

# Early Detection of Small fibre Neuropathy in Newly Diagnosed Type 2 Diabetes

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# On Behalf CLAHRC-GM, Neuropathy Team:

*National Institute for  
Health Research*

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- Susan Howard
- Rebecca Spencer
- Sarah Cotterill
- Catherine Perry
- Mike Bresnen
- Ruth Boaden
- Mitra Tavakoli



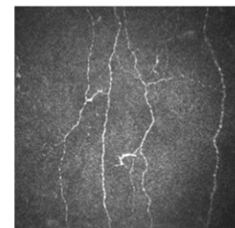
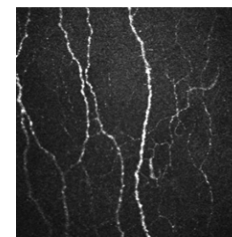
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The Heidelberg Engineering logo, featuring the words 'HEIDELBERG' and 'ENGINEERING' in white capital letters on a dark background, with a red square to the left of 'ENGINEERING'.

# Corneal Confocal Microscopy: A Surrogate End Point

CCM has been clinically proven in adults for:

- Objective early diagnostic test of diabetic neuropathy (1-3)
- Assesses Intervention/therapeutic response (4-5)
- High Reproducibility & Sensitivity (6-7)
- Correlation with pathology (pathogenic process) (1,3,8, 9)
- Correlation with functional changes (biologic process) (10, 11)
- Other Neuropathies (12-16)
- Established Normative reference values (17)

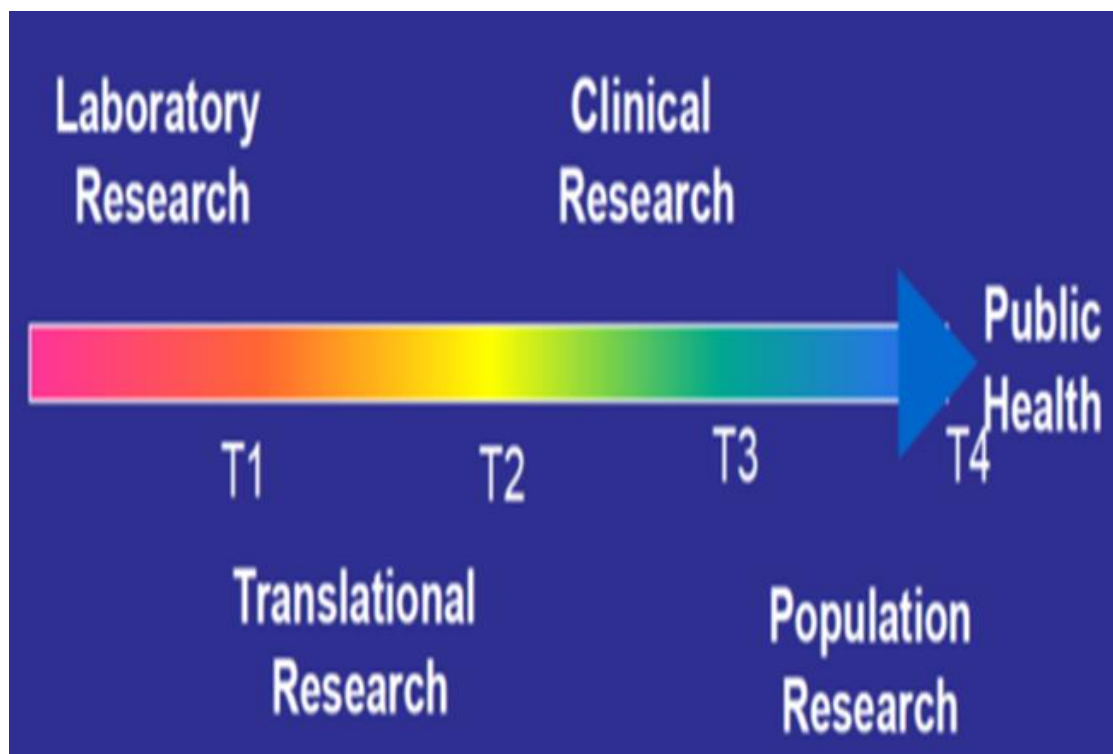


1. Tavakoli M, et al. Diabetes Care. 2010; 33(8):1792-7. 2. Petropoulos IN, et al. Diabetes Care. 2013; 36(11):3646-51. 3. Ziegler D, et al. Diabetes. 2014; 63(7):2454-63. 4. Tavakoli M, et al. Diabet Med. 2011; 28(10):1261-7. 5. Tavakoli M, et al. Diabetes. 2013; 62(1):254-60. 6. Petropoulos IN, Cornea. 2013; 32(5):e83-9. 7. Hertz P, et al. Diabet Med. 2011; 28(10):1253-60; 8. Quattrini C, Diabetes. 2007; 56(8):2148-54. 9. Sivaskandarajah GA. Diabetes Care. 2013; 36(9):2748-55. 10. Tavakoli M, et al. Diabetes Care. 2007; 30(7):1895-7. 11. Pritchard N, et al. Clinical & experimental optometry. 2012; 95(3):355-61. 12. Tavakoli M, et al. Muscle & nerve. 2012; 46(5):698-704. 13. Tavakoli M, et al. Exp Neurol. 2010; 223(1):245-50. 14. Tavakoli M, et al. Muscle Nerve. 2009; 40(6):976-84; 15. Asghar O, et al. Diabetes Care. 2014; 37: 2643-; 16. Azmi et al. Diabetes Care 2015 (In Press); 17. Tavakoli M, et al. Diabetes Care, 2015; 38:838-843

# Screening for Diabetic Neuropathy



*National Institute for  
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# From Research to Practice:

## Implementation of Corneal Confocal Microscopy for Screening Diabetic Neuropathy alongside Diabetic Retinopathy Screening Programme

Details at Poster Number 21

High Court..not on honeymoon

# 135 DIABETES VICTIMS EACH WEEK HAVE AMPUTATIONS

Obesity crisis fuels shock surge in disease-related ops costing NHS £2billion

**DIABETES REPORT**  
AMPUTATIONS due to diabetes have soared to 135 a week yet four in five could be prevented, experts say. As Type 2 diabetes now has no cure, it is the leading cause of amputations in the NHS. Estimates for this year are 135 a week, compared with 100 a year ago. Surgeons say the number of amputations has risen because of the obesity crisis. "We need urgent action," says Dr. [Name].

**FULL STORY: PAGE 45**

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## Simple test by University of Manchester diabetics from having limbs amputated

06:00, 1 JULY 2015 BY DEAN KIRBY

Hundreds of patients will take part in pioneering tests as part of £200k project

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## Diabetic? One quick trip to the optician's could save your...leg: Two-minute eye test detects early signs of nerve damage

- Test uses a probe with a camera to scan the eye for early signs of damage
- Diabetics are at particularly high risk of condition known as neuropathy
- They suffer damage to nerves that transmit impulses from brain to body
- Can lead to complications in limbs and amputations if not caught early

By KATHERINE KEOGH FOR THE MAIL ON SUNDAY  
PUBLISHED: 22:02, 9 May 2015 | UPDATED: 13:03, 10 May 2015

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## Optom trial to scan cornea for diabetic nerve damage

APRIL 30 2015

Researchers at the University of Manchester are embarking on a six-month project to screen patients for diabetic nerve damage by scanning the nerves of the cornea. If successful, the technique could form part of the diagnostic arsenal of community optometrists.

The £200,000 project, which is part-funded by Heidelberg Engineering, will be carried out at four optometry practices in Greater Manchester and aims to assess the feasibility of a community approach, alongside diabetic retinopathy screening.

Diabetic neuropathy is a common long-term complication of diabetes which affects the nerves. It mainly affects the legs and feet and can lead to ulceration and even amputation of a limb.

# Study Population

**449 DM Patients and 70 Healthy Subjects have been screened with CCM for Diabetic Neuropathy**

**In 4 optometry practices, part of  
South Manchester Eye Screening Programme**

**97 T2DM patients  
with Duration of  
Diabetes < 1.4 year**

**67 Healthy  
Control Subjects**

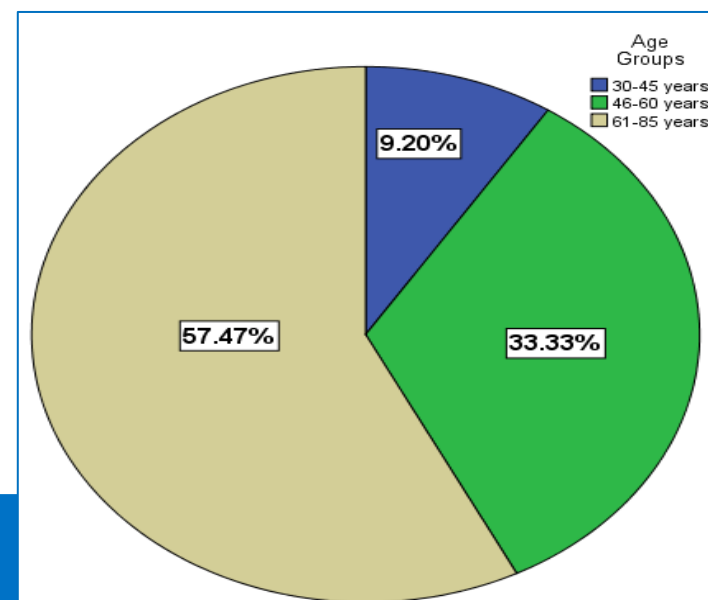
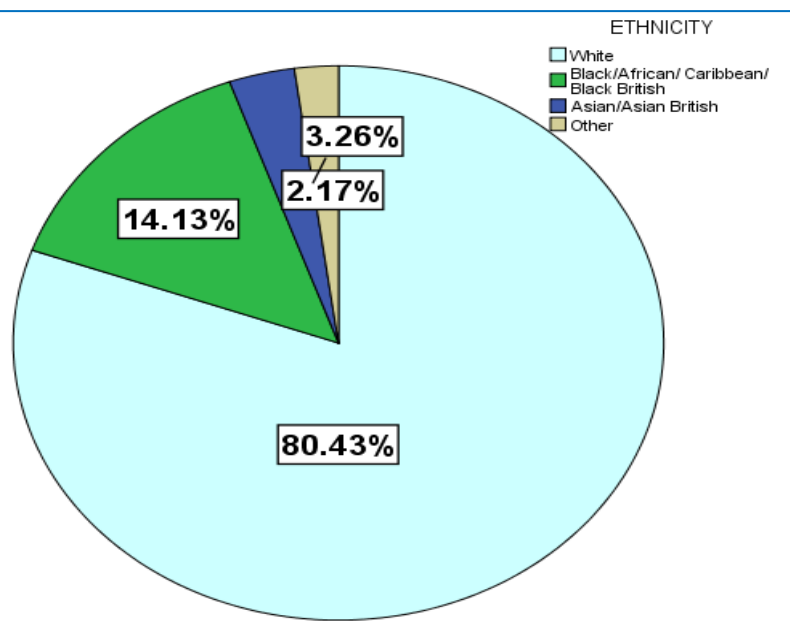


# Demographic Data



National Institute for  
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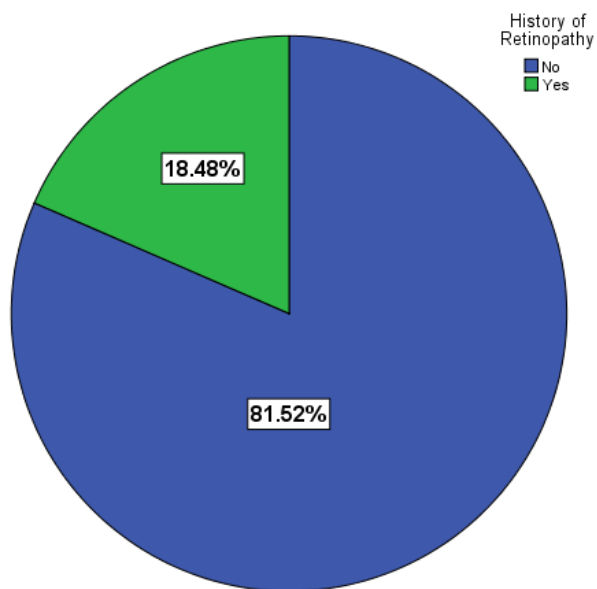
	Controls	T2DM Patients	
NUMBER	67	97	
GENDER (F/M) (% male)	26/41 (61%)	35/62 (63%)	
DURATION DIABETES	0	1.04 $\pm$ 0.07	
AGE (Years)	62 $\pm$ 14	63 $\pm$ 12	



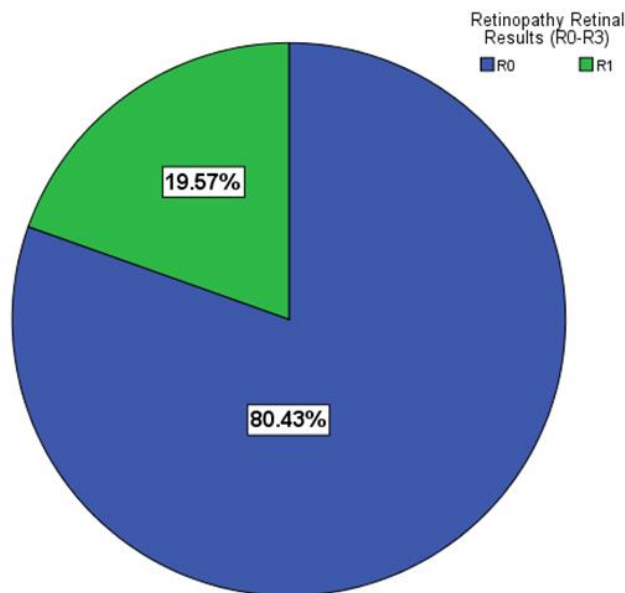


# Retinopathy

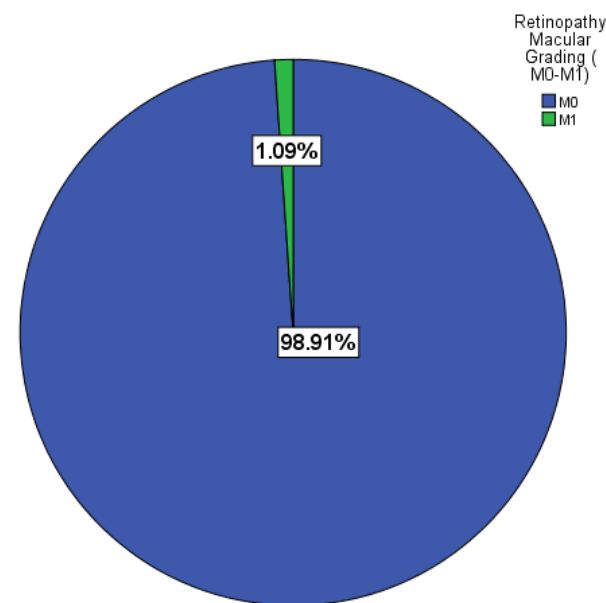
History of Retinopathy



Current Grade Retinopathy- R\*



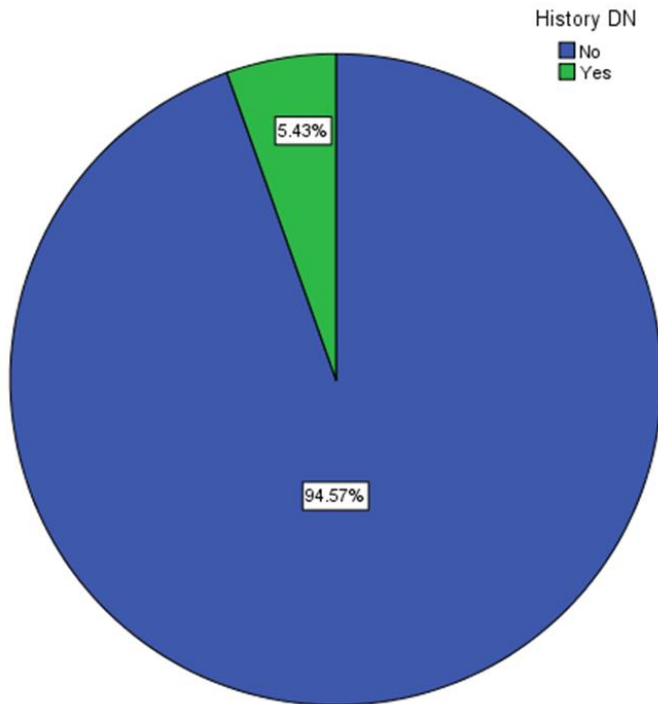
Current Grade Retinopathy- M\*



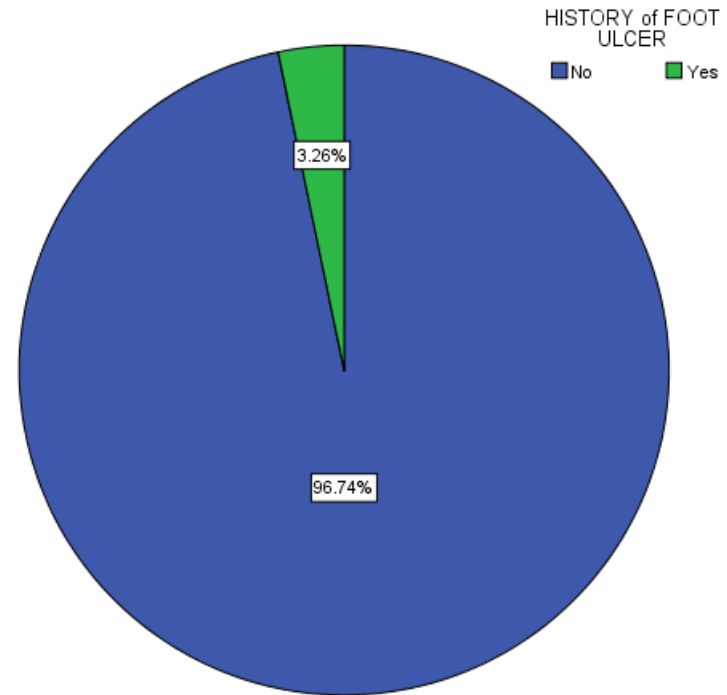
\*Classification based on Early Treatment of Diabetic Retinopathy Study (ETDRS)

# History of DN & Foot

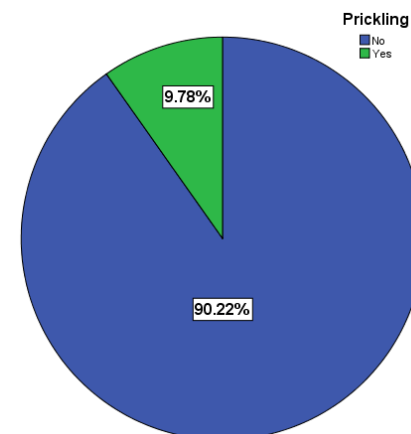
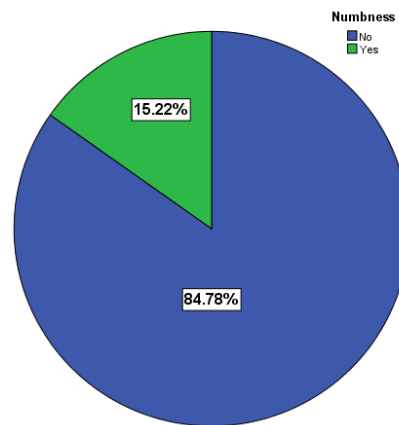
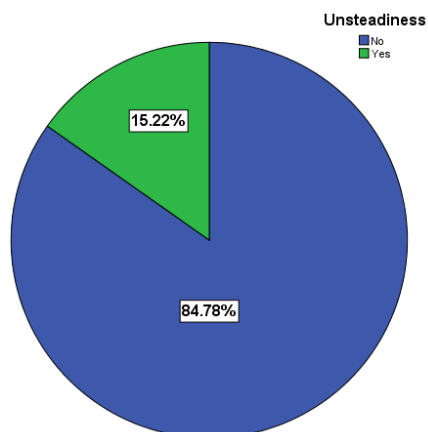
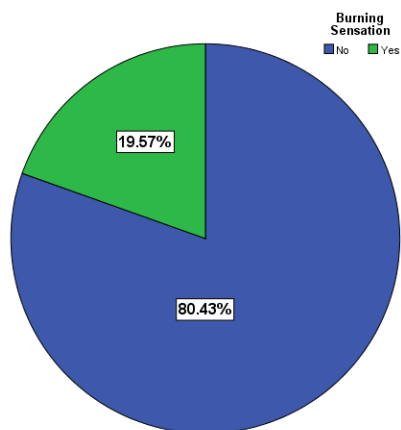
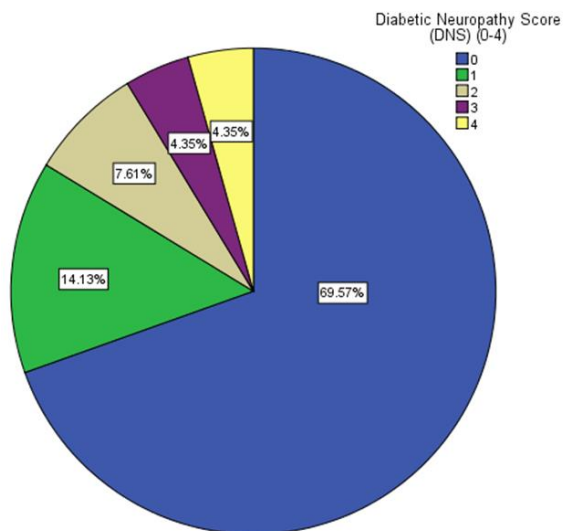
## History of Diabetic Neuropathy



## History of Foot Ulcer



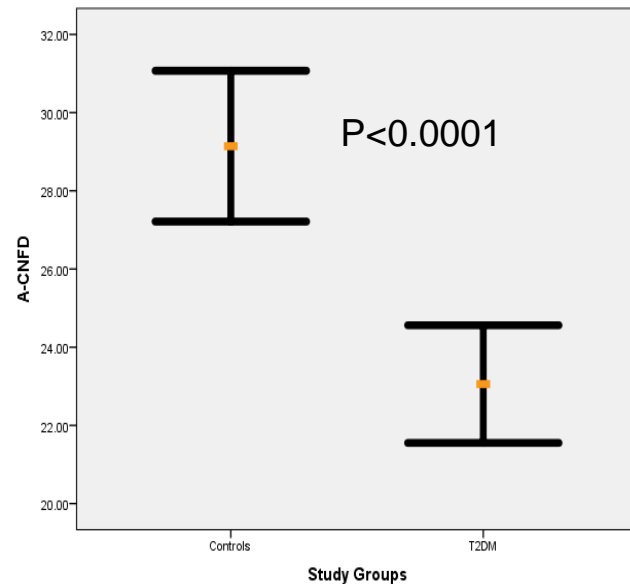
# Neuropathy Symptoms (DNS)



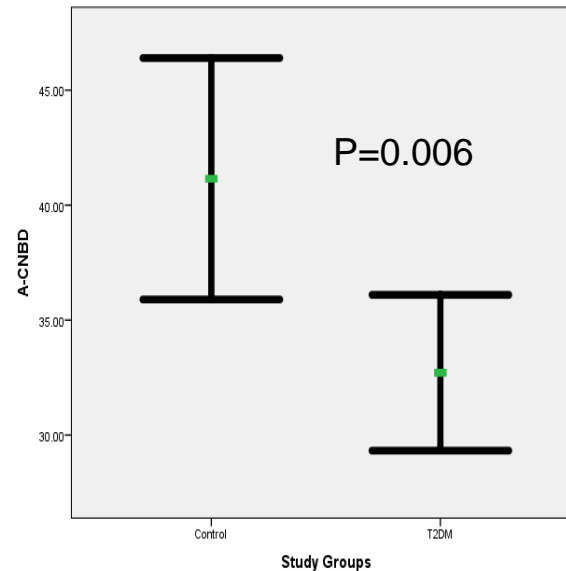
# CCM Results

	Controls	Diabetes	P-Value
A-CNFD (no/mm2)	29.14 $\pm$ 6.81	23.83 $\pm$ 7.85	<0.0001
A- CNBD (no/mm2)	41.14 $\pm$ 18.56	33.42 $\pm$ 16.36	0.007
A-CNFL (mm/mm2)	17.40 $\pm$ 3.36	14.39 $\pm$ 3.34	<0.0001
BEADING Pixel Size	184.11 $\pm$ 4.49	237.59 $\pm$ 19.91	<0.0001

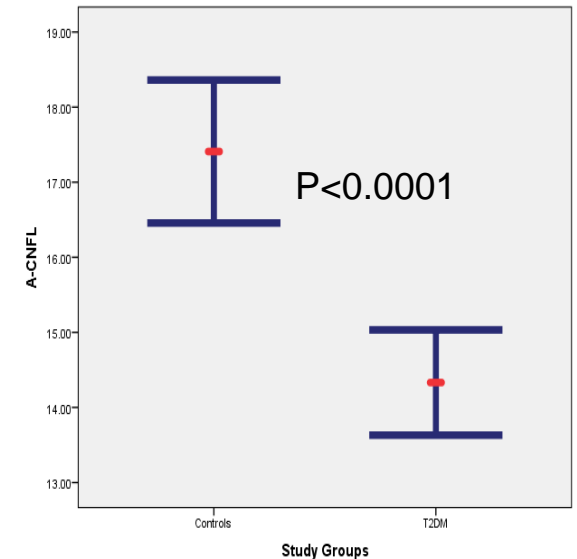
# Corneal Nerves



Corneal Nerve Fibre Density



Corneal Nerve Branch Density



Corneal Nerve Fibre Length

# Prevalence of Abnormality

- Percentages of CCM measures below the 2.5th percentile limit of normal in the diabetic and control groups studied

	Controls (No)	T2DM (No)	Percentage abnormal cases (%)
<b>A-CNFD</b>	1 (1.4%)	14	14.43%
<b>A-CNBD</b>	0	3	3.02%
<b>A-CNFL</b>	1	17	17.52%

# Conclusion

- The level of neuropathy symptoms that reported by newly diagnosed T2DM patients was interestingly high.
- The prevalence of background retinopathy was considerably high.
- There was a significant level of small fibre damage at corneal nerves of this cohort of newly diagnosed T2DM.
- Corneal Confocal microscopy can detect neuropathy at early stages and be used as screening method.



# Thank You

**“In God we trust.  
All others must  
bring data”.**

W. Edwards Deming

