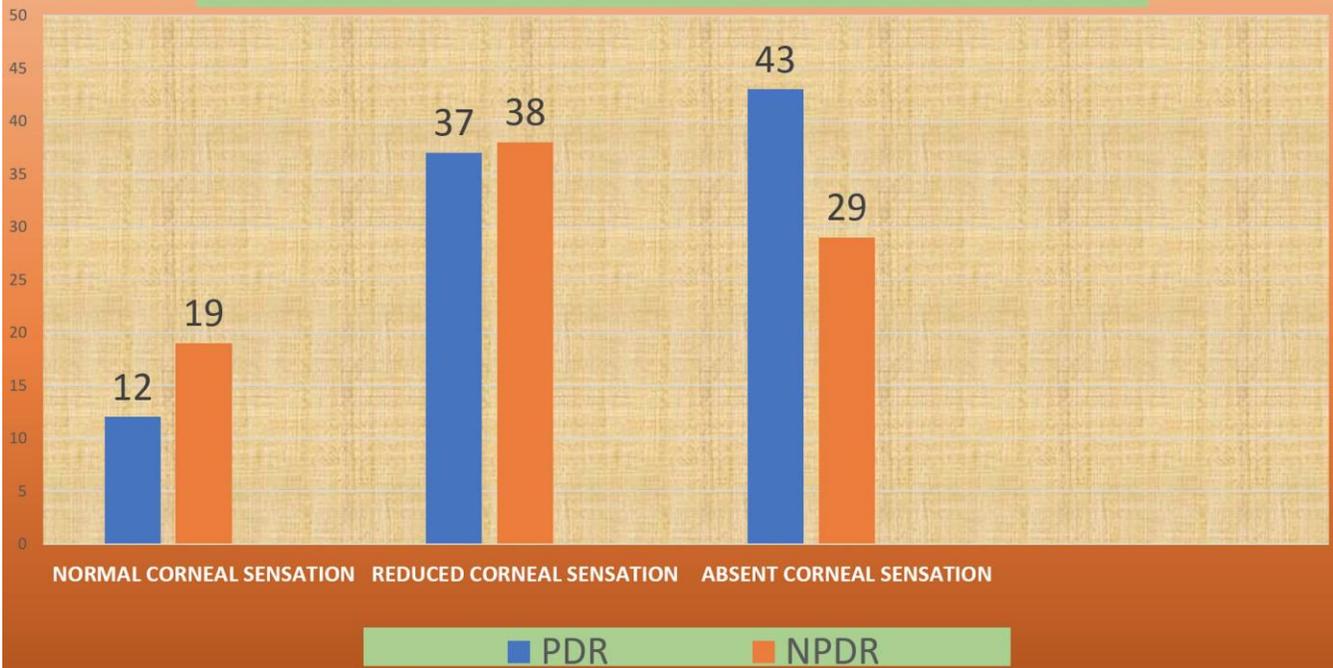
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Duration of Diabetes in years in different groups



■ Normal Corneal Sensation ■ Absent corneal Sensation
■ Reduced Corneal Sensation

INCIDENCE OF DIABETIC RETINOPATHY IN % IN VARIOUS GROUPS



Discussion

Patients with diabetes have decreased corneal sensitivity and thus are very vulnerable to corneal surface disorders like recurrent erosion, post-operative epithelial defects etc. In the study by Nielsen (6) it was demonstrated that corneal sensitivity (determined using Cochet and Bonnet's aesthesiometer) in 83% of diabetic patients was reduced.

Rosenberg et al (7). using confocal microscopy found decreased corneal sensitivity together with a decreased number of long nerve fiber bundles in the sub basal nerve plexus. In addition, patients with diabetes had fewer nerve fiber bundles than healthy control subjects possibly due to the presence of polyneuropathy. In all patients with diabetes with neuropathy, the sub basal nerve densities were significantly reduced

Misra et al. also described a clinical application of in vivo confocal microscopy in patients with diabetes mellitus type one (8). They measured the corneal nerve parameters in type one diabetics and controls and confirmed a decrease in the sub basal nerve density and corneal sensitivity in diabetic patients

In our study also it is clearly shown that patients with long standing diabetes had a progressive and significant reduction of corneal sensation. Another interesting finding, we have noticed was that incidence of proliferative diabetic retinopathy is more in patients with reduced corneal sensations [37 %] and absent corneal sensation [43%] group as compared to normal corneal sensation group [12 %].

Similarly, incidence of non-proliferative diabetic retinopathy is also noticed more in patients with reduced [38 %] and absent corneal sensation [29%] group as compared to normal corneal sensation group [19 %].

Conclusion

We have shown a significant association between the duration of diabetes and reduced corneal sensitivity. Another association we could co-relate is higher the incidence of proliferative or non-proliferative diabetic retinopathy, higher the chances of corneal hypoesthesia. In the present study, we did not quantify nephropathy and therefore could not assess any association of presence of nephropathy with loss of corneal sensitivity.

These findings have important clinical implications regarding the development of corneal abnormalities in diabetic patients. Further investigations on mechanisms of corneal nerve damage and establishment of diabetic corneal neuropathy should be the main focus of future research.

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