Diabetic Retinopathy in Masvingo, Zimbabwe: An Observational Study to Assess Prevalence, Progression, Associated Characteristics and Feasibility of Digital Fundoscopy Screening

Alvern N. Mutengerere,[1] Adrian T.M. Musengi,[1] Martina Kawome,[2] Kudakwashe Madzeke,[1] Manya Mirchandani,[3] Alvin Ng,[4a] Laura E. Ruckstuhl[5]

[1]SolidarMed, Masvingo, Zimbabwe; [2]Sally Mugabe Central Hospital, Ministry of Health and Child Care, Harare, Zimbabwe; [3]Costello Medical, London, United Kingdom; [4]Costello Medical, Singapore, Singapore; [5]SolidarMed, Lucerne, Switzerland.

[a]Alvin Ng is no longer affiliated to Costello Medical, Singapore, Singapore.

Objective

To assess the prevalence and progression of diabetic retinopathy (DR) among patients with diabetes mellitus (DM) in Masvingo, Zimbabwe; determine the baseline variables associated with DR and its progression over one year; and assess the feasibility of embedding digital fundoscopy (DF) as a screening method for DR in this setting.

Background

- Diabetic retinopathy (DR) is estimated to affect 22.3% of patients with diabetes mellitus (DM) worldwide, with a particularly high reported prevalence of 35.9% in Africa, a figure projected to rise through 2030.[1–3]
- DR is a leading cause of blindness; early diagnosis enables effective DM management to prevent DR progression and adverse outcomes.[4,5]
- Many underserved communities lack access to screening programmes.
- Digital fundoscopy (DF) offers a well-established, non-invasive screening method for early detection that is easy to operate by non-specialist physicians.[6]

Methods

- In this observational study (2019–2021), 202 patients with DM aged ≥18 who routinely attended Masvingo Provincial Hospital, Zimbabwe, were screened for DR presence and severity using DF at baseline and one year (**Table 1**).
- Images were sent to a remote ophthalmologist for diagnosis.
- Univariable logistic regression examined associations between demographics and medical history with DR, followed by a multivariable model adjusting for DM type, number of years with DM, total cholesterol, and haemoglobin A1c (HbA1c).

Results

- At baseline, 84 (41.6%) participants were diagnosed with DR (**Figure 1**).
- At year one, among 84 with baseline DR, DR progressed in 11 participants and regressed in 13; among 118 without baseline DR, eight had developed DR at year one – an annual incidence of 6.8% (**Figure 1**).
- Elevated levels of HbA1c were associated with significantly increased odds of DR at baseline (**Figure 2A**, **Figure 2B**).
- High levels of triglycerides were associated with decreased odds of DR at baseline compared to normal levels (**Figure 2A**, **Figure 2B**), as well as low density lipoproteins (**Figure 2B**); however, the relationship between these and DR varies across research.[7,8]
- Logistic regression for DR progression was not conducted due to the small number of participants with this outcome; further research is required to explore the factors associated with DR progression.
- The mean turnaround between image capture and clinical report availability at baseline (36.16 days) and year one (18.89 days) were aligned with global guidelines.[9–12]

Conclusions

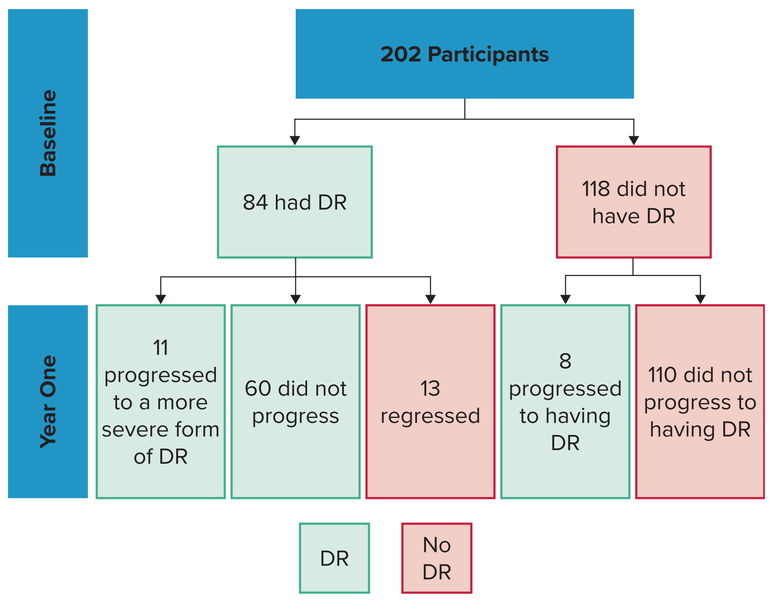
High DR rates in Masvingo highlight the need for increased screening and healthcare resources in this setting; integrating DF into standard practice would be feasible. Patients with poorly managed DM, indicated by elevated HbA1c, could be prioritised for DR screening and monitoring to facilitate early diagnosis and prevent avoidable blindness. These findings should inform future healthcare provision strategies in Zimbabwe.

Table 1: Baseline characteristics

Characteristic	Participants with DR (n=84)	Participants without DR (n=118)	All participants (n=202)
Age (years), mean (SD)	57.50 (11.43)	55.99 (13.38)	56.62 (12.60)
Sex, n (%)			
Female	69 (82.14)	88 (74.58)	157 (77.72)
Male	15 (17.86)	30 (25.42)	45 (22.28)
Number of years since DM diagnosis, mean (SD)	7.93 (6.50)	6.37 (6.85)	7.02 (6.74)
Triglycerides (mg/dL), mean (SD)	139.33 (68.31)	160.81 (91.26)	151.88 (82.99)
LDL (mg/dL), mean (SD)†	106.6 (39.70)	103.12 (37.60)	104.55 (38.42)
HbA1c			
%, mean (SD)	7.67 (2.51)	7.13 (3.06)	7.35 (2.85)
mmol/mol, mean	60	54	57

†Three patients had missing data for LDL at baseline.

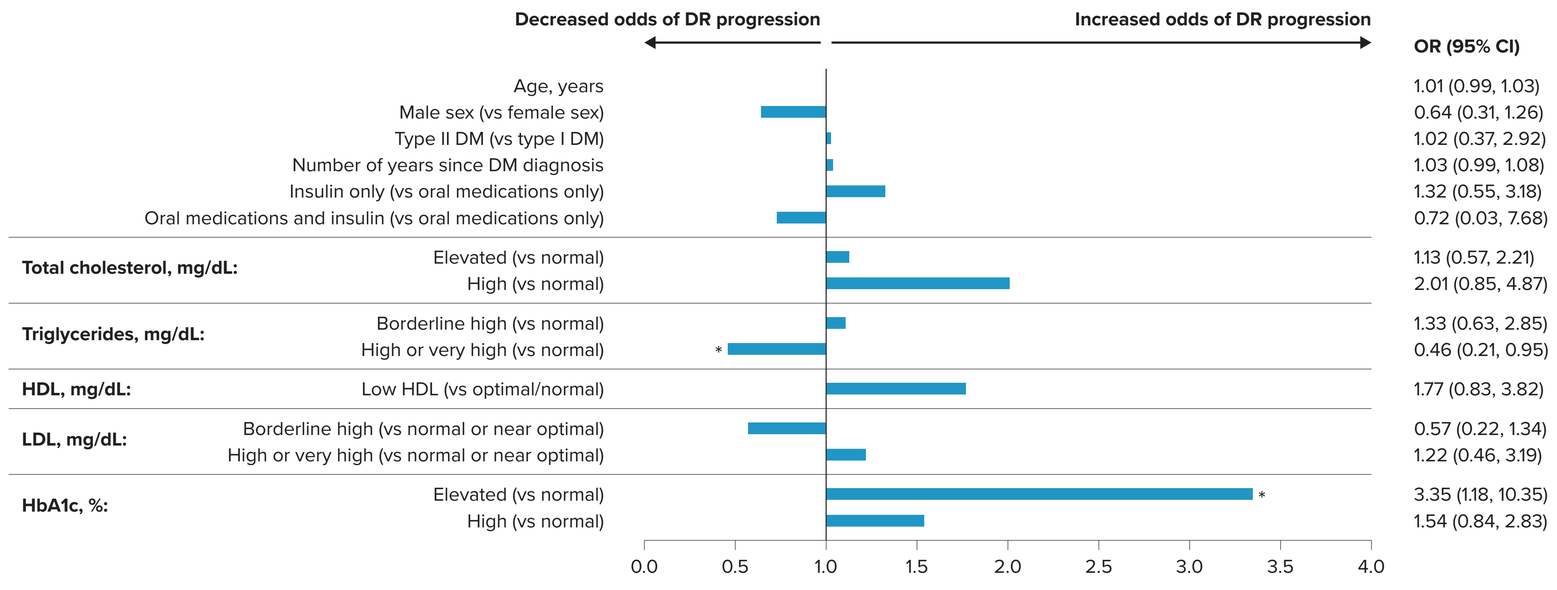
Figure 1: Number of participants with DR/DR progression at baseline and year one



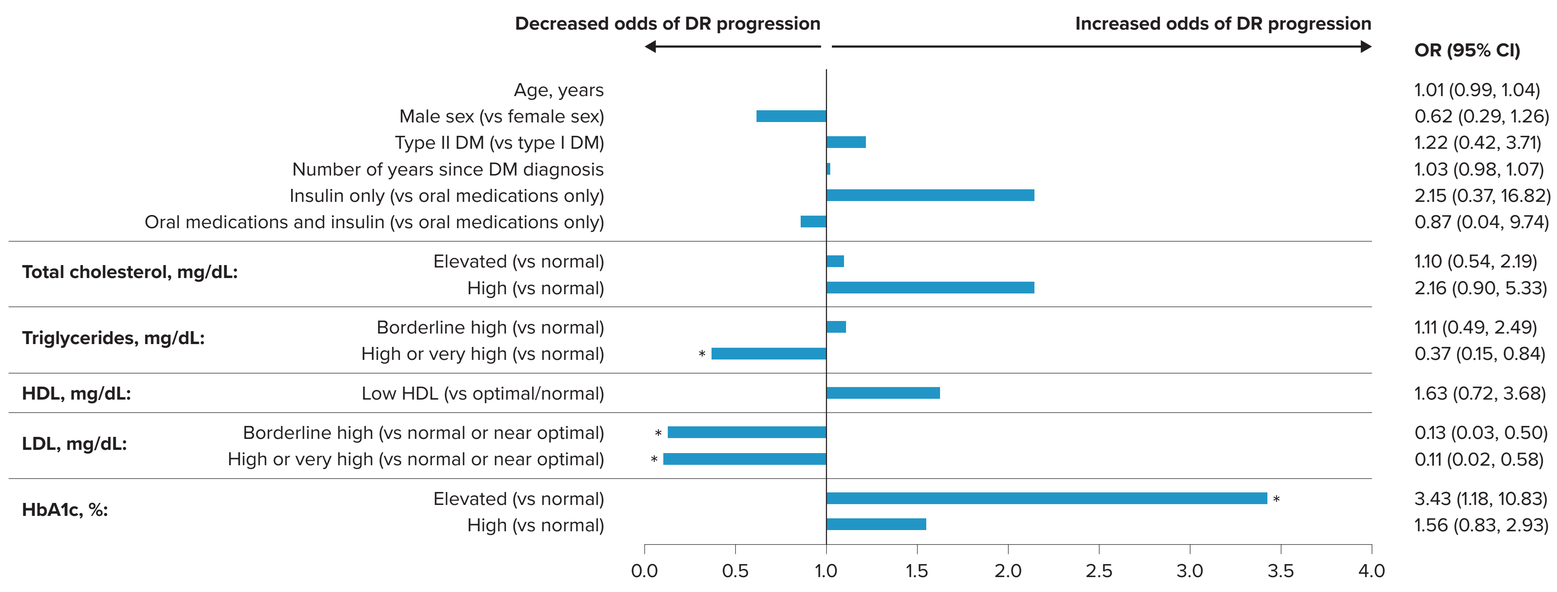
Raw dataset included 204 patients. One patient was excluded from the data analyses due to age <18 years, and one was excluded due to the number of years since their DM diagnosis being larger than their age.

Figure 2

A. Unadjusted association of baseline variables with DR at baseline



B. Adjusted association of baseline variables with DR at baseline



The lab values were categorised as follows: total cholesterol (normal, <200 mg/dL; elevated, 200–239 mg/dL; high, ≥240 mg/dL), triglycerides (normal, <150 mg/dL; borderline high, 150–199 mg/dL; high or very high, ≥200 mg/dL), HDL (low, <40 mg/dL; optimal/normal, ≥40 mg/dL), LDL (optimal or near optimal, <130 mg/dL; borderline high, 130–159 mg/dL; high or very high, ≥160 mg/dL), creatinine (normal, <125 µmol/L; elevated, 125–199 µmol/L; high, ≥200 µmol/L), and HbA1c (normal, <7.0%/<53 mmol/mol; elevated, 7.0–7.9%/53–63 mmol/mol; high, ≥8.0%/≥64 mmol/mol). ORs for patients with elevated or high creatinine could not be estimated due to the small number of patients observed in these groups. For Figure 2B, adjusted associations were adjusted for DM type, number of years since DM diagnosis, total cholesterol and HbA1c. *p<0.05.

Abbreviations: µmol: micromole; **CI:** confidence interval; **DF:** digital fundoscopy; **dL:** decilitre; **DM:** diabetes mellitus; **DR:** diabetic retinopathy; **HbA1c:** haemoglobin A1c; **HDL:** high-density lipoprotein; **L:** litre; **LDL:** low-density lipoprotein; **mg:** milligram; **mmol:** millimole; **mol:** mole; **OR:** odds ratio; **SD:** standard deviation.

References: [1]Teo ZL et al. 2021;128:1580–1591; [2]Kropp M et al. 2023;14:21–42; [3]Tan TE, Wong TY. 2023;13:1077669; [4]Marques AP et al. 2021;35:100852; [5]Vashist P et al. 2011;36:247–252; [6]Taylor C. 2021;8:e76–e78; [7]Burgess PI et al. 2017;12(8):e0181359.; [8]Bryl A et al. 2022;11:2761; [9]Benjamin JE et al. 2021;21:70; [10]Boucher MC, El Yamani MEM. 2019;54:359–366; [11]Chedid EH et al. 2013;17:21–5; [12]NHS England. Diabetic eye screening standards valid for data collected from 1 April 2019. 2021. **Author Contributions:** Substantial contributions to study conception/design, or acquisition/analysis/interpretation of data: **AlM**, **AdM**, **MK**, **KM**, **MM**, **AN**, **LR**; Drafting of the publication, or reviewing it critically for important intellectual content: **AlM**, **AdM**, **MK**, **MM**, **AN**, **LR**; Final approval of the publication: **AlM**, **AdM**, **MK**, **KM**, **MM**, **AN**, **LR**. **Disclosures: AlM:** Employee of SolidarMed. Pursued and completed a Master's thesis on the prevalence of diabetic retinopathy, assessing progression and regression of DR after year one review; **AdM:** Employee of SolidarMed; **MK:** Employee of MOHCC; **KM:** Employee of SolidarMed; **MM:** Employee of Costello Medical; **AN:** Employee of Costello Medical; **LR:** Employee of SolidarMed. **Acknowledgements:** The authors thank Janneke van Dijk, co-principal investigator, for contributions made to study conception and design, study implementation, quality control and development of study tools; Dr Fortune Nyamande, co-principal investigator, for technical advice during study implementation; the NCD Clinic patients under the DFID project at Masvingo Provincial Hospital; the Ministry of Health and Child Care, NCD Clinic nurses, theatre nurses and hospital management team at Masvingo Provincial Hospital and the Council of the Blind, Child Blind Mission and Morgenster Mission Hospital. Third-party writing assistance for this poster was provided by Emma Soopramanien, MSc, and Melanie Seaton, PhD, Costello Medical, UK free of charge on a pro bono basis in accordance with Good Publication Practice guidelines.

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