



## Original research

## Short-term effectiveness of a culturally tailored educational intervention on foot self-care among type 2 diabetes patients in Morocco



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## ABSTRACT

**Background:** Self-management education (SME) is an important yet unacknowledged aspect of diabetes care. Despite the raise of diabetes and its complications with significant burden in developing countries, research on SME interventions in Morocco is lacking.

**Aims:** To assess the effectiveness of a culturally tailored SME intervention on foot-care self-management practices among type 2 diabetes patients and to identify factors associated with practices variation.

**Methods:** We designed a pre-post prospective quasi-experimental study and recruited patients with type 2 diabetes aged 30 years old or above. The intervention consisted of an interactive group discussion using different materials: a narrative video, a PowerPoint presentation and a printed guide. Foot-care practices were assessed prior to the session and one month later using 2 items from the Summary of Diabetes Self-Care Activities (SDSCA). Binary logistic regression was performed to identify factors associated with a favorable variation, defined as an increase in the mean frequency score of foot-care by a minimum of 1 day/week.

**Results:** A total of 199 participants were recruited and 133 completed the second assessment. Mean age was  $55.2 \pm 11.2$  years old. Women represented 67% and 72% of participants was illiterate. The foot-care score mean increased from  $3.5 \pm 2.9$  days to  $5.9 \pm 1.8$  days one month after the intervention (mean variation was  $2.4 \pm 3.1$  days;  $p < 0.001$ ). A favorable variation was found among 75 (37.7%) participants. In multivariate analysis, literacy was associated with higher likelihood of a favorable variation of foot-care practices (OR = 2.82; 95%CI: 1.09–7.31) while previous education about diabetic foot was associated with lower likelihood of a favorable variation (OR = 0.26; 95%CI: 0.08–0.78).

**Conclusions:** There was a general improvement in foot-care practices after the intervention. Our findings suggest the role of literacy and previous patient education in shaping the observed variation. Culturally tailored interventions targeting other disease management domains are needed in our context.

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## Introduction

The increasing burden of type 2 diabetes mellitus (DM) poses significant challenges to health care systems worldwide. The global prevalence of type 2 DM has almost doubled in the last 30 years, from 4.7% in 1980 to 8.5% in 2014, with a higher increase shown in low and middle income countries [1]. Across the Middle East and North Africa, 35.4 million people were estimated to be living with the disease in 2015, with this number expected to increase

to 72.1 million by 2040 [2]. In Morocco, a prevalence of 6.6% has been reported among adults aged 20 years and over [3]. This disease is responsible for high rates of mortality and related morbidity here largely as a consequence of the degenerative complications. This makes the disease management complex and costly, and underlines the need for more effective preventive strategies.

Studies focusing upon the management of chronic conditions such as DM have long emphasized the importance of an active patient role, acknowledging the need to promote strategies that provide patients with an opportunity to take on a more structured and purposive role in their day-to-day care [4]. Self-management education (SME) is an important strategy that can build patients confidence and provide them with the knowledge and skills to take a

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more active role in their own disease management. Many studies evaluating the effectiveness of SME for chronic conditions have demonstrated positive health outcomes [5–7]. For diabetes in particular, results have indicated improvements in diabetes knowledge, levels of fasting blood glucose and hemoglobin A1c (HbA1c) [8,9].

Among DM complications, diabetic foot is a major cause of disability and premature deaths [10]. Painless neuropathic foot is the main cause of foot ulcers and amputations: patients can often not recognize early symptoms of the disease, and therefore pay less attention to even the more serious of foot injuries. Preventing foot ulcers requires strict glycemic control as well as proper foot-care: minimal foot self-care practices include systematic daily inspection of feet and inside of shoes [11]. For developing countries, factors related to poverty, literacy and environmental barriers, delays in seeking treatment, and less priority given to foot-care by both patients and health providers have been cited as major contributing factors that can increase the risk of foot complications [12,13]. For those in Morocco, foot ulcers represent both a significant yet unacknowledged threat to many patients [14], highlighting a clear gap between evidence and practice. Effective preventive measures – through early diagnosis measures and enhanced patient education- are crucial for reducing the mortality and morbidity related to this complication [15–17].

Though data focused on the incidence and burden of foot ulcers for patients with diabetes in Morocco is scarce, there is clear consensus that promoting foot self-care and regular screening of foot are key measures needed to prevent foot ulcers and amputations. At present, educational material is mainly adapted from available publications and guidelines from developed countries. To our knowledge, there has been no published research into the effectiveness of culturally tailored SME interventions for diabetes patients within the Moroccan context. More specifically, no SME intervention related to foot self-care practices among those patients is available. We hypothesized that an educational intervention using culturally targeted material may enhance the practice of foot-care among type 2 diabetes patients in our context.

The primary objective of this study was therefore to assess the effectiveness of a culturally tailored SME intervention on foot-care self-management practices among type 2 diabetes patients. A secondary objective was to identify factors associated with a favorable variation of self-care practices after the intervention.

## Methods

### Design and participants

We performed a single-arm quasi-experimental interventional study consisting of a pre-post prospective design. Target population was represented by patients aged 30 years old or above, who were diagnosed with type 2 diabetes mellitus for at least 6 months. Excluded from the study were patients not speaking Moroccan dialect or unable to participate and complete the study procedures due to physical or mental disabilities. The study sample was constituted with eligible volunteers recruited through patient organizations and primary care facilities, in 4 areas in Southern Morocco. Participants were approached by healthcare professionals and patient organizations members who briefly explained the study aim and procedures. Individuals willing to participate were invited to the study site for a scheduled group meeting with the study team.

### Intervention

The intervention consisted of an interactive educator-led group discussion, the content of which was developed after meetings

with an expert in diabetology. It included a brief overview of diabetes definition, types and symptoms as well as major complications including diabetic foot. Self-management strategies were presented and described with focus on foot care. This consisted of discussing key messages and adopted an approach of over-viewing wrong messages before discussing correct ones. Messages concerning foot care were categorized in 5 sections: 1/general foot-care (washing, drying and avoiding heat and cold), 2/nail care, 3/shoes use and choice, 4/socks use and 5/what to do in case of an injury.

Educational tools consisted of a PowerPoint presenting an overview about diabetes. A narrative video was developed using a culturally sensitive approach to the context with regard to the character, language and cultural practices. In this video, we displayed an individual performing daily activities, such as showering, going to bed, cutting nails, wearing socks, or wearing sandals to walk at home. A CD-rom containing the video was provided to participants after the session. Finally, an additional short guide summarizing the content was developed, printed and provided to participants. With regard to the content, educational messages were adapted with emphasis on the cultural expression of the corresponding concepts. The educational tools were also designed in order to be more appropriate and relevant for participants, such as presentation of the settings, character portrayal, and clothes and accessories. Moreover, due to expected low levels of literacy, we decided to privilege the use of image and sound for the developed tools.

A group of seven medical graduates were trained to conduct group educational sessions with patients. Each group attended one educational session including power point presentation, video visualization and discussion. Groups included 15–20 participants and the sessions lasted 90 min in average. Participants were invited and encouraged to contribute and interact with the rest of the group.

### Data collection

Eligible and consenting participants were interviewed by trained medical students before the educational session. The questionnaire aimed at gathering data on various domains. Socio-demographic data included sex, age, literacy, professional activity and health insurance. Disease characteristics included disease duration and medical visits over the past year. We also recorded information on previous participation to education sessions and membership of a patient organization.

For the purpose of foot self-care activities assessment, we used two items from the Summary of Diabetes Self Care Activities (SDSCA): 1/ “on how many of the last seven days did you check your feet?” and, 2/ “on how many of the last seven days did you inspect the inside of your shoes?”. Both items report on the frequency of the behavior over the past week, on a scale from 0 to 7 (number of days). One month later, participants were invited to respond once again to the two foot-care items. For this assessment, we used items from the Moroccan version of the SDSCA [18].

### Statistical analysis

Statistical analyses were performed using SPSS version 16.0 for windows. Qualitative variables were described using frequencies and percentages. Quantitative variables were described using means and standard deviations.

For foot-care, the score was computed as the mean of the ratings for the two constituting items. Pre-post variation of foot-care score was calculated using the formula (post score – pre score). We defined a favorable variation as an increase in the mean frequency score of foot-care by a minimum of 1 unit (=day/week).

The Wilcoxon nonparametric test for paired samples was used for pre-post comparison of foot-care score. In order to account for the effect of loss to follow-up after the intervention, individuals who completed the second assessment were compared to those lost to follow-up using Khi-2 test. The Mann-Whitney nonparametric test for independent samples was used to compare foot-care scores between complete cases and lost to follow-up cases. Significance level was set at 0.05. Binary logistic regression was performed to identify factors associated with a favorable variation of foot-care score after the intervention. Unadjusted and adjusted odds ratios (OR) are presented along with 95% confidence intervals.

### Ethical considerations

This study was conducted in accordance with the ethical principles of the declaration of Helsinki [19]. Participants in the study were recruited on a volunteer basis. The interviewers explained the study objectives and procedures to the subjects. Verbal consent was obtained from participants prior to their inclusion. Confidentiality of collected data was ensured and access to data was limited to the study team. All volunteers regardless of their inclusion or not in the study were welcome to take part in the SME session.

### Results

A total of 199 participants were recruited and completed the first assessment. Their mean age was  $55.2 \pm 11.2$ , with values ranging from 30 to 83 years old. Women represented 67% of the sample ( $n = 133$ ). Seventy-two percent ( $n = 142$ ) of participants were illiterate. Mean duration of disease was  $6.4 \pm 4.9$  years, with 53% of participants diagnosed since 5 years or more. One hundred and six participants reported having previously received education about the disease and 140 were members of a patients' organization. Table 1 shows participants characteristics and disease features.

For the second assessment, the study team interviewed 133 (66.8%) participants. Sixty-six individuals did not attend the second scheduled meeting. There was no statistically significant difference for foot-care score at first assessment between the two groups:  $3.5 \pm 2.9$  days and  $3.2 \pm 2.8$  days for complete cases and cases lost to follow-up, respectively. Table 2 summarizes the comparison of the two groups with regard to factors considered in this study. There was no statistically significant difference when considering socio-demographic variables. Individuals who had health insurance tended to complete the follow-up assessment. Participants lost to follow-up have reported more frequently being members of a patients' organization or being previously exposed to education about diabetes or diabetic foot (Table 3).

Among the group who completed follow-up, the foot-care score mean was  $3.5 \pm 2.9$  days prior to the SME session. One month later, the mean was  $5.9 \pm 1.8$  days. Mean variation was  $2.4 \pm 3.1$  days.

**Table 1**  
Sample characteristics (socio-demographics and disease features).

	n	%
Female ( $n = 199$ )	133	66.8
Illiterate ( $n = 196$ )	142	72.4
Professional activity ( $n = 192$ )	63	32.8
Health insurance ( $n = 191$ )	71	37.2
Disease duration $\geq 5$ years ( $n = 196$ )	104	53.1
$\geq 3$ medical visits in the last year ( $n = 174$ )	84	48.3
Previous education on diabetes ( $n = 197$ )	106	53.8
Previous education on foot-care ( $n = 193$ )	81	42.0
Member of a patient organization ( $n = 197$ )	140	71.1

**Table 2**  
Comparison of complete cases and lost to follow-up cases.

	Complete cases ( $n = 133$ )	Lost to follow-up cases ( $n = 66$ )	p
Gender (female)	66.2	68.2	0.776
Age ( $\geq 55$ years old)	48.1	51.5	0.652
Literacy (yes)	31.1	20.3	0.114
Professional activity (yes)	29.2	34.6	0.450
Disease duration ( $\geq 5$ years)	55.6	47.6	0.293
Health insurance (yes)	43.8	23.0	0.005
Medical visits over the last year ( $\geq 3$ )	52.5	39.3	0.102
Previous education about diabetes (yes)	48.5	64.6	0.033
Previous education about diabetic foot (yes)	36.2	54.0	0.019
Member of a patients' organization (yes)	62.1	89.2	<0.001

\*p: level of significance; Khi-2 test.

The results in italic refer to statistically significant associations.

This pre-post intervention increase was statistically significant ( $p < 0.001$ ).

We considered an increase in frequency of one day per week or more as a favorable variation of foot-care practices. A favorable variation was found among 75 participants corresponding to 37.7% of all cases. Individuals lost to follow-up were considered as presenting a negative outcome.

Univariate logistic regression of factors associated with a favorable variation of foot-care practice after the intervention showed that individuals with any level of literacy were more likely to present a favorable variation, while poorer outcome was found among individuals who reported previous education about diabetes or diabetic foot or those who were members of a patients' organization. In the multivariate analysis, 2 factors remained significant: literacy (higher likelihood of a favorable variation) and previous education about diabetic foot (lower likelihood of a favorable variation).

### Discussion

This study was carried out with the purpose to assess the effectiveness of a culturally targeted educational intervention, focused on improving foot-care practices among type 2 diabetes patients. The sample consisted of a female majority (67%), which is not surprising: participants were recruited through patient organizations and primary-care facilities, where it was reported that women tend to utilize health services more often than men [20]. Moreover, the high illiteracy rate observed in the sample (72%) in conjunction with a low proportion of those with health insurance (35.7%) gives an indication of the difficulties in accessing both medical care and general medical information, and further demonstrates the need for more practical and effective preventive education in this setting.

The format of early SME interventions focused on a more didactic 'top-down' approach to delivering such educational programs, with health professionals focusing on providing patients with mostly prescriptive information. Those interventions were also mainly centered upon knowledge as the key outcome and measure of success, with an assumption made that this would be sufficient to prompt patients to perform better self-care activities [8]. However, subsequent research demonstrated that knowledge alone was not enough to stimulate important behavior changes among patients with diabetes, highlighting a need for a more comprehensive approach with continuous and repetitive interactions, and focusing on other important outcome variables, such as behavioral, social, and psychological factors [9,21]. An emphasis on incorporat-

**Table 3**

Binary logistic regression of factors associated with an increase of the frequency of foot-care by 1 day or more per week after the intervention (n = 199).

	Univariate regression		Multivariate regression	
	Unadjusted OR	95% CI	Adjusted OR	95% CI
Gender (female)	1.20	0.65–2.22	1.63	0.50–5.36
Age ( $\geq 55$ years old)	0.85	0.48–1.50	1.09	0.47–2.52
Literacy (yes)	1.96	1.04–3.70	2.82	1.09–7.31
Professional activity (yes)	0.77	0.41–1.44	0.78	0.28–2.76
Disease duration ( $\geq 5$ years)	1.21	0.68–2.16	1.69	0.78–3.81
Health insurance (yes)	1.15	0.63–2.10	0.73	0.32–1.65
Medical visits over the last year ( $\geq 3$ )	1.74	0.94–3.24	1.43	0.68–3.01
Previous education about diabetes (yes)	0.27	0.14–0.47	0.79	0.28–2.22
Previous education about diabetic foot (yes)	0.24	0.12–0.46	0.26	0.08–0.78
Member of a patients' organization (yes)	0.30	0.16–0.57	0.61	0.26–1.41

OR: Odds Ratio; CI: confidence interval.

The results in italic refer to statistically significant associations.

ing issues of self-efficacy, problem-solving abilities, and skills-building in program success was therefore introduced [8,13], and a shift toward more participatory, interactive interventions developed, focusing on strategies targeting lifestyle changes, patient motivation and personal attitudes toward the chronic condition [22–24]. Adopting a participatory approach demonstrated better understanding and reinforcement of educational messages through the patient's involvement in different group activities.

Studies have also emphasized that displaying and delivering information in a manner that was culturally relevant is integral to patient engagement, helping to break down key concepts and build understanding through simple behaviors that could be incorporated into day-to-day self-care [25–30]. Several studies highlighted the importance of a culturally sensitive design of educational interventions, particularly with regard to literacy skills and cultural specificities in developing countries or among minorities [31–34].

This intervention consisted of a culturally sensitive workshop involving both facilitated group discussion and narrated video content. We purposely focused on one aspect of diabetes self-management: good minimal foot-care practices. This allowed for a simpler, clearer, and more focused approach prioritizing an area of self-care that was previously cited as poorly understood and not well adhered to by type 2 diabetes patients in this context [14]. Studies have shown that properties of effective SME interventions include group-based [35,36], reinforced or intensive messaging [37], and patient participation and collaboration [9,21,33]. We therefore adopted a group discussion approach to encourage participant's contribution and engagement, and provided take-home material to reinforce messages delivered during the face-to-face session. Our educational material was designed to take into account local usages, norms, and practices that are relevant to this context.

We attempted to simplify the content as much as possible as we expected that our target population has low health literacy. In a recent review, Mackey et al. reported on the consistent association between health literacy and knowledge, beliefs and self-efficacy in different chronic conditions [38]. We also used multiple educational tools to facilitate patients' engagement. Previous studies reported on the importance of combining written information with an interactive component to facilitate better understanding among patients [39]. There has also been an emphasis on the role of pictorial aids and teach-back methods (reiterating information back to health professionals) to improve understanding and information recall for people with limited literacy skills [40]. In this way, it is easier for patients to understand key concepts being introduced, and engage more actively with the educational content.

On average, we observed an increase in foot care activities frequency among participants in the study, providing indication that

access to culturally adapted education can be a powerful tool to increase awareness and promote behavior change strategies among patients. Improvements in different health outcomes, including self-care activities, have been shown in previous studies [27,31,34,41]. Specifically, improvements in knowledge and skills related to foot self-care have been consistently reported across studies [25,35,37,42]. We believe that this finding is explained by the fact that target skills are simple and generate no additional cost for the patient which makes it easy to observe them.

In order to shed more light on these findings, we wanted to identify factors associated with the intervention outcome. For this analysis, we defined a favorable variation as an increase of foot-care frequency of at least 1 day per week based on the second assessment. Participants lost to follow-up were considered as presenting unfavorable outcome.

Because 1/3 of participants did not complete the follow-up, we were interested in examining the difference between this group and the group with complete follow-up. Individuals lost to follow-up were more frequently members of patients' organization and reported previous education about diabetes or diabetic foot. The fact that those individuals felt that the information they received during the intervention was not new to them may explain why they did not complete the second assessment. Another significant difference was found for health insurance, which was more frequent among complete cases as compared to lost to follow-up cases. This may be explained by the fact that those patients who had easier access to healthcare were more willing to acquire complementary knowledge and skills to help manage their condition. The two groups did not differ with regard to other factors or to the initial foot-care practice score.

Within this study, a favorable outcome after the intervention was associated with previous attendance of educational sessions about diabetic foot. Surprisingly, participants who had not previously been exposed to such education were more likely to increase their foot-care practices by at least one day per week as compared to those who reported having received it. A similar trend was observed for participants who reported previous attendance of an education session about diabetes in general in univariate analysis, but not in multivariate analysis.

That the intervention had such a meaningful impact among those not previously exposed to education about diabetic foot could also suggest that this introduction to a topic that patients were unaware of was positively received. Unfortunately, we did not have data on the content and characteristics of the previous education activities in order to understand their impact. Moreover, caution should be taken in interpreting those findings in light of the well-known biases related to self-reported data such as memory bias. Future research should include a comprehensive assessment of previous education received by participants in order to



understand how it could have shaped their response to a new educational intervention.

In univariate analysis, participants who were not members of patient organizations tended to present favorable variation more frequently as compared to patient organizations members. Although this relationship was not significant in multivariate analysis, it may suggest that this group may have been more eager to benefit from the intervention having not been part of a support group previously. The intervention provided an outlet for discussion and mutual learning, which could explain the more apparent desire to be more active in their self-management activity. This could also perhaps be better understood as reflecting unmet needs for social support and health education among this group. Studies have shown the importance of psychological and social aspects of health in the context of chronic diseases such as diabetes and the impact of such factors on both knowledge acquirement and self-efficacy skills development [23,43,44]. Alongside the mutually supportive function of patient groups, these organizations can be used as educational centers for patients. As emphasized by Lamchabab et al. in their study with patients in northern Morocco, poor understanding of medical information was a significant barrier to awareness of the risks and management of diabetic foot as it is often too technical and written and presented in French [14]. This emphasizes that for patients that are accessing overwhelmed primary care services, information may not be appropriately delivered, further supporting the idea that they may seek this information through other mediums such as patient support groups.

Literacy was consistently associated with favorable variation after the intervention in univariate and multivariate regression. This finding underlines the impact of literacy, health literacy and more specifically knowledge about the disease on a patient's ability to acquire self-management skills in the context of chronic diseases [38,45,46]. It also emphasizes that, despite a culturally targeted design of the intervention, literacy remained a significant determinant for the outcome implying the need for further research to explore strategies of skills acquirement among low literacy patients.

There were no significant differences observed for demographic variables (specifically age and gender), which seems consistent with other studies that have independently investigated the effects of these variables and found no significant impacts upon outcomes for diabetes patients [8,12,31]. There was also no significant difference observed for professional activity in our study even though it has been widely cited that lower socioeconomic status tends to be correlated with lower diabetes knowledge and self-care behaviors [12,13,23].

Finally, there was no association between disease duration and improvement in foot care activity, although there is evidence to suggest that the longer patients live with the disease, the more likely they are to engage in better self-care activities as they naturally become more self-efficacious over time [13,44]. However, that there was no association in the present study could be suggestive of the lack of resources and knowledge of diabetes care in this setting in general, regardless of disease duration. This is further supported by prior studies in Morocco that have revealed a general trend of low awareness of diabetes care, specifically for risks and complications related to diabetic foot, in conjunction with little access to healthcare services, and inappropriate information resources [14]. This further highlights the need for future research in order to identify key determinants of self-care management in our context and successful interventions to be implemented.

The strength in designing a longitudinal prospective study was that it allowed us to objectify a change over time after the intervention. However, the absence of a control group makes it difficult to assign causality. Due to practical reasons (notably the setting in which participants were recruited), it was difficult to recruit a

control group and maintain comparability between groups because of contamination bias that has been widely reported within such behavioral interventions, highlighting positive benefits observed in both groups. Additionally, we avoided recruiting a control group in a different setting because of risk of high heterogeneity between the intervention and control groups. We thus, decided to adopt a pre-post intervention assessment.

The study setting was close to that of a real-life setting, which makes it easy to consider the possibility of replication and deployment in practice. Although the self-reported nature of the behavioral data is a limitation of the study, the use of a simple assessment tool should make it easier to replicate the study or to monitor this domain of self-management practices among a larger patients' population. What is further important to assess in future studies are clinical outcomes such as the incidence of foot ulcers and their characteristics.

The re-test at one month was used to avoid misinterpreting a change observed right after the session as being clinically significant. We also aimed to extend the single face-to-face SME by providing a printed guide and a copy of the video to the participants following the workshop so that they can consult them at home or discuss them with their families. Nonetheless, longer-term evaluation is needed to ascertain the persistence of knowledge and skills developed after the SME, as it had been recognized that over time these positive outcomes can decrease in effect, and that there is more research needed to understand how to sustain these behaviors among patients [8,34].

Finally, this was a simple intervention focusing on foot-care. The choice to focus on foot-care was made based on the lack of awareness of such crucial and inexpensive area of diabetes self-management, and the higher incidence of diabetic foot complications in developing countries and among underserved populations. Interventions tailored to suit the cultural and social context in which they are implemented should be given more focus by professionals and policy makers involved in diabetes care, in conjunction with more careful evaluation of patients' response and adherence to such programs. In our context, future research should focus on the development and testing of more complex and comprehensive interventions including diet and physical activity.

## Conflicts of interests

None.

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