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DIABETIC Medicine

LETTER

Mortality in people with a diabetes foot ulcer: An update from the Salford podiatry clinic follow-up study

In a clinic-based prospective study, we previously reported a very high long-term mortality rate in individuals with diabetic foot ulcer (DFU),[1] greater for those with a hind foot ulcer and described a close relation between risk of sepsis/renal failure and DFU mortality. We highlighted the importance of addressing all risk factors as soon as people present with a DFU in order to mitigate the longer-term health consequences. The findings mirror the conclusions of a recent review which reported that the mortality rate for people with DFUs is 231 deaths per 1000 person-years, compared with 182 deaths per 1000 person-years in people with diabetes without foot ulcer.[2]

More recently in 2023, in a 10-year follow-up study,[3] we highlighted the observation that an elevated urinary albumin/creatinine ratio or low-estimated glomerular filtration rate (eGFR) was commoner in those with a foot complication and elevated the odds ratio of death in those with an established foot complication. Other work has supported this observation.[4]

We here have updated mortality outcome findings from our single-site follow-up study at Salford Royal Hospital in the United Kingdom which recruited consecutive patients from April to June 2016. We previously reported on the 4 years up to the end of 2019 on 98 individuals, 17 had type 1 diabetes (T1D), and 81 had type 2 diabetes (T2D). Thirty-one were women. The mean age (range) in 2016 was 63.6 (28–90) years with range of diabetes duration from 1 to 45 years.

In this latest analysis we applied the annual expected mortality rate for the general population by age and sex as published by the Office of National Statistics[5] to generate the total number of expected deaths each year and divided that into the actual recorded deaths to give the age and sex standardised mortality rate (SMR). This was compared across the PERIOD 1 = 2016–2019 and PERIOD 2 = 2020–2023 study periods. The influence of the patient recorded status at the start of the study including sex, age duration with condition, type of diabetes, glycated haemoglobin (HbA1c), eGFR and body mass index (BMI), when linked to foot ulcers was analysed to see which showed the largest association with mortality rate.

Of the 98 individuals 35 had died by the end of 2019 with an SMR of 5.0 (Figure 1); up to the end of 2023, a further 33 had died with an SMR of 8.4 for the second period. At end of follow-up 68/98 individuals had died (Figure 1). Thirty-five per cent died with the primary cause of death being sepsis or pneumonia with 13% dying from renal complications and 15% from cardiac complications. Twelve per cent died from multi-organ failure. The effect of factors that were measured at the start of the audit on SMR in the first and second periods for the original cohort of 98 included:

a. Age <65 years PERIOD 1: 51 patients SMR *21.8* and PERIOD 2: 29 patients SMR *20.2*. Age ≥65 PERIOD 1: 53 patients SMR *3.0* and Period 2: 39 Patients SMR *6.9*
b. Initial eGFR <50 mL/min/1.73 m^2: PERIOD 1: 27 patients SMR *5.4* and PERIOD 2: 15 patients SMR *17.4*. Initial eGFR ≥50 mL/min/1.73 m^2: PERIOD 1: 61 patients SMR *4.7* and PERIOD 2: 42 patients SMR *6.4*
c. Initial HbA1c ≥58 mmol/mol: PERIOD 1: 64 patients SMR *7.0* and PERIOD 2: 43 patients SMR *11.7*. Initial HbA1c <58 mmol/mol: PERIOD 1: 33 patients SMR *3.2* and PERIOD 2: 20 patients SMR *6.1*
d. T1D: PERIOD 1: 17 patients SMR of *10.5* and PERIOD 2: 12 patients SMR *29.0*, T2D: PERIOD 1: 80 Patients SMR *4.6* and PERIOD 2: 50 patients SMR *7.2*

Position of ulcer continued to play a role in PERIOD 1. The 25 patients with a hind foot ulcer had SMR 6.3 while the 63 patients with a forefoot ulcer had SMR 5.4; in PERIOD 2 the 14 patients with a hind foot ulcer had SMR 13.0, while 39 patients with a forefoot ulcer had SMR 9.2.

Weight difference in relation to 2016 BMI <30 kg/m^2 or ≥30 kg/m^2 did not associate strongly with difference

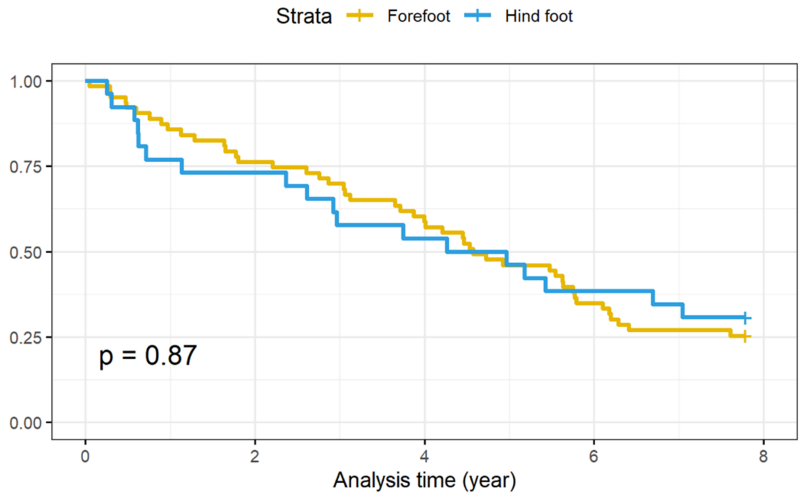

FIGURE 1 Kaplan–Meier plot of duration of participation in the study versus mortality by ulcer position and comparison of SMR by sex for Periods 1 and 2. SMR, standardised mortality rate.

	Patients	Patient Years	Average Age	Actual Deaths	Expected Deaths	SMR
2016-2019 (P1)						
Female	31	107	66.3	12	2.15	5.6
Male	67	227	63.1	23	4.91	4.7
Sub-Total	98	334	64.2	35	7.06	5.0
2020-2023 (P2)						
Female	19	67	67.4	9	1.55	5.8
Male	44	154	63.6	24	2.93	8.2
Sub-Total	63	221	64.8	33	4.49	7.4
OVERALL	98	555	64.4	68	11.55	5.9

in SMR during each period, nor did duration of diabetes <10 years or ≥10 years.

That more than two-thirds of participants died only 7 years following presentation with a foot ulcer and the very high SMR in younger individuals (<65 years old), and in people with T1D, highlights the critical importance of bringing all relevant indices of risk to target in people who have developed a foot ulcer, wherever this is possible. The SMR remained higher for hind foot versus forefoot ulcers in the second period although the Kaplan–Meier plot which does not take into account age or sex and only looks at the unadjusted mortality rate, did not show a difference in mortality rate in the later stages of follow-up.

Calibration of mortality for people with diabetes foot ulceration, against the general population for age and sex to estimate SMR, affords to patients and clinicians greater clarity of the inherent risks of diabetes foot ulceration for those with this condition and in relation to specific subgroups as defined here.

Future identification of putative risk factors could enable better identification of people with diabetes who are at the greatest risk of shortened life expectancy in relation to the context of their health profile and related comorbidities, while screening and management of cardiovascular risk factors should remain a focus of health promotion policies at all levels of diabetes care.[6]

AUTHOR CONTRIBUTIONS

A. Heald prepared all drafts of the paper with the assistance of H. Rashid and A. Robinson. Extraction and validation of patient data was undertaken by H. Schofield. Data analysis was performed by M. Stedman and W. Lu with contributions from J. M. Gibson and M. B. Whyte. E. Jude provided ongoing input to the manuscript with senior review by G. Dunn and M. Edmonds.

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CONFLICT OF INTEREST STATEMENT

No author has any conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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