Received: 19 December 2023 | Revised: 11 April 2024 | Accepted: 15 April 2024

DOI: 10.1002/hsr2.2098

ORIGINAL RESEARCH

Health Science Reports Open Access WILEY

Level of and factors associated with foot self-care among people with diabetes in Idlib Province of Northwest Syria: A cross-sectional study

Tareq Al-Ashkar[1,2] | Thaer Alhussein[1,2] | Mohammad S. Eido[1,2] | Shaimaa Al-Hassan[1,2] | Ali Alam[1,2] | Maryam Fathallah[1,2] | Muhammad Al-Abdullah[1,2] | Omar Alhiraki[2,3] | Ibrahim S. Al-Busaidi[4]

[1]Faculty of Medicine, Idlib University, Idlib, Syria

[2]Northwest Syria Research Team (NWS-RT), Idlib, Syria

[3]Acute Medicine Department, Lincoln County Hospital, United Lincolnshire Hospitals NHS Trust, Lincoln, UK

[4]Department of Primary Care and Clinical Simulation, University of Otago, Christchurch, New Zealand

Correspondence

Omar Alhiraki, Acute Medicine Department, Lincoln County Hospital, United Lincolnshire Hospitals NHS Trust, Lincoln, UK.
Email: omar.alrashidlahiraki@ulh.nhs.uk

Ibrahim S. Al-Busaidi, Department of Primary Care and Clinical Simulation, University of Otago, Christchurch, New Zealand.
Email: Ibrahim.al-busaidi@otago.ac.nz

Abstract

Background and aims: Diabetic foot and lower limb problems are among the most neglected complications during the Syrian armed conflict due to the absence of a functioning health infrastructure, including early detection and timely management of limb-threatening wounds. This study aimed to determine self-reported diabetes-related foot disease (DRFD), adherence to recommended foot self-care (FSC) practices, and associated factors among people with diabetes in war-torn Northwest Syria (NWS).

Methods: This was a cross-sectional study conducted at six primary care clinics in Idlib, NWS, between March 27 and April 17, 2022, utilizing the validated interviewer-administered Diabetes Foot Disease and Foot Care Questionnaire. Data on demographic characteristics, DRFD, and FSC practices were collected. FSC score was determined by adding the points from all 12 FSC items, with a maximum score of 48, and were categorized into very poor (≤12), poor (13–24), moderate (25–36), and good (37–48). A convenience sample of 331 consecutive Syrians, aged ≥18 years, with diabetes, were invited. Multiple linear regression was used to identify variables associated with FSC practices.

Results: A total of 328 patients completed the questionnaire (response rate: 99.1%). The overall FSC score was average (mean total score 27.24, SD 7.03). Over one-third (37.8%) had a very poor/poor score, 50.3% had an average score, and 11.9% had a good score. Household income/month of ≥51 USD ($\beta = 2.6$, 95% confidence interval [95% CI]:1.06–4.1, $p = 0.001$) and diabetes duration of ≥10 years ($\beta = 1.8$, 95% CI: 0.2–3.4, $p = 0.027$) significantly predicted better FSC practice.

Conclusion: A significant proportion of participants had inadequate adoption FSC behaviors. Higher socioeconomic status was associated with better FSC practices. Future research should evaluate diabetic foot education and professional foot care in this population.

KEYWORDS
diabetes mellitus, diabetic foot, foot ulcer, self care, Syria

1 | INTRODUCTION

The 2021 International Diabetes Federation (IDF) Diabetes Atlas estimated that around 537 million adults aged 20–79 years (10.5%) are affected by diabetes and this is projected to increase to 12.2% (783 million) by 2045.[1] The vast majority of people with diabetes (PwD) (80.6%, 432.7 million) reside in low- and middle-income countries (LMICs).[1] Several factors are thought to drive the global diabetes epidemic, including but not limited to obesity, socio-economic status, ageing, lifestyle choices, urbanization, and education.[2]

Diabetes is associated with macrovascular and microvascular complications, including diabetes-related foot disease (DRFD).[3] DRFD, a devastating but often preventable complication, is an umbrella term that describes a foot of a person with diabetes, active or in remission, that is affected by ulceration, infection, or destruction of the soft tissue with or without peripheral neuropathy and/or peripheral arterial disease.[4] It is estimated that the lifetime risk of developing a foot ulcer for any person with diabetes ranges between 19% and 34%.[5] A recent meta-analysis estimated the global annual prevalence of diabetic foot ulceration to be 6%.[6]

Foot ulcers in PwD are often associated with long-term recurrent complications (e.g., re-ulceration, infection, and amputation) and premature mortality.[3–7] Most diabetic foot ulcers become infected and around 20% of moderate–severely infected ulcers result in amputation.[6] Furthermore, around 85% of diabetes-related lower limb amputations are preceded by foot ulcers.[7] Therefore, adopting recommended foot self-care (FSC) practices is essential in the early detection of pre-ulcerative lesions and prevention of subsequent foot ulcers and amputation. Despite this, adherence to FSC behaviors continue to be in LMICs.[8-11]

Syria has descended into a full-scale brutal armed conflict for more than a decade, resulting in the destruction of vital infra-structure, including the collapse of its health system.[12] The management of common chronic diseases, such as diabetes, in war-torn Syria is complicated due to a myriad of obstacles, including foot and safety insecurities, limited access to health services, lack of medications, and trauma.[13] Recent estimates suggest that the prevalence of diabetes in Syria has continued to rise over the past few decades, with 13.6% (1.5 million) of Syrians aged 20–79 years affected by diabetes as of 2021.[1] Diabetic foot ulcers are among the most vulnerable and neglected diabetes complications by the health system and patients alike during the Syrian conflict due to the absence of early detection and timely limb-salvage management for limb-threatening wounds.[14] During the current Syrian conflict, the financial burden of DRFD care is primarily taken by the severely harmed public health sector, which directs most of its limited resources towards war-related injuries and civil victims.[14,15]

Key points

- The absence of a functioning healthcare service infra-structure in war-torn NWS made DRFD among the most devastating and neglected complications of diabetes.
- Overall, the adherence to recommended FSC practices was average. Over a third were in the poor/very poor category. Household income/month of ≥51 USD and diabetes duration of ≥10 years independently predicted improved FSC practices.
- Enhancing socioeconomic standards may facilitate better adoption of FSC practices.

Northwest Syria (NWS) is the last opposition-controlled territory, which includes large cities such as Aleppo and Idlib, holding around 4.1 million civilians, of whom 2.8 million are internally displaced people (IDP).[16,17] Civilians in NWS live in a state of poverty, hopelessness, and low literacy and numeracy levels, and the health care system is severely lacking in resources and infrastructure due to the ever-growing health needs and the well-documented indiscriminate targeting of health facilities.[16,18] Adopting recommended FSC practices plays a key role in preventing foot ulceration and subsequent amputation.[8] However, the situation in NWS does not facilitate PwD to engage in preventative FSC practices, which include daily foot hygiene and inspection, wearing protective footwear, and seeking early medical review for pre-ulcerative lesions.[18] The current situation in Syria as a whole and the opposition-controlled territory particularly breeds a fertile environment for declining awareness, self-care, and prevention of DRFD.[3,8,13–15]

To our knowledge, no studies have examined FSC practices among PwD after more than a decade-long Syrian humanitarian crisis. Up-to-date data evaluating FSC behaviors among PwD are urgently needed to direct FSC education and development of primary foot preventative services in war-torn NWS. In this study, we present data on self-reported DRFD, footwear choices, and levels of FSC practices and associated factors among PwD in opposition-controlled NWS.

2 | MATERIALS AND METHODS

2.1 | Study design

We conducted a cross-sectional study among PwD in NWS between March 27 and April 17, 2022.

2.2 | Population and sampling

According to the Humanitarian Needs Assessment Programme, a joint UN assessment initiative that tracks displacement and returns movements, the population of Idlib province in NWS is estimated at 2.7 million.[17] The IDF reported the prevalence rate of diabetes in Syrian adults as 13.6%,[1] which makes our target sample about 367,000 in Idlib province.

A recent study utilizing the Diabetes Foot Disease and Foot Care Questionnaire (DFDFC-Q) reported the prevalence of poor diabetic FSC practice to be 22% (poor and very poor categories).[8] The sample size was determined using a single population proportion formula (Epitools).[19] Taking the prevalence of poor diabetic FSC practice at 22%, a confidence level of 95%, and a 5% margin of error, the estimated required sample size was 264. To account for 5% substantially incomplete questionnaires and 20% anticipated non-response rate, the target estimated sample size was 330.

The inclusion criteria included all PwD (Type 1 or Type 2) aged ≥18 years, attending six specialized clinics providing primary diabetes care in the Idlib province, and staffed by endocrinologists, general practitioners, and nurses. We excluded participants who did not provide informed consent.

2.3 | Setting and data collection

Given the limitations posed by the ongoing conflict, we utilized a convenience sampling method to recruit eligible participants. Due to logistical difficulties reaching all diabetes clinics available in Idlib province, we selected all of the safely accessible public clinics, which provide diabetes care for the majority of PwD in NWS.

A pilot study involving 20 participants (nine females and 11 males, with an average age of 40 years) from six distinct clinics was carried out before initiating the primary data collection process and minor changes in wording were made accordingly. The pilot study's participants were not included in the main study.

All data collectors received a standardized training course explaining the objectives and methods of the study, and how to administer the questionnaire. We used the Kobo Toolbox application installed on mobile phones and tablet computers for data collection. This was designed to facilitate fieldwork in resource-limited conditions and internet outages. It took ~15 min to complete each survey.

Data collectors visited the selected clinics (Table 1) at different times during formal opening hours (8.30 a.m.–3.30 p.m.) over the collection period. The first and second clinics (Idlib University Hospital and Idlib Central Hospital) are located in Idlib City and surrounding suburbs and camps. The third and fourth clinics (Alquds Hospital and Atmeh Hospital) provide diabetes care to inhabitants of most of the Syrian–Turkish border camps. The fifth and sixth clinics (Alandalus Hospital and Maarat Misrin Hospital) are in the middle area of Idlib province.

TABLE 1 Selected diabetes clinics in Idlib province by recruited participants.

Diabetes clinic	Location	Frequency	Percent
Idlib University Hospital	Idlib city	91	27.7
Idlib Central Hospital	Idlib city	67	20.4
Alquds Hospital	Aldana	51	15.5
Atmeh Hospital	Atmeh	60	18.3
Alandalus Hospital	Hazano	28	8.5
Maarat Misrin Hospital	Maarat Misrin	31	9.5
Total		328	100

2.4 | Study instrument

We used the DFDFC-Q, developed and validated by Al-Busaidi et al.,[3,8] in a study of 350 PwD (Types 1 and 2) aged ≥20 years attending primary and secondary health facilities (nonhospital settings) in Oman, an Arabic speaking country located on the Arabian Peninsula. The DFDFC-Q is available in Arabic and English, and provides a comprehensive way of evaluating the quality of diabetic foot care.[8] It has been used in other countries with varying healthcare systems and patient socioeconomic characteristics such as Sudan and Poland, and translated into other languages with acceptable psychometric properties.[8,9,20,21] This questionnaire is applicable for the settings of this study, given the similar social, cultural, and environmental characteristics between Syria and Oman.[8] We obtained permission from the original authors to use the original Arabic language version of the questionnaire without making any modifications. The questionnaire covered six domains related to sociodemographic characteristics, patient-reported DRFD, FSC practice, footwear choices, FSC education, and professional foot care.

FSC level was determined by assessing the frequency of performing 12 recommended practices. Responses to each item were rated on a scale as follows: never (0), rarely (1), once a month (2), once a week (3), and daily (4). The overall FSC score was calculated by adding the points from all 12 items, with a maximum score was 48 points. According to previous analyses,[8,9,21] the level of adherence to recommended FSC practices was categorized into four quality levels: good (37–48 points), average/moderate (25–36 points), poor (13–24 points), and very poor (≤12 points).

2.5 | Ethical consideration

This study was approved by the Ethical and Scientific Research Committee at Idlib University, the Council of Higher Education and Scientific Research at Idlib University, and the clinics from which patients were surveyed. Verbal informed consent was obtained from all study participants.

2.6 | Statistical analysis

Data were exported into Microsoft Excel and IBM SPSS Statistics 29.0 for Windows (IBM Corp.) for analysis. Descriptive statistics were used to summarize participant characteristics and FSC scores. Categorical variables were presented as frequencies, and percentages and continuous variables were presented as means ± SDs or medians with interquartile ranges.

Multiple linear regression was used to examine the independent association of routinely available demographic and diabetes-related variables known to influence diabetes self care (age category, gender, education level, marital status, employment status, monthly household income, diabetes type, insulin therapy, diabetes duration, diabetes education, and attending a diabetes education program) with the FSC score. Statistical significance was determined if type I error rate was <5% ($p < 0.05$).[8,9,20,21]

3 | RESULTS

3.1 | Characteristics

Of the 331 invited to participate, 328 consented to participate and were included in the final analysis (response rate: 99.1%). The participants were predominately female (56.1%), married (77.4%), and unemployed (76.5%), with a mean age of 55.6 ± 13.6 years (median: 56; interquartile range [IQR]: 49–65, range: 17–85). Most participants had Type 2 diabetes (91.8%), on oral hypoglycaemic agents only (71.6%) and the median diabetes duration was 9 years (IQR: 3–15). The median blood pressure (BP) was 130/80 mmHg (IQR systolic BP: 120–150; diastolic BP: 75–90; $n = 328$) and only 3% ($n = 10$) had glycated hemoglobin obtained over the past 12 months before the study. Only 17 (5.2%) participants attended a diabetes education program. The clinical and sociodemographic characteristics of the participants are presented in Table 2.

3.2 | Diabetic self-reported foot symptoms and complications

One in eight participants (79.9%) reported having at least one or more sensory peripheral neuropathy (SPN) symptoms (range: 36.9%–57%) and nearly three-quarters (73.6%) reported symptoms of peripheral vascular disease (PVD) (range: 14.3%–46.6%) within the past month. Then, 12.2% (range: 8.5%–17.4%) and 8.8% (range: 3%–8.5%) of participants reported receiving a diagnosis of SPN and PVD, respectively. Over two-thirds ($n = 245$, 74.7%) reported no history of SPN or PVD diagnoses. Past and current history of foot deformities were reported by 37.2% of participants ranging between 3.4% for hammer, mallet, or clawed toes to 18.6% for other forms of growths. Foot ulceration (22.3%) or lower limb amputation (7.3%), with almost two-thirds ($n = 15$, 62.5%) occurring in the last 2 years (Table 3).

TABLE 2 Demographic and clinical characteristics of participants ($n = 328$).

Characteristic	N	%
Gender		
Male	144	43.9
Female	184	56.1
Age (years)	56 (IQR 49–65)	
Age groups		
≤29	16	4.9
30–39	18	5.5
40–49	51	15.5
50–59	107	32.6
60–69	85	25.9
70–79	41	12.5
≥80	10	3.0
Marital status		
Single	16	4.9
Married	254	77.4
Divorced	4	1.2
Widowed	54	16.5
Professional status		
Employed	77	23.5
Unemployed	251	76.5
Highest educational level		
Uneducated	116	35.4
Elementary	102	31.1
Secondary	49	14.9
High school	30	9.1
Occupational training (Institute)	16	4.9
University (Bachelor)	14	4.3
Postgraduate degree (Diploma, Master, or PhD)	1	0.3
Household income per month, USD		
≤50	151	46.0
51–200	160	48.8
201–500$	16	4.9
More than 500$	1	0.3
Smoking status		
Current smoker	57	17.4
Nonsmoker	208	63.4
Ex-smoker	63	19.2
Diabetes type		
Type 1	27	8.2
Type 2	301	91.8

TABLE 2 (Continued)

Characteristic	N	%
Diabetes treatment		
Diet only	23	7.0
Oral hypoglycaemic agents only	235	71.6
Insulin only	40	12.2
Oral hypoglycaemic agents and insulin	30	9.1
Diabetes duration (years)		
<10	166	50.6
≥10	162	49.4
Attended a diabetes education program		
Yes	17	5.2
No	311	94.8

Note: Values are presented as median ± IQR or *n* (%), or unless otherwise specified.

Abbreviation: IQR, interquartile range.

3.3 | Footwear

Almost nine in 10 (*n* = 288, 87.8%) participants reported wearing open shoes as their regular footwear, with traditional Syrian sandals (38.7%) being the most commonly used type (Figure 1). These open-toed sandals, typically crafted from leather, feature a simple strap system over the foot and sometimes around the heel, with flat soles made of layered leather or other hard materials. Custom-made footwear was only used by 3.4%. Most participants (97.6%) reported wearing socks, with special diabetic socks being the least used type (0.3%).

3.4 | Self-reported FSC level

The overall self-reported FSC level for the study group was average/moderate (mean total score: 27.24, SD: 7.03, 95% confidence interval [95% CI]: 26.48–28, range: 10–44; Table 4). The sum mean score for all FSC items (on a scale from 0 to 4) was 2.28 (SD: 0.43). Of the 328 participants, over one-third (37.8%) had poor/very poor FSC performance, while 50.3% attained a moderate FSC level (Table 4).

Five FSC practices had the lowest performance (mean score of 0–2) included using lubricants to moisturize feet (0.90 ± 1.30), tested water temperature (1.38 ± 1.72), checking inside of shoes (1.38 ± 1.67), drying between toes (1.53 ± 1.75), and not walking barefoot (1.83 ± 1.85). Some of the FSC practices with the highest mean scores include feet washing (3.88 ± 0.61), not having wet feet (3.20 ± 1.12), and not applying moisturizers to the skin

TABLE 3 Patient-reported diabetes-related foot symptoms and complications in the past month (*n* = 328).

	n	%
SPN symptoms		
Burning sensation in feet	187	57.0
Tingling and stinging (pins and needles) sensation in feet	175	53.4
Numbness in feet	182	55.5
Heaviness or tightness in feet	121	36.9
None of the above	66	20.1
PVD symptoms		
Pain or cramps in calves while walking	153	46.6
Pain or cramps in posterior thighs while walking	66	20.1
Pain or cramps in buttocks while walking	47	14.3
None of the above	160	48.8
Foot or calf pain at night rest	186	56.7
SPN diagnosis		
Partial or total loss of sensation in the feet	28	8.5
Nerve damage in the feet	45	13.7
Neuropathy or peripheral neuropathy	57	17.4
None	251	76.5
PVD diagnosis		
Atherosclerosis in lower extremity vessels	10	3.0
Poor circulation in lower extremities	28	8.5
Peripheral artery disease	10	3.0
None	264	80.5
Foot deformities		
Hammer, mallet, or clawed toes	11	3.4
Bunions	44	13.4
Corns or calluses	30	9.1
Other forms of growths or swelling on the feet that are painful or become irritated when wearing footwear	61	18.6
None of the above	206	62.8
Foot ulceration	73	22.3
Lower limb amputation	24	7.3
Part of the foot (toes or metatarsals)	18	75
Below knee	4	16.7
Through knee, above knee or trans pelvic	2	8.3

Abbreviations: PVD, peripheral vascular disease; SPN, sensory peripheral neuropathy.

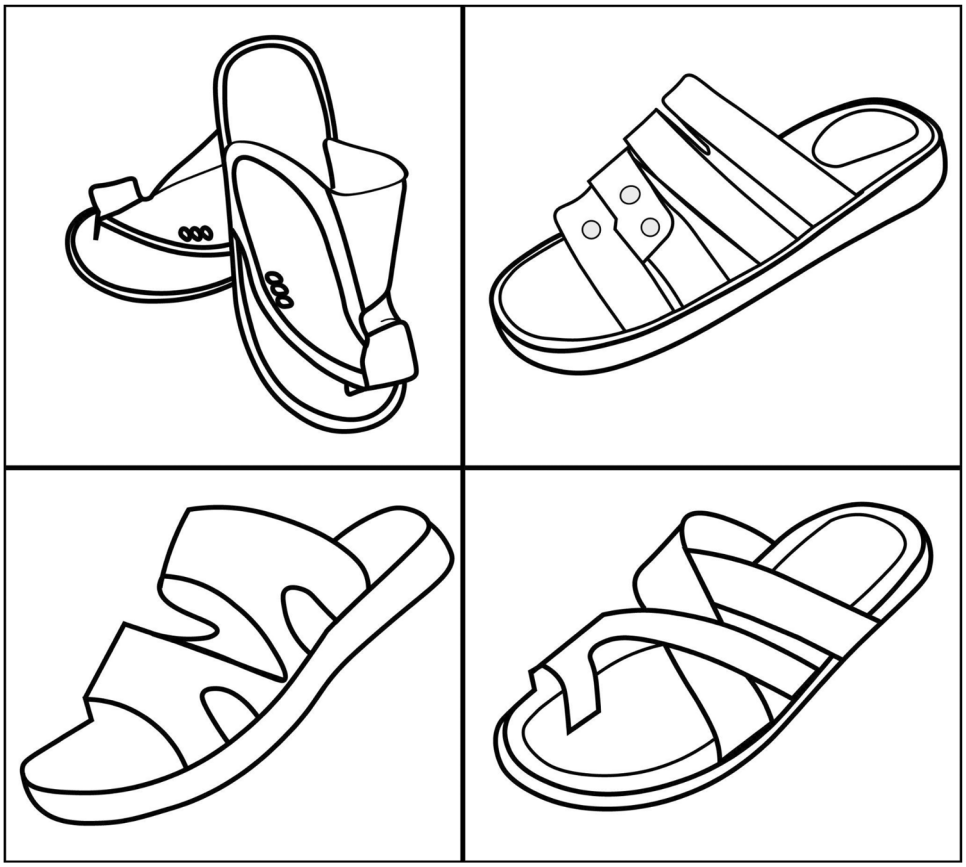

FIGURE 1 Traditional Syrian open footwear in Northwest Syria.

TABLE 4 Level of adherence to recommended FSC practices ($n = 328$).

FSC score[a]	FSC category[a]	N	%
0–12	Very poor	3	0.9
13–24	Poor	121	36.9
25–36	Average/moderate	165	50.3
37–48	Good	39	11.9

Abbreviation: FSC, foot self-care.

[a]Score categories are based on Al-Busaidi et al.[8]

between toes (3.26 ± 1.22). Table 5 outlines the frequency of FSC practices reported by the study participants.

Nearly half (45.7%) of our patients looked at the bottom of their feet once daily and one-third (32.5%) checked their shoes daily before putting them on. Three hundred and ten participants (94.5%) washed their feet daily; however, only 51.5%, 30.2%, and 27.1% checked and dried between toes daily and tested water temperature before use, respectively. Only 27 (8.2%) and 23 (7%) used daily lubricants on the feet and between the toes, respectively. One hundred and eight (32.9%) reported that they never walked barefoot or that 39.3% never wore shoes without socks (30.8%) daily. Most of the participants (64%) reported cutting their toenails weekly.

3.5 | Factors associated with better FSC level

The association between respondents' characteristics and FSC scores was assessed using univariate analysis. None of the variables was significantly associated with FSC among the respondents at the 0.05 level of significance, except people with household income/month (compared with ≤50 per month, ≥51 USD as a household income/month increased the score by a mean of 2.54 points, $p = 0.001$). Table 6 illustrates FSC scores by demographic and clinical characteristics (univariate analysis).

We performed a multivariate analysis to determine the independent predictors of FSC quality. Multiple linear regression showed Household income/month of ≥51 USD ($\beta = 2.6$, 95% CI: 1.06–4.1, $p = 0.001$) and diabetes duration of ≥10 years ($\beta = 1.8$, 95% CI: 0.2–3.4, $p = 0.027$) significantly predicted predictors of better FSC practice. Table 7 outlines the multivariate analysis of the impact of selected characteristics on FSC scores.

4 | DISCUSSION

This is the first field study from war-torn NWS to evaluate the impact of the conflict on FSC behaviors among PwD. DRFD symptoms and complications were commonly reported in our population; eight in 10

TABLE 5 FSC practices and frequency of performing among participants.

Practice	N	Frequency of foot self-care practices, (%)					Mean	SD
		Never	Rarely	Monthly	Weekly	Daily		
Looked at bottom of feet	327	72 (22)	51 (15.5)	18 (5.5)	36 (11)	150 (45.7)	2.43	1.67
Washed feet	328	6 (1.8)	1 (0.3)	3 (0.9)	8 (2.4)	310 (94.5)	3.88	0.61
Checked between toes	328	63 (19.2)	45 (13.7)	16 (4.9)	35 (10.7)	169 (51.5)	2.62	1.64
Dried between toes	327	149 (45.4)	64 (19.5)	4 (1.2)	11 (3.4)	99 (30.2)	1.53	1.75
Tested water temperature	326	167 (50.9)	57 (17.4)	3 (0.9)	10 (3)	89 (27.1)	1.38	1.72
Checked shoes	325	160 (48.8)	54 (16.5)	15 (4.6)	19 (5.8)	77 (23.5)	1.38	1.67
Did not soak feet	327	194 (59.1)	63 (19.2)	24 (7.3)	35 (10.7)	11 (3.4)	3.20	1.12
Used lubricants on feet	328	184 (56.1)	76 (23.2)	13 (4.0)	28 (8.5)	27 (8.2)	0.90	1.30
Did not use lubricants between toes	328	206 (62.8)	68 (20.7)	9 (2.7)	22 (6.7)	23 (7)	3.26	1.22
Did not walk barefoot	325	108 (32.9)	49 (14.9)	3 (0.9)	9 (2.7)	156 (47.6)	1.83	1.85
Did not wear shoes without socks	325	129 (39.3)	70 (21.3)	8 (2.4)	18 (5.5)	100 (30.8)	2.34	1.73
Cut toenails	328	6 (1.8)	6 (1.8)	106 (32.3)	210 (64)	0 (0)	2.59	0.63
Overall							2.28	0.43

Abbreviation: FSC, foot self-care.

reported one or more SPN symptoms, three-quarters of PVD symptoms within the past month, 22% had active or past foot ulcers, and 7% had a history of lower-limb amputation. Despite this, overall adherence to recommended FSC practices were low; the level of FSC performance was moderate (mean score 27.24 out of a maximum of 48), and over a third were in the poor/very poor category. Income and diabetes duration were the only independent predictors of improved FSC practices.

Self-reported DRFD symptoms and complications among our study population were significantly higher than some other Arab countries.[8,9,22–24] A recent study from Sudan reported similarly high levels of foot symptoms, including a 29% prevalence of current/past foot ulceration.[9] The prevalence of foot ulceration is much lower in other regional countries with improved health systems (2.7%–11.9%).[25–28] However, self-reported foot ulceration and lower-limb amputation are similar to that reported in other countries affected by conflict and internal displacement of residents, including Afghanistan.[29] The high burden of DRFD symptoms and complications reported in this study likely reflects the poorly resourced healthcare system, reduced access to care, and overall low awareness. However, given this study's conflict settings and self-reporting design, we could not validate the results by reviewing participants' medical records or examinations when surveys were conducted.

FSC practice is one of the essential self-management behaviors to prevent DRFD symptoms and complications.[11] In this study, overall adherence to recommended FSC was moderate (50.3%). This is echoed in a recent systematic review and meta-analysis of eight studies and 2493 PwD, which found over half (62.8%) of participants achieved a moderate diabetic FSC score.[20] This is comparable with studies from countries with similar socioeconomic and cultural characteristics, including Oman, Sudan, and Ethiopia.[8,9,30–32] In contrast, a recent study from Jordan reported relatively high levels of adherence to FSC practices (~73%).[33] This can be explained by the fact that this study recruited patients from specialized secondary level referral diabetic foot centers who were at high risk of foot ulceration (Category 3 and the highest of the International Working Group on the Diabetic Foot Risk Stratification System). This patient population receives a higher level of professional care and is expected to perform recommended FSC practices at a higher level given their elevated risk of foot complications.

Sociocultural factors and religious rituals may impact the adoption of evidence-based recommended FSC behaviors.[8,34] A high proportion of participants reported specific FSC practices, particularly daily foot washing (94.5%) and checking between toes (51.5%) daily, which is similar to other studies conducted in Muslim-majority countries.[8,23] This might be attributed to the Islamic ritual ablution (Wudhu), performed by Muslims almost before each prayer daily.[8,23] However, some FSC practices were significantly underperformed, including using lubricants to moisturize feet, testing water temperature, checking inside shoes, drying between toes, and not walking barefoot. In addition, most participants reported wearing open shoes (88%) and did not wear socks (98%). These figures are significantly lower than those reported in neighboring countries with similar characteristics, including Oman, Jordan, Kuwait, Saudi Arabia, and Iran.[8,35–38] This might relate to financial constraints, accepted socioreligious norms, climate status (extremely hot and dry in some seasons), and a lack of awareness,[8] as around 95%% of our population have not attended any diabetic training program.

Monthly household income independently predicted improved adherence to FSC practices. This is similar to previous studies which linked low household income with poor self-care behaviors in PwD.[39,40] People experiencing economic insecurity are more likely

TABLE 6 FSC scores by demographic and clinical characteristics (n = 328).

Characteristic	*n*	Mean	SD	Median	Min	Max	*p*
Total	328	27.24	7.03	27	10	44	
Gender							
Male	144	27.69	6.859	28.00	10	44	0.299
Female	184	26.89	7.153	26.50	11	43	
Age (years)							
<65	239	27.54	7.024	27.00	11	44	0.156
>65	89	26.44	7.006	26.00	10	41	
Education							
Uneducated/school	297	27.29	7.138	27.00	10	44	0.803
Occupational training/University	31	26.81	5.930	27.00	12	41	
Marital status							
Married	254	27.48	7.097	28.00	10	44	0.213
Not married	74	26.42	6.760	26.00	13	41	
Employment							
Employed	77	28.09	7.309	27.00	12	44	0.319
Unemployed	251	26.98	6.931	27.00	10	43	
Monthly household income, USD							
≤50	151	25.87	6.423	25.00	10	43	*0.001*
≥51	177	28.41	7.320	28.00	12	44	
Diabetes type							
Type 1	27	27.78	5.951	27.00	17	38	0.645
Type 2	301	27.19	7.121	27.00	10	44	
Diabetes duration (years)							
<10	166	26.52	6.857	26.00	11	42	0.082
≥10	162	27.98	7.142	28.00	10	44	
Insulin therapy							
Yes	70	28.46	7.099	28.00	11	43	0.115
No	258	26.91	6.983	27.00	10	44	
Diabetes Education Program attendance							
Yes	17	30.24	8.920	31.00	16	41	0.103
No	311	27.08	6.888	27.00	10	44	

Abbreviation: FSC, foot self-care.
*Statistical significance as p value < 0.05.

to be diagnosed with Type 2 diabetes and experience serious health complications.[41] Additionally, it is well-documented that adherence to diabetes self-care practices, in general, is significantly lower among socio-economically disadvantaged PwD.[42] Individuals with low-income shoulder most of the burden of diabetes care; they are often unable to access care and may be unable to afford healthy food, appropriate footwear, or diabetes medications.[40] PwD living in rural and remote areas (almost like NWS) were nearly four times more likely to have poor FSC practice.[11] Moreover, lower income is often associated with lower education attainment,[43] impacting health literacy and self-care behaviors like diabetes FSC.[44] Our findings show that one-third of participants were illiterate, suggesting the need for tailored health education in low-income, low-literacy groups to enhance diabetes management, including FSC.

The longer a person has diabetes, the greater the need for diligent self-foot care to prevent foot complications and maintain

TABLE 7 Multivariate analysis of the impact of selected characteristics on FSC scores (n = 328 patients).

Characteristic	Regression parameter	95% Confidence interval		p
Gender				
Male	Reference	−0.304	1.510	0.74
Female	−0.304			
Age, years				
<65	Reference	−3.474	0.236	0.087
>65	−1.619			
Education				
Uneducated/school	Reference	−4.214	1.050	0.238
Occupational training/ University	−1.582			
Marital status				
Not married	Reference	−1.088	2.948	0.365
Married	.930			
Employment				
Unemployed	Reference	−1.449	2.771	0.538
Employed	.661			
Monthly household income, USD				
≤50	Reference	1.061	4.194	*0.001**
≥51	2.627			
DM type				
Type 2	Reference	−3.075	3.725	0.851
Type 1	0.325			
DM duration, years				
<10	Reference	.208	3.469	*0.027**
≥10	1.839			
Insulin therapy				
No	Reference	−1.047	3.360	0.303
Yes	1.156			
Diabetes Education Program attendance				
No	Reference	−0.891	5.887	0.148
Yes	2.498			

Abbreviations: DM, diabetes mellitus; FSC, foot self-care.
*Statistical significance as p value < 0.05.

good overall health.[5] This makes it increasingly important for individuals with diabetes to practice good self-foot care. Our findings revealed that patients who reported having diabetes for more than 10 years had higher odds of good foot care behaviors. This is consistent with other studies[45,46] and might be explained by prolonged exposure to the disease, which can increase patients' experience and improve self-care behaviors and knowledge.[47] However, these results are controversial, with other studies showing that foot care performance declines with the increasing duration of diabetes.[35,48]

Identifying high-risk patients for diabetic foot complications and implementing preventive measures are cost-effective, lead to early interventions, and reduce the risk of lower extremities amputation.[20] People with DRFD are at higher risk of neglect during armed conflicts resulting in a higher rate of amputations.[15] Foot care education, as well as the provision of professional foot care, are fundamental elements in the prevention of DRFD. Future studies should explore barriers to FSC among our study population.

5 | STRENGTHS AND LIMITATIONS

To our knowledge, this study is the first to be conducted in NWS with ongoing conflict. Moreover, we successfully utilized a culturally sensitive tool[8,9] to evaluate FSC practices and estimate the community prevalence of DRFD symptoms and complications midst of a humanitarian crisis with broken health information systems. The response rate was also high, with low attrition (nonresponse/missing data).

This study has several limitations that should be highlighted. Conducting research in armed conflict settings and war-torn infrastructure is very challenging. During the conflict, information systems collapsed, resulting in limited reliable data and uncertainty regarding healthcare figures.[49] Therefore, convenience sampling was used to cover the most accessible diabetic clinics to create a representative sample rather than recruiting a community dwelling diabetes population. Due to security concerns, our sample was exclusively taken from Idlib province. However, our results can be extrapolated to the entire area of NWS, given the similarity in sociodemographic characteristics, especially in IDP camps. Additionally, the cross-sectional design, convenience sampling, and self-reporting of data may have introduced biases (e.g., recall, interviewer biases) and resulted in over- or under-estimation of the true prevalence of DRFD complications. In particular, participants may have reported higher levels of FSC than practiced, either to present themselves positively or due to misunderstandings. This potential bias should be considered when interpreting our findings.

6 | CONCLUSION

A high prevalence of DRFD symptoms and complications was identified, and a significant proportion of PwD in NWS have inadequate FSC practice. Improving economic security/socio-economic status may facilitate higher adherence to recommended FSC practices, thereby reducing DRFD complications. As populations living in armed conflict territories face unique challenges and barriers to health, prioritizing research on FSC education and professional foot care delivered to PwD in war-torn NWS is crucial.

AUTHOR CONTRIBUTIONS

Tareq Al-Ashkar: Conceptualization; data curation; investigation; methodology; project administration; resources; writing—original draft. **Thaer Alhussein**: Conceptualization; data curation; investigation; methodology; writing—original draft. **Mohammad S. Eido**: Conceptualization; data curation; investigation; methodology; writing—original draft. **Shaimaa Al-Hassan**: Conceptualization; data curation; investigation; methodology; writing—original draft. **Ali Alam**: Conceptualization; data curation; investigation; methodology; writing—original draft. **Maryam Fathallah**: Conceptualization; data curation; investigation; methodology; writing—original draft. **Muhammad Al-Abdullah**: Conceptualization; data curation; investigation; methodology; resources; writing—original draft. **Omar Alhiraki**: Conceptualization; investigation; methodology; project administration; resources; supervision; visualization; writing—original draft; writing—review and editing. **Ibrahim S. Al-Busaidi**: Conceptualization; formal analysis; investigation; methodology; resources; software; supervision; validation; visualization; writing—original draft; writing—review and editing.

ACKNOWLEDGMENTS

We would like to extend our heartfelt appreciation to the participants who willingly participated in this study. Special thanks extend to Dr. Yaser Alkanash for his invaluable support and for facilitating the conduct of this project. We also thank the reviewers and editor for their valuable input on the article. This research received no specific grant from any funding agency. Open access publishing facilitated by University of Otago, as part of the Wiley - University of Otago agreement via the Council of Australian University Librarians.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

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

TRANSPARENCY STATEMENT

The lead author Ibrahim S. Al-Busaidi affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

ORCID

Omar Alhiraki http://orcid.org/0000-0001-9186-9796
Ibrahim S. Al-Busaidi http://orcid.org/0000-0003-2423-4162

REFERENCES

1. Sun H, Saeedi P, Karuranga S, et al. IDF diabetes Atlas: global, regional and country-level diabetes prevalence estimates for 2021 and projections for 2045. *Diabetes Res Clin Pract*. 2022;183:109119.
2. Thibault V, Bélanger M, Leblanc E, et al. Factors that could explain the increasing prevalence of type 2 diabetes among adults in a Canadian province: a critical review and analysis. *Diabetol Metab Syndr*. 2016;8:71.
3. Al-Busaidi IS, Abdulhadi NN, Coppell KJ. Care of patients with diabetic foot disease in Oman. *Sultan Qaboos Univ Med J*. 2016;16:e270-e276.
4. Van Netten JJ, Bus SA, Apelqvist J, et al. Definitions and criteria for diabetic foot disease. *Diabetes Metab Res Rev*. 2020;36(suppl 1):e3268.
5. Armstrong DG, Boulton AJM, Bus SA. Diabetic foot ulcers and their recurrence. *N Engl J Med*. 2017;376:2367-2375.
6. Zhang P, Lu J, Jing Y, Tang S, Zhu D, Bi Y. Global epidemiology of diabetic foot ulceration: a systematic review and meta-analysis (†). *Ann Med*. 2017;49:106-116.
7. Chamberlain RC, Fleetwood K, Wild SH, et al. Foot ulcer and risk of lower limb amputation or death in people with diabetes: a national population-based retrospective cohort study. *Diabetes Care*. 2022;45:83-91.
8. Al-Busaidi IS, Abdulhadi NN, Coppell KJ. Development and pilot testing of a diabetes foot care and complications questionnaire for adults with diabetes in Oman: the diabetic foot disease and foot care questionnaire. *Oman Med J*. 2020;35:e146.
9. Elseed OMT, Al-Busaidi IS, Abdallah TA. Diabetes-related foot and lower limb complications and foot self-care practices in Khartoum, Sudan: a cross-sectional study. *Am Heart J*. 2021;242:172.
10. Gupta SK, Rastogi A, Kaur M, Malhotra S, Lakshmi PVM. Foot self-care behaviour among people with type 2 diabetes mellitus living in rural underserved area of North India: a community-based cross-sectional study. *Int J Low Extrem Wounds*. 2022:153473462211100.
11. Mekonen EG, Demssie TG. Preventive foot self-care practice and associated factors among diabetic patients attending the University of Gondar comprehensive specialized referral hospital, Northwest Ethiopia, 2021. *BMC Endocr Disord*. 2022;22:124.
12. Akbarzada S, Mackey TK. The Syrian public health and humanitarian crisis: a 'displacement' in global governance? *Global Public Health*. 2018;13:914-930.
13. Khan Y, Albache N, Almasri I, Gabbay RA. The management of diabetes in conflict settings: focus on the Syrian crisis. *Diabetes Spectrum*. 2019;32:264-269.
14. Alsabek MB, Aziz ARA. Diabetic foot ulcer, the effect of resource-poor environments on healing time and direct cost: a cohort study during Syrian crisis. *Int Wound J*. 2022;19:531-537.
15. Aziz ARA, Alsabek MB. Diabetic foot and disaster; risk factors for amputation during the Syrian crisis. *J Diabetes Complications*. 2020;34:107493.
16. Alsaied T, Mawas A, Sayah FA, Kental A, Saqqur M. A new primary health-care system in the Syrian opposition territories: good effort but far from being perfect. *Avicenna J Med*. 2017;07:189-192.
17. United Nations. *Humanitarian needs assessment programme. Mobility and needs monitoring-March 2020 Syrian Arab Republic-North-west Syria*. 2020.
18. Omar A. Understanding and preventing attacks on health facilities during armed conflict in Syria. *Risk Manag Healthc Policy*. 2020;13:191-203.
19. EPITOOLS. *Sample size to estimate a proportion or apparent prevalence with specified precision* [Online]. Accessed June 7, 2023. https://epitools.ausvet.com.au/oneproportion
20. He Q, Zhang J, Chen X. An estimation of diabetes foot self-care based on validated scores: a systematic review and meta-analysis. *J Tissue Viability*. 2022;31:302-308.
21. Świątoniowska N, Chabowski M, Jankowska-Polańska B. Quality of foot care among patients with diabetes: a study using a Polish version of the diabetes foot disease and foot care questionnaire. *J Foot Ankle Surg*. 2020;59:231-238.

22. Bou-Orm I, Adib S. Prevalence and clinical characteristics of diabetes mellitus in Lebanon: a national survey. *East Mediterr Health J*. 2020;26:182-188.
23. Abu-Qamar MZ. Knowledge and practice of foot self-care among Jordanians with diabetes: an interview-based survey study. *J Wound Care*. 2014;23:247-254.
24. Alabbood M, Marzoq A. A study on diabetic foot disorders in Basrah, Southern Iraq. *Iraqi Natl J Med*. 2021;3(2):11-24.
25. Al-Mahroos F, Al-Roomi K. Diabetic neuropathy, foot ulceration, peripheral vascular disease and potential risk factors among patients with diabetes in Bahrain: a nationwide primary care diabetes clinic-based study. *Ann Saudi Med*. 2007;27:25-31.
26. Al-Maskari F, El-Sadig M. Prevalence of risk factors for diabetic foot complications. *BMC Fam Pract*. 2007;8:59.
27. Al-Rubeaan K, Al Derwish M, Ouizi S, et al. Diabetic foot complications and their risk factors from a large retrospective cohort study. *PLoS One*. 2015;10:e0124446.
28. Mairghani M, Elmusharaf K, Patton D, et al. The prevalence and incidence of diabetic foot ulcers among five countries in the Arab world: a systematic review. *J Wound Care*. 2017;26:S27-S34.
29. Omar AS, Faiz KA, Saeed KMI, Humayoun FA, Safi K. Epidemiologic and clinical characteristics of diabetic foot ulcer among patients with diabetes in Afghanistan: an IDF supported initiative. *Diabetes Res Clin Pract*. 2023;196:110227.
30. Degefa G, Wubshet K, Tesfaye S, Hirigo AT. Predictors of adherence toward specific domains of diabetic self-care among type-2 diabetes patients. *Clin Med Insights Endocrinol Diabetes*. 2020;13:117955142098190.
31. Nasir GM, Khan HR, Parvez K, Omar J, Sohail MI. Diabetic foot self-care: associated risk factors, awareness and practice among type II diabetic patients. *Ann PIMS Shaheed Zulfiqar Ali Bhutto Med Univ*. 2019;15:91-96.
32. Noaman AA. Assessment of preventive foot care practices among patients with diabetes mellitus type II. *J Fac Med Baghdad*. 2017;59:244-248.
33. Ababneh A, Moosa S, Aljarrah Q, et al. Factors associated with foot self-care in patients with diabetes-related high-risk feet: a cross-sectional design. *Inquiry*. 2023;60:00469580231220135.
34. Al-Busaidi IS. Influence of religion and sociocultural factors on foot self-care practices in the Gulf Countries. *Diabet Foot J Middle East*. 2017;3:8-9.
35. Alsaleh FM, Albassam KS, Alsairafi ZK, Naser AY. Knowledge and practice of foot self-care among patients with diabetes attending primary healthcare centres in Kuwait: a cross-sectional study. *Saudi Pharm J*. 2021;29:506-515.
36. Khamseh ME, Vatankhah N, Baradaran HR. Knowledge and practice of foot care in Iranian people with type 2 diabetes. *Int Wound J*. 2007;4:298-302.
37. Al-Qaddah RM, Al Eyadeh MA, Abu-Qamar DMZ, Younes N, Al-Ryalat D, Haddad F. Knowledge and practice of foot care among diabetics at King Hussein Medical Center, Jordan. *J R Med Services*. 2016;23:55-63.
38. Wazqar AA, Baatya MM, Lodhi FS, Khan AA. Assessment of knowledge and foot self-care practices among diabetes mellitus patients in a tertiary care centre in Makkah, Saudi Arabia: a cross-sectional analytical study. *Pan Afr Med J*. 2021;40:123.
39. Boakye EA, Varble A, Rojek R, et al. Sociodemographic factors associated with engagement in diabetes self-management education among people with diabetes in the United States. *Public Health Rep*. 2018;133:685-691.
40. Aga F, Dunbar SB, Kebede T, Guteta S, Higgins MK, Gary RA. Foot self-care behaviour in type 2 diabetes adults with and without comorbid heart failure. *Nurs Open*. 2022;9:2473-2485.
41. Gaskin DJ, Thorpe RJ, Mcginty EE, et al. Disparities in diabetes: the nexus of race, poverty, and place. *Am J Public Health*. 2014;104:2147-2155.
42. Reshma P, Rajkumar E, John R, George AJ. Factors influencing self-care behavior of socio-economically disadvantaged diabetic patients: a systematic review. *Health Psychol Open*. 2021;8:205510292110414.
43. Raghupathi V, Raghupathi W. The influence of education on health: an empirical assessment of OECD countries for the period 1995–2015. *Arch Public Health*. 2020;78:20.
44. Al-Kaabi JM, Al Maskari F, Cragg P, Afandi B, Souid A-K. Illiteracy and diabetic foot complications. *Primary Care Diabetes*. 2015;9:465-472.
45. Gurmu Y, Gela D, Aga F. Factors associated with self-care practice among adult diabetes patients in West Shoa Zone, Oromia Regional State, Ethiopia. *BMC Health Serv Res*. 2018;18:732.
46. Shojaeimotlagh V, Baghi V, Dalvand P, Chin Y-F, Aslani M, Gheshlagh RG. Foot care performance and foot self-care behaviors in Iranian patients with type 2 diabetes: a cross-sectional study. *Clin Diabetol*. 2022;11:309-315.
47. Kassahun T, Gesesew H, Mwanri L, Eshetie T. Diabetes related knowledge, self-care behaviours and adherence to medications among diabetic patients in Southwest Ethiopia: a cross-sectional survey. *BMC Endocr Disord*. 2016;16:28.
48. Magbanua E, Lim-Alba R. Knowledge and practice of diabetic foot care in patients with diabetes at Chinese general hospital and medical center. *J ASEAN Fed Endocr Soc*. 2017;32:123-131.
49. Alhiraki OA, Fahham O, Dubies HA, Hatab JA, Ba'Ath ME. Conflict-related excess mortality and disability in Northwest Syria. *BMJ Glob Health*. 2022;7:e008624.

How to cite this article: Al-Ashkar T, Alhussein T, Eido MS, et al. Level of and factors associated with foot self-care among people with diabetes in Idlib Province of northwest Syria: A cross-sectional study. *Health Sci Rep*. 2024;7:e2098. doi:10.1002/hsr2.2098