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BARRIERS TO SELF-FOOT CARE MANAGEMENT IN PATIENTS WITH TYPE 2 DIABETES MELLITUS: A CROSS-SECTIONAL STUDY FROM EASTERN INDIA

Guruprasad Thimmaiah* — Department of Hospital Administration, PGIMER (Post Graduate Institute of Medical Education and Research), Chandigarh, India *Corresponding Author

Kingshuk Bhattacharjee — Department of Healthcare Management, Shri Jagadishprasad Jhabarmal Tibrewala University, Rajasthan, India

ABSTRACT **Background:** The benefits of self-foot care management are well recognized in type 2 diabetes subjects. However, a substantial proportion of patients don't perform self-foot care assessment at all. We aimed to enumerate the barriers to self-foot care management in Type 2 Diabetes Mellitus (T2DM) patients and factors associated with these barriers. **Methodology:** A cross-sectional study of successive type 2 diabetes patients attending routine out-patient diabetes clinics in tertiary care hospitals in Kolkata, India from 1st June 2018 to 31st October 2020. All patients who matched our study eligibility criteria were interviewed by diabetes care providers using a structured questionnaire modeled after a systematic review of similar studies but tuned to regional preferences. Besides demographic details, patient particulars, laboratory investigations, the questionnaire included 2 direct questions on possible barriers to self-foot care management. The questions were grouped into five categories viz. environmental (4 questions), behavioral (9 questions), occupational (2 questions), physical inability (7 questions) and medical reason (1 question). **Results:** An overwhelming 70% of the study population have more than one barrier to self-foot management. A larger proportion of females (68.9%) were not taking self-foot care management compared to their male counterparts (53.5%). Around one-third of the male participants cited lack of time as a major barrier to self-foot care management. Around 30% females reported lack of foot care education and training as the major obstacle to self-foot care management. **Conclusion:** This study elaborates the need for awareness regarding possible barriers when counseling T2DM patients. Self-foot care management remains one of the cheapest pillars of diabetic foot care management, the benefits of which extend beyond glycemic control. This study also highlights the importance of physician advice regarding self-foot care management. Behavioral causes seem to be the commonest barrier to self-foot care and hence strategies to target the same need to be thought of.

KEYWORDS : Diabetes, Barriers, Self-foot care, India

INTRODUCTION:

The vast majority of people with diabetes, around 80 %, live in 'developing' countries, and it is in these countries that the largest increases in the burden of diabetes will occur over the coming decades.[1] Diabetic foot problems are a major cause of morbidity and premature mortality in people with diabetes and contribute substantially to the health care costs associated with diabetes.[2–4] Interventions to reduce the burden of diabetic foot ulceration and amputation are estimated to be highly cost-effective, indeed cost saving, in both developed and developing country settings.[5,6] The challenge, particularly in less well-resourced health care systems, is how to implement effective foot care that realizes these potential health gains and cost savings.[7-10]

Studies aimed at finding these barriers to self-foot care management are scarce, especially in the Asian subcontinent. Moreover, most of the available studies have targeted a small population of patients with DM. With that in mind, this study was devised with a goal to describe the possible barriers to self-foot care management, in an Indian context.

OBJECTIVES/AIMS:

1. To enumerate the barriers to self-foot care management in Type 2 Diabetes Mellitus (T2DM) patients.
2. To enumerate the relationship of the most common barriers to age, sex, lifestyle and duration of diabetes.

RESEARCH DESIGN & METHODOLOGY:

All patients attending the Diabetes clinic in tertiary care hospital in Kolkata, India during the time 1st June,2019 to 31st October 2020 were approached. Exclusion criteria included:

(i) Refusal to provide written informed consent
(ii) Pre-existing physical disability requiring long-term support
(iii) Type 1 Diabetes Mellitus
(iv) Pregnancy
(v) Patients below age of eighteen
(vi) Recent hospital admission for any cause within the last 6 months
(vii) Any documented psychiatric illness likely to impair judgment

Consecutive patients attending diabetes clinic in the hospitals were approached and briefed about the study. Following written informed consent, willing candidates fulfilling our criteria were interviewed by diabetes care providers using a structured questionnaire available in English, Bengali and Hindi. The questionnaire was devised from but not limited to a systematic review of similar studies(6) tailoring it to circumstances relevant to our regional population. They were offered 23 direct questions on possible barriers to self-foot care management. The responses were grouped into 5 categories viz.

(I) Environmental (4 Questions)
(ii) Behavioral (9 Questions)
(iii) Occupational (2 Questions)
(iv) Physical Inability (7 Questions)
(v) Medical reasons (1 Question)

The questionnaire also included demographic details, patient particulars (BMI, duration of T2DM, Insulin or anti-hypertensive use) and recent laboratory investigations (HbA1c, Fasting and Postprandial glucose levels).

Statistical Methods: Descriptive statistical analysis has been carried out in the present study. Significance is assessed at a level of 5%. Results on continuous measurements are presented as Mean ± SEM and results on categorical measurements are presented in Number (%). Significance is assessed at a level of 5%.

The following assumptions were made of the data: 1) Cases of the samples should be independent, 2) The populations from which the samples are drawn have the same variance (or standard deviation) and 3) The samples are drawn from different populations are random. Normality of data was tested by Anderson Darling test, Shapiro-Wilk, Kolmogorov-Smirnoff test and visually by QQ plot.

Statistical software: The Statistical software namely SAS (Statistical Analysis System) version 9.2 for windows, SAS Institute Inc. Cary, NC, USA and Statistical Package for Social Sciences (SPSS Complex Samples) Version 21.0 for windows, SPSS, Inc., Chicago, IL, USA were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs and tables.

RESULTS:

A total of 1000 patients were included in our study. The demographic and clinical variables of the patients are shown in Table1.

Table 1 Study Sample Characteristics

Clinical Profile Variables	
Age, Mean ± SD	59.92 ± 10.59
BMI, Mean ± SD	25.81 ± 3.31

Hip Circumference, Mean ± SD	89.53 ± 6.93
Waist Circumference, Mean ± SD	90.71 ± 7.63
Waist Hip Ratio, Mean ± SD	0.99 ± 0.08
WHR - No Risk (Male<0.95, Female<0.85)	50.16%
WHR - Risk (Male ≥ 0.95, Female ≥ 0.85)	59.88%
Neck Circumference, Mean ± SD	36.16 ± 3.59
Duration of Diabetes, Mean ± SD	11.68 ± 4.52
Hypertension, %	293 (29.3%)
Smoking, %	364 (36.4%)
Ex-smoker, %	182 (18.2%)
Alcoholic, %	144 (14.4%)
Ex-Alcoholic, %	201 (2.10%)
Anti-diabetic Drug Intake-Insulin & Orals, %	228 (22.8%)
Anti-diabetic Drug Intake-Oral agents, %	472 (47.2%)
Married, %	692 (69.2%)
Family History of Diabetes, %	422 (42.2%)

Table 2: Gender wise barriers to self-foot care management:

Parameters-Category (Total N)		**Top 5 Barriers**	**N (%)**
Gender	**Male (N=500)**	Lack of Time	176 (35.20%)
		I don't know how to take care	116 (23.20%)
		Lack of motivation	92 (18.40%)
		Barefoot walking is common in my place	68 (13.60%)
		I cannot afford to buy shoes	48 (9.60%)
	Female (N=500)	I don't know how to take care	148 (29.60%)
		I have a problem reaching my foot	132 (26.40%)
		I cannot afford to buy shoes	112 (22.40%)
		I don't think it is important to take care of foot	60 (12.00%)
		Lack of Time	48 (9.60%)

We tried to explore the barriers to the self-foot care amongst our study participants. In the male subgroup, amongst all the reported barriers, the most commonly identified barrier for not being able to take care of the feet is lack of time which has been reported by 176 study participants (35.2%). In the female sub-group, the most common barrier which was reported by 148 (29.6%) of the study participants was that the patients were not able to take care of their feet due to lack of training and education. This was followed by a third most common barrier 132 (26.4%) primarily due to musculoskeletal problem due to which the patients found it difficult to reach their feet and to perform foot care accordingly. The fourth most common barrier reveals that 116 (23.2%) of the study participants don't know how to take care of their foot which is primarily due to lack of education and proper training wither by the treating clinician or by the paramedical staff. The next barrier 112 (22.4%) which was sited is the lack of ability to buy expensive shoes, particularly in the female sub-group. On further exploratory analysis, most of the females reported that as they were financially dependent on their husband, it is difficult for them to convince their husband to generate fund for buying of the expensive diabetic foot shoes. The next most common barrier which was reported by males was lack of constant motivation. As considerable amount of time has to be spent on adequate self-foot care management on regular basis, it was found to be started by most of the study participants, but it was waned gradually in the long run. This was particularly highlighted in the male sub-group as compared to the female sub-group. The next common barrier reported by the male subjects is that bare foot walking is quite common in their place and it was found to be one of the reasons for inflicting injuries to the feet and further diabetic foot complications.

Another barrier which was reported by 30 out of 250 females was that they don't think it is important to take care of their foot. When we interviewed and conducted a case study we found that most of the women reported that there is much important work to perform in their day to day work rather than sitting and spending so much of time in taking care of their feet. The fifth most common reason cited by the females is that they also don't have time to take care of their feet due to competing priorities. (Table 2)

Table 3: Age wise barriers to self-foot care management:

Parameters-Category (Total N)		**Top 5 Barriers**	**N**
Age Group (in years)	**Age 20-40 (N=312)**	I don't know how to take care	88
		Poor communication between patient and health care provider	72
		I don't know how to take care	56
		I cannot afford to buy shoes	48
		Inconvenience for my work	48
	Age 41-60 (N=404)	Inconvenience for my work	164
		Lack of motivation	116
		I have a problem reaching my foot	72
		I don't know how to take care	32
		Poor communication between patient and health care provider	20
	Age > 60 (N=284)	Lack of support from family	104
		I have a problem reaching my foot	48
		I can't see well enough	52
		Barefoot walking is common in my place	40
		I don't know how to take care	40

When we tried to identify the barriers in different age groups from 20 to 40 years, 41 to 60 years and age greater than 60 years, we found a mixed bag of barriers amongst the three sub-groups. There were a sizeable number of subjects in all the three sub-groups with 312 in the 20 to 40 years of age group, 404 subjects in the age group of 41 to 60 years and 284 subjects in the age group greater than 60 years. In the age group of 20 to 40 years, we found that the top most barriers are that the 88 patients (28.21%) don't know how to take care of their foot. The next common barrier was reported by 72 patients (23.08%) as poor communication between the patient and the healthcare provider, followed by 56 patients (17.95%) who reported that they don't know how to take care of their feet, followed by 48 participants (15.38%) who reported that they can't afford to buy shoes with same number of patients reporting that taking care of the feet is causing inconvenience to their work. In the next age sub-group ranging from 41 to 60 years, we see that the barrier namely "inconvenience for my work" jumps to the top position. In contrast to only 24 patients reporting that taking foot care is causing inconvenience to their work, the number of patients soared up to 164 (40.59%) which found foot care activities as causing inconvenience to the work. This rise in 25% can be attributed to the fact that these patients are more working class and have many other responsibilities to bear. The second top most reason was reported by 116 (28.71%) of the patients is lack of motivation which is quite common in the middle-aged group. The third common reason is the difficulty in reaching the foot which is most common in the middle-aged group which is a total of 72 patients accounting for 17.82%. A total of 32 (7.92%) of the middle-aged patients said that they don't know how to take care of their foot and 20 (4.95%) patients found the communication between them and their clinicians as difficult to understand or poor communication as a result of which they were not being able to take care of their foot properly. In the elderly age group which primarily comprised of individuals greater than 60 years of age, 104 (36.62%) reported that they lack support from their family. On further exploratory research, it was found that most of the elderly individuals don't have any income and hence are fully dependent on their family members for financial support, but they don't get adequate funds for the management of diabetes. A total of 48 (16.9%) of the study subjects have reported that they found it extremely difficult to reach their feet due to age related musculoskeletal disorders and ailments of degeneration due to increased age. A total of 52 (18.31%) of the study subjects have reported that they were not able to see properly due to eye related disorders like diabetic retinopathy, diabetic macular edema etc. and hence was not able to take care of their feet. Forty patients (14.08%) in the elderly group reported that they were commonly engaged in barefoot walking due to which they are highly prone to get foot related injuries leading to diabetic foot ulcers and infections. When we tried to convince these elderly patients on the hazards of bare foot walking especially in diabetes patients, we found it very difficult to convince them against their traditional contradictory belief of the various benefits of bare foot walking. It was far easier to convince the younger age group as well as the middle-aged age group as compared to the elderly population. The last barrier in the elderly age group as reported by 14.08% of the individuals was that they don't know how to take care of their feet. On interacting with them, we found out that though these patients were adequately educated by the patients, but these patients were not receptive of the teachings and

learning due to diminished neurocognitive changes. On reviewing the reports of some of the patients it was found that some of them had a differential diagnosis of dementia as well as Alzheimer's disease. We tried to find much literature on the proper and effective techniques of diabetic foot care education in this subset of patients who have been diagnosed with neurological changes and have associated senile dementia, but we couldn't find any. Overall, we observed that it was much easier to motivate the younger and middle-aged patients and accordingly the compliance to medications and adherence to therapeutic lifestyle modifications was found to be much better in this population. (Table 3)

Table 4: Barriers to self-foot care management according to duration of diabetes:

Parameters-Category (Total N)		Top 5 Barriers / Number	N (%)
Duration of Diabetes (in years)	**Less than 5 years (N=248)**	I don't know how to take care	176
		Inconvenience for my work	128
		Lack of Time	96
		I have a problem reaching my foot	56
		I don't think it is important to take care of foot	40
	5-10 years (N=620)	Lack of motivation	520
		Lack of Time	336
		I don't know how to take care	224
		I have a problem reaching my foot	48
		Lack of support from family	32
	Greater than 10 years (N=132)	Lack of Time	64
		Lack of motivation	44
		I don't know how to take care	24
		I have a problem reaching my foot	8
		I cannot afford to buy shoes	8

Our next analysis tried to identify different barriers to self-foot care education with regards to the duration of diabetes. We have tried to segregate our study patients based on the duration of diabetes because diabetes duration itself is an independent predictor of complications and depression was found to be higher in patients with long standing diabetes due to which the barriers can markedly vary in the study participants as influenced by the duration of diabetes. If we consider the 248 subjects in the group with duration of diabetes less than 5 years of diabetes duration, we found that a total of 88 subjects (35.48%) reported that they don't know how to take care of their foot. This was followed by 64 subjects (25.81%) who found taking adequate care of their feet to be causing inconvenience to work. Lack of time was another important barrier which was reported by 48 (19.35%) of the study subjects. Since, this sub-group has lesser duration of diabetes and inherently less microvascular and macrovascular complications, hence they don't want to devote sufficient time to the care of diabetes and found it causing inconvenience to their work because they attribute more priority to work and less to their health. Only 28 subjects reported that they find it difficult reaching their feet due to musculoskeletal or joint related problems which is quite natural to be low in this younger age group. And as already reported vide-supra that they don't have any complications and so they don't think it is important to take care of their feet. In the next sub-group with duration of diabetes between 5 to 10 years which is comprised of 620 subjects, we found that lack of motivation was primary barrier which has been reported by 260 subjects. The next barrier was lack of time which was reported by 168 (27.1%) of the subjects. On further exploratory analysis, it was found that most of these subjects either work in private industries, have long travelling time to office or they work in low positions. The next reason for barrier which has been reported by 112 participants is that they don't know how to take care of their foot. On further exploratory analysis, it was noted that most of these participants have not received formal education with regards to self-foot care management in diabetes. It is noteworthy that though the participants have received education on diabetes as a whole but there was not any learning disseminated on foot care. The next barrier was reported by 48 participants who reported that they cannot reach their foot due to some musculoskeletal or joint related problems. Now this problem is not very uncommon in the middle-aged population, especially it was reported to be much higher in the post-menopausal women as compared to the males of similar age. Nowadays also the incidence of andropause and pre-mature ovarian failure are on the rise due to which there was a myriad of musculoskeletal problems being reported in the middle-aged population. The incidence of musculoskeletal problems is particularly heightened in diabetes especially the cases of adhesive capsulitis and muscle infarctions, DISH etc. Sixteen of the patients reported that they don't get adequate support from their family members due to which they were not able to take proper care of their foot. Interestingly, it was found that all these sixteen participants were females and they complained of lack of monetary and time resources from their family members who led to poor care of the feet. The last category comprised of 148 participants with duration of diabetes greater than 10 years. In this category, the most common barrier is lack of time which has been reported by 64 subjects. The next common barrier is lack of motivation which has been reported by 44 subjects. On subsequent exploratory analysis, it was found that there were equal numbers of subjects in the male and female sub-group which reported lack of motivation, but substantially greater numbers of females have reported lack of time as compared to males. We have also observed in our study as reported vide-supra as well as in other studies that lack of motivation is directly proportional to the duration of diabetes. Furthermore, twelve patients have reported that they don't know how to take care of their feet and have attributed it to lack of proper education and training by their treating primary care physician. Also, four patients have reported that they have a problem reaching their feet due to which they were not able to take care of their feet. Another four patients have reported that they were not able to take adequate care of their feet as they were not able to buy expensive shoes. Hence, the lack of self-foot care management was due to combined effect of lack of resources, lack of time and lack of motivation. Hence, the strategy should be focused on addressing all the components via developing a multi-pronged approach as in a trident rather than a single faceted approach. The impact of education can be measured on multiple occasions to determine the effect of education on self-foot care management of diabetes. (Table 4)

Table 5: Barriers to self-foot care management according to degree of glycemic control:

Parameters-Category (Total N)		Top 5 Barriers	N (%)
HbA1c (in %)	**Less than 7% (N=236)**	Lack of Time	92 (38.98%)
		I don't know how to take care	68 (28.81%)
		Lack of support from family	36 (15.25%)
		I cannot afford to buy shoes	24 (10.17%)
		I have a problem reaching my foot	16 (6.78%)
	7%-9% (N=344)	Lack of Time	132 (48.53%)
		Lack of motivation	52 (19.12%)
		I cannot afford to buy shoes	44 (16.18%)
		Inconvenience for my work	28 (10.29%)
		Poor communication between patient and health care provider	20 (7.35%)
	Greater than 9% (N=492)	I have a problem reaching my foot	104 (21.14%)
		Poor communication between patient and health care provider	68 (13.82%)
		Lack of support from family	56 (11.38%)

DISCUSSION:

Although studies highlighting barriers to self-foot care management in T2DM come up from time to time, to our knowledge this is one of the largest studies of 1000 patients addressing the barriers to self-foot care management in T2DM patients.

Foot conditions are highly prevalent amongst diabetic patients. Globally the lifetime risk of a diabetic patient developing a foot ulcer is 15%. They potentially result in decreased function and quality of life for patients. They result in either loss of limb and loss of life and diabetes is by far the leading cause of amputation in the developed

world. Such negative outcomes are preventable. To a large extent, these negative outcomes occur due to late diagnosis and improper diabetic foot care. In fact, the majority of people with diabetes do not receive or practice the foot care recommended by current guidelines.[11-14]

The present study is the first of its kind to enlighten on the perceived barriers to self-foot care in the Indian population. Our study results confirm that self-foot care is low in the Indian T2DM diabetes population, with an overwhelming 70% of the study population have more than one barrier to self-foot management. A larger proportion of females (68.9%) were not taking self-foot care management compared to their male counterparts (53.5%). Around one-third of the male participants cited lack of time as a major barrier to self-foot care management. Around 30% females reported lack of foot care education and training as the major obstacle to self-foot care management.

One of the significant findings of our study is depression was found to be highly prevalent in the individuals who lack motivation. Around 44 (16.18%) reported that they were not able to buy shoes due to the high cost of the diabetic shoes. A small number 28 (10.29%) have described that taking care of their feet are causing great inconvenience to their work. Twenty subjects with HbA1c between 7% & 9% have complained of poor communication by their health care provider due to which they were not having proper knowledge of self-foot care management. The last bracket included a total of 492 individuals with HbA1c greater than 9%. These patients are having uncontrolled hyperglycemia along with osmotic as well as catabolic symptoms. This sub-group of patients is often found to have poor adherence and compliance in all aspects of healthcare management. Thus, it is very interesting to observe the behavioral trend of these subjects when it comes to self-foot care management. A total of 104 (21.14%) have reported that they have problem reaching their feet and hence were not able to take proper take care of their foot. The remaining 68 (13.28%) of patients revealed that there was a poor communication between the patient and the health care provider due to which they were confused and lacked clarity as well as proper understanding with regards to the techniques of foot care. They expressed that though they received overall diabetes education, but they didn't receive any education with regards to best practices of foot care. The smallest of all the categories which comprised of only 56 (11.38%) have disclosed that they don't get adequate support from their family members either in terms of monetary or psychosocial support.

Limitations Of The Present Study: All the patients did not have HbA1C done at the time of survey and hence correlation of self-foot care management with good glycemic control could not be done.

Strength Of The Present Study: On the other hand, the interview-based design ensured more complete response for this study. Participants were offered the chance to discuss the questionnaire with the care providers before they filled in the form. This gave the educators and physicians a chance to integrate the study within the scope of their routine counseling and identify those who did not perform self-foot care management, particularly clarifying recommendations. Absence of a validated questionnaire prompted us to select the barriers from existing literature and modifying them to our local population. This emphasizes the need of such a tool in evaluating the barriers in subsequent studies.

CONCLUSION:

This study elaborates the need for awareness regarding possible barriers when counseling T2DM patients. Self-foot care management remains one of the cheapest pillars of diabetic foot care management, the benefits of which extend beyond glycemic control. This study also highlights the importance of physician advice regarding self-foot care management. Behavioral causes seem to be the commonest barrier to self-foot care management and hence strategies to target the same needs to be thought of.

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