

Educating patients of diabetes mellitus for diabetic foot care

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ABSTRACT

Background and Purpose: Diabetes mellitus (DM) is a global pandemic. Among the spectrum of diabetic complications, diabetic foot is a leading cause of morbidity and hence awareness and education regarding primary healthcare inclusive of self-care pertaining to diabetic foot care is of paramount importance. **Aim:** The aim of the study was to educate patients of DM regarding the disease and its associated complications, specifically pertaining to diabetic foot care. **Methodology:** The study was carried out in three phases, first was to assess the diabetic patients related to their awareness on disease complications and diabetic foot care, through pretest questionnaire, the second phase was to sensitize patients and educate them on the same, the third phase was to re assess the knowledge gained by the patients through posttest assessment. **Results:** The study evaluated the absolute and relative learning gain regarding the awareness and knowledge of foot care among diabetic individuals. The absolute learning gain was 40.92% and the relative learning gain was 76.48% and normalized learning gain was 0.88, the normalized gain was assessed to be high. **Conclusion:** The study concluded that training and sensitizing individuals with diabetes will definitely help reduce morbidity of diabetic foot and hence the medical and paramedical staff need to spread awareness regards the same.

Keywords: Absolute learning gain, complications, diabetes mellitus, diabetic foot, normalized learning gain, relative learning gain

Introduction

Diabetes mellitus (DM) is one of the most common chronic diseases across the world. WHO estimates 60% of diabetic population will be from developing countries of Asia by 2025. Currently, India is a country with second highest number of people with type 2 DM.^[1] In tandem with the rise of DM is its associated complications. Some of the important complications include coronary artery disease, nephropathy, retinopathy, microalbuminuria, and neuropathy. Among these complications, diabetic neuropathy is one of the most common and serious complications. Ethical Approval Done, dated 10th April 19.

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Among the complications of diabetes, those that occur in the foot are considered the most preventable. A rural Indian study cited that the prevalence of diabetic foot occurring as a result of diabetic neuropathy among outpatient and inpatient diabetics was found to be 10.4% and around 8.7%, respectively; diabetic foot people majorly suffered from foot ulcer or blisters in the 1st year of onset.^[2] The annual incidence of new foot ulcer in patients with diabetes is 2.2%, with incidence increasing to 5.8% in 3 years.^[3,4] The lifetime incidence of developing a foot ulcer is estimated to be as high as 25%.^[5,6]

Poor knowledge and poor foot care practices were identified as important risk factors for foot problems in diabetes. Hence, in order to minimize, if not totally prevent, foot complications, it is important that appropriate and timely foot self-care be emphasized to patients with diabetes.^[7] It has been observed that about 10–15% of people with diabetes will develop a foot ulcer

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at some point and have shown that about 5–24% of the foot will progress and finally lead to limb amputation.^[8] Facilitators of foot self-care practices, such as patient education, appear to be reserved for individuals who have already developed foot complications.^[9]

Primary healthcare is the most essential type of care provided to the patient, it is the first contact healthcare and tends to be the immediate first aid for the patient; the care is either provided by the grass route healthcare worker or is provided as self-care by the patient himself. In any situation it is of paramount importance that the person concerned needs to be well aware and trained to correctly assess and subsequently dispense of proper management and care for the concerned pathology. This study will assess patients' knowledge and practice of diabetic foot care, and help educate the patients pertaining to the same with the aim to reduce morbidity related to DM and its complications specifically regarding the diabetic foot care by providing intelligence, education, and awareness among the patients.

Aim and Objectives

Aim

To educate patients of DM regards the disease and its associated complications, specifically pertaining to diabetic foot care.

Objectives

- To assess the awareness of patients regards their understanding of DM and its associated complications and their awareness of diabetic foot care through pretest questionnaire.
- To sensitize patients of DM with regards the disease and its complications with special emphasis on diabetic foot and associated complications.
- To train patients in regards to the awareness and knowledge of diabetic foot care.
- To assess the impact of understanding among patients in regards to DM and diabetic foot care post sensitization through posttest questionnaire.

Methodology

Study type

Observational study.

Study duration

Two Months.

Study design

Cross-sectional study.

Study population

The present study was carried out among patients diagnosed with DM and follow-up diabetic patients attending the Surgery and Medicine OPD at a rural tertiary care hospital. The selected patients were explained the study and their consent for participation was taken.

Phase 1: Assessing awareness

The patient were assessed in terms of his/her awareness in regards to DM as a disorder along with its complications. The patient was also asked specifically regards the diabetic foot lesions and foot care.

Phase 2: Intervention

Tutoring the patients on how to assess the severity of DM; how to understand the emanating and expected complications of DM. Understanding specific complications regards to the foot care. Training patients regards foot care, inclusive of the techniques and methodology of foot care.

Phase 3: Assessing intellectual impact

Post-sensitizing and tutoring, the patients were evaluated regards their awareness of DM as a disease and its associated complications, they were assessed regards their ability to identify foot lesions as well as their approach toward foot care, associated with pathologic lesions.

Confidentiality was maintained throughout the research. The study was conducted after clearance from the Institutional Ethics Committee (IEC).

Selection criteria

Inclusion criteria

- New cases, diagnosed with DM.
- Known cases (follow-up cases) of DM.
- Cases with complications of DM without diabetic foot.
- Cases with diabetic foot.
- Non-medical background.

Exclusion criteria

- Patients not willing to train for diabetic foot care.
- Patients with complicated diabetic foot pathology.
- Patients with acute metabolic diabetic complications.
- Patients who were directly or indirectly associated with medical profession.

Data collection instrument

Nottingham Assessment of Functional Foot Care Questionnaire on Knowledge of Foot Care was utilized as a tool for assessment among patients.^[10]

Sample size

The study comprised of 184 patients diagnosed with DM. The sample size is based on the Krejcie and Morgan methodology of calculation of sample size.^[11]

Data analysis

Data analysis was carried by Statistical Package SPSS (version 25.0, IBM Corporation) and Microsoft Excel 2016 (Microsoft Corporation). The study assessed the pretest and posttest forms to analyze the patients learning gain, based on the training imparted to the patient for diabetic foot care.

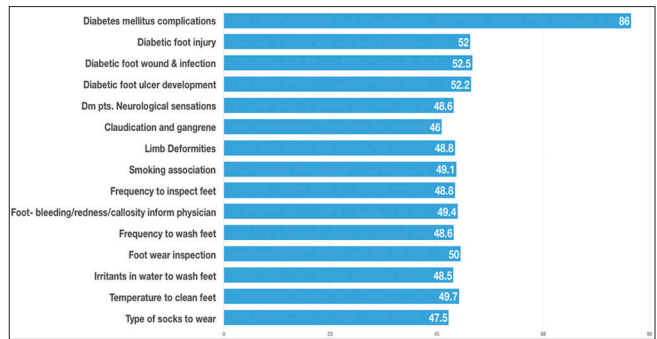
Observations

PRETEST SCORE:

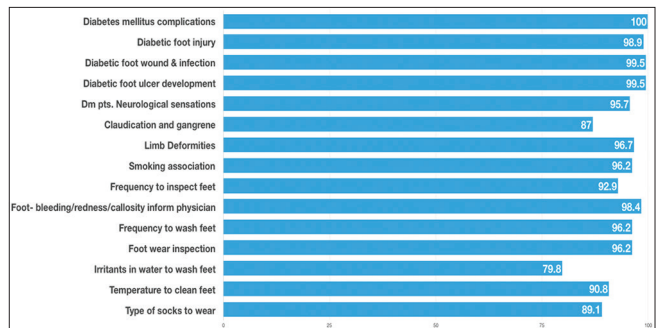
Table 1: Table showing the affirmative responses per question in the pre-test questionnaire	
Question	Response
Diabetes mellitus Complications	86
Diabetic foot injury	52
Diabetic foot wound & infection	53
Diabetic foot ulcer development	52
DM pts. Neurological sensations	49
Claudication and gangrene	46
Limb deformities	49
Smoking association	49
Frequency to inspect feet	49
Foot-bleeding/redness/callosity inform physician	49
Frequency to wash feet	49
Foot wear inspection	50
Irritants in water to wash feet	49
Temperature to clean feet	50
Type of socks to wear	48

POSTTEST SCORE:

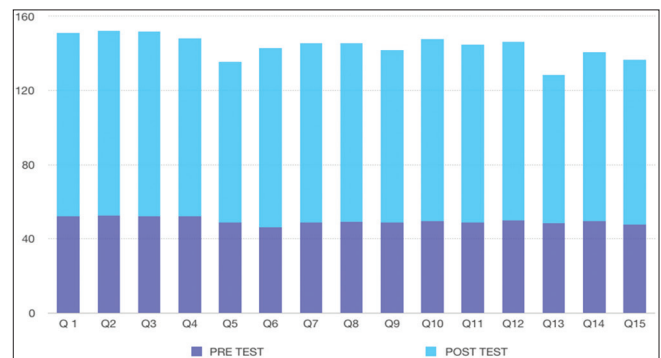
Table 2: Table showing the affirmative responses per question in post-test questionnaire	
Question	Response
Diabetes mellitus Complications	100
Diabetic foot injury	99
Diabetic foot wound & infection	100
Diabetic foot ulcer development	100
DM pts. Neurological sensations	96
Claudication and gangrene	87
Limb deformities	97
Smoking association	96
Frequency to inspect feet	93
Foot-bleeding/redness/callosity inform physician	98
Frequency to wash feet	96
Foot wear inspection	96
Irritants in water to wash feet	80
Temperature to clean feet	91
Type of socks to wear	89



Graph 1: Bar graph showing affirmative responses to the pre-test questionnaire



Graph 2: Bar graph showing affirmative responses to the post test questionnaire



Graph 3: Graph showing comparison between Pre-test and Post test score on the affirmative response on questionnaire

Results

The present study was conducted in all genders between the age groups of 21 yrs and 78 years, the study conducted surveillance and assessment among patients of DM through pretest and posttest questionnaire. Results were calculated as per the pretest and posttest scores achieved based on the questionnaire [Tables 1 and 2].

The assessment was based on absolute learning gain, relative learning gain, normalized learning gain [Graphs 1 and 2].

Mean Pretest Score = 13.91 ± 11.49

Mean Posttest Score = 24.68 ± 2.02

Mean % Pretest Score = 53.50 ± 44.19

Mean % Posttest Score = 94.42 ± 10.45

I) **Absolute learning gain** = [(% posttest) - (% pretest)]
 = 94.42 – 53.50 = 40.92%

II) **Relative learning gain** = [(% posttest) - (% pretest)]
 ----- × 100

(% pretest)

$$= \frac{94.42 - 53.50}{53.50} \times 100 = 76.48\%$$

53.50

III) **Normalized gain g** = [(% posttest - % pretest)]

[100-(% pretest)]

$$= \frac{94.52 - 53.50}{100 - 53.50} = 0.88 \text{ (High Gain)}$$

(100-53.50)

Effectiveness of intervention was determined using the range of “Normalized gain g” as follows:

- 0–0.29 - Low Gain
- 0.30–0.69 Medium gain
- 0.70–1.0 – High gain

Discussion

Globally, nearly 415 million people have DM, majority of the patients belong to the middle-income and low-income countries. In India, nearly about 70 million people have diabetes, with a projected number of diseases being around 125 million cases by the year 2040.^[12] The diabetic foot as a complication of DM accounts for around 6% of all the associated complications in individuals suffering from type 1 DM. The diabetic foot complications in patients is inclusive of foot ulcers, wound infections, gangrene. Around 0.03–1.5% of the patients suffering with DM tend to develop gangrene and subsequently resulting in limb (foot) amputation. This seriously deteriorates the quality of life among the patients and hence it becomes most imperative for the patient to be educated and made aware regarding the complications of diabetic foot and knowledge to take care of foot.^[13]

Uncontrolled diabetes causes neuropathy and peripheral arterial disease through various complex metabolic pathways. Development of foot ulcers are triggered by neuropathic sensory loss superadded with peripheral vascular disease. A systematic review reported a prevalence of 0.003–2.8% for diabetes-related peripheral neuropathy and 0.01–0.4% for diabetes-related peripheral arterial disease. Foot ulcers, gangrene, osteolysis, fractures, dislocation, and deformities are caused by the combination of sensory neuropathy, vasculopathy, mechanical variabilities like load on the joints/foot, metabolic abnormalities, and repeated microtrauma.^[14]

DM being a complex disease and of chronic persistent behavior, it becomes imperative that the patients and the healthcare providers should be well aware of certain important aspects of the disease to provide appropriate primary healthcare or selfcare. The concerned persons (healthcare providers as well

as patients) need to know that glycemic control is the most important aspect to control the development and progression of diabetes and its associated complications (macro and microvascular complications). To achieve the controlled glycemic state in any diabetic individual, there needs to be continuous primary healthcare, proper self-management, as well as clear management strategies, hence it becomes mandatory for the patients and healthcare providers to be updated regarding day-to-day management of diabetic foot complications and care.^[15] The present guidelines for diabetic foot care are based on “Standard treatment guideline formed by the Ministry of Health and Family Welfare of India—The diabetic foot: Prevention and management in India 2016”.^[16] The guidelines recommend the physicians to assess the patient’s general condition.

The best recommended way to prevent complications like diabetic foot fall into two important aspects, first aspect being is to educate the patients and spread awareness among patients pertaining to DM-related complications and how to develop foot care strategy. Patients of DM need to be educated and made aware of certain important aspects pertaining to diabetes. Second aspect is to promote healthcare among these diabetic patients through follow-up and frequent check-ups.

There are five key elements that are vital for proper management of diabetic foot which include as follows: 1. Good glycemic control, 2. regularly inspecting and examining foot at risk, 3. sensitizing and educating patients regarding diabetic complication and diabetic foot care, 4. to ensure at all times that patients use appropriate footwear, and 5. early referral and treating at risk individuals for diabetic foot complications.^[17]

A Cochrane review comprising 11 randomized controlled trials suggested that foot education among diabetic individuals was of paramount importance and awareness among patients through the same resulted in major positive impact on the knowledge and patient’s approach on the same. This resulted in definitive reduction in patient morbidity and improved patient life style as well as the socioeconomic burden. The international Working group on diabetic foot acknowledges that all across the globe there is limited evidence on the efficacy of patient education related to diabetic foot care and understanding.^[18]

In the present study, the assessments were made based on a standardized pretest and posttest questionnaire. The study evaluated education and knowledge attained through evaluating the pretest and posttest scores and subsequently calculating the absolute learning gain, relative learning gain, and normalized learning gain [Table 3]. The mean pretest score was 13.91 ± 11.49 and the mean posttest score was 24.68 ± 2.02 while the mean % pretest score was 53.50 ± 44.19 and the mean % posttest score was 94.42 ± 10.45 [Graph 3]. Based on the score, the absolute learning gain was 40.92%, the relative learning gain was 76.48%, and the normalized gain g was 0.88 (High Gain). Other studies similar to the present study related to awareness and education related to diabetic foot in patients with DM are as follows:

Table 3: Table showing Pre-test and Post test score from affirmative responses

Questions	Pre-Test Response	Post-test Response
Q. 1. Daibetic Complications	86	100
Q. 2. Diabetic foot injury	52	98.9
Q. 3. Diabetic foot wound and infection	52.5	99.5
Q. 4. Diabetic foot ulcer development	52.2	99.5
Q. 5. DM pts. Neurological sensations	48.6	95.7
Q. 6. Claudication and Gangrene	46	87
Q. 7. Limb deformities	48.8	96.7
Q. 8. Smoking association	49.1	96.2
Q. 9. Frequency to inspect feet	48.8	92.9
Q. 10. Foot bleeding/redness/callosity to inform physician	49.4	98.4
Q. 11. Frequency to wash to feet	48.6	96.2
Q. 12. Foot wear inspection	50	96.2
Q. 13. Irritants in water to wash feet	48.5	79.8
Q. 14. Temperature to clean feet	49.7	90.8
Q. 15. Types of socks to wear	47.5	89.1

In a study carried out by Jindasa and Jeewantha in Sri Lanka to determine the knowledge and practice of diabetic foot care in patients with chronic diabetes, the researchers found that around 38.2% patients with DM had to undergo amputations of feet and around 82.7% had developed foot ulcers. On assessment carried on patients regarding awareness of diabetic foot, 52.7% patients were aware regarding foot care strategies, however on asking whether they actually practice or follow it, 22.7% did not practice it. Hence, an important observation made by the study was simply educating the people and making them aware regarding diabetic foot complications and care did not help as many patients to practice or follow the same.^[19]

In another study, a cross-sectional regarding awareness of diabetic foot among patients of type 2 DM in Durban, South Africa carried out by Gole and Naidoo, very few patients (around 22.2% patients) reported examining their feet, unfortunately they too examined their feet when they developed some complication. The study concluded awareness regarding diabetic foot disease needs to be better addressed was not to its optimal best as per the management and awareness guidelines of diabetic foot.^[20]

Muhammad Lufti *et al.* conducted a study to assess knowledge and practice of diabetic foot care in a tertiary medical centre. The present study comprised of a total of 157 patients, most of the patients had a poor knowledge regarding diabetic foot care (58%) and on top of that around 61.8% patients even practised poor diabetic foot care protocols. The study concluded that patients who reported having foot infections and wound were the ones who really did not follow good foot care practices.^[21]

Alhuqayl *et al.* conducted a cross-sectional survey pertaining to awareness of foot care among diabetic patients. The study found out that around 46.7% patients were inadequate as far as their awareness of diabetic foot care was concerned.^[22]

Sabar *et al.* in their cross-sectional study assessed the prevalence of diabetic neuropathy and the knowledge and practice about the foot care. The study concluded that the diabetic complications inclusive of diabetic foot was high among patients who had poor understanding regarding diabetic foot associated complications and understanding of diabetic foot care. Majority of patients had a knowledge score of 38% and a moderate amount of practice regards to diabetic foot care around 40%.^[23]

In a study carried out by Pinakin *et al.* showed that after sensitizing the patients in regards to complications associated with DM assessment was carried out, 27% patients of patients had poor knowledge, whereas 50% patients had average knowledge and only 23% patients had good knowledge. Also akin to the knowledge gain majority of people (around 51%) had an average to poor practice of taking care of diabetic foot and its awareness. The particular study suggested that immense work is needed to spread awareness and knowledge among diabetic people for proper care of diabetic foot.^[24]

Aldawish *et al.* assessed the level of awareness of diabetic foot disease among patients with type 2 DM. A total of 99 patients were part of the study. After sensitizing the patients, only 22.2% patients reported examining their feet, this examination was done by the patient only post-development of complications. All people who were better educated and exposed to foot care techniques definitely had statistically better outcome, and less development of complication related to diabetic foot.^[25]

A study was carried out by Kishore *et al.* about the awareness of foot care among patients with diabetes attending a tertiary care hospital, around 400 patients were subjected to a questionnaire to assess the knowledge and awareness regarding diabetic foot complications and foot care, only 50 patients out of 400, that is, 12.5% had received previous health education pertaining to diabetic foot disease and awareness regarding foot care, the study concluded that awareness regarding diabetic foot complications and foot care need to be more emphatically spread across the patients of DM and also among healthcare workers so as to prevent complications importantly diabetic foot disease.^[26]

Selvakumar *et al.* carried out a study on awareness and practice regarding foot self-care among patients of known type 2 DM in a rural area. In the particular study, 64.55% people were not aware regarding diabetes foot care and complications. Majority of patients (around 74.2%) walk bare foot, 67.7% did not check their foot wear, around 54.8% did not cut their toenails properly. The study concluded that foot care awareness and knowledge regarding foot care need to be better spread across the society and that better education on the same will help prevent morbidity and mortality related to DM and its complications.^[27]

The present study found that there was a major lack of awareness among the general population at large in and around Wardha which is similar to the findings of reports seen in other studies from different parts of India with regards to the lack of foot

care awareness among patients with diabetes. All over the country not much efforts have been taken to improve the condition of the diabetic individuals, hence there was a strong need for the present study.

Awareness regarding DM as a major non-communicable disease and cause of morbidity increased among patients after sensitization and education on the same. Patients were also made aware regarding diabetic foot complications and were educated on foot care techniques and precautions.

Conclusion

The study concludes that there is a considerable lack of awareness pertaining to DM and its associated complications among diabetic individuals. It becomes of paramount significance to make the diabetic individuals well educated regarding primary healthcare and self-care. The present study helped majorly increase the awareness and thereby educating the patients in regards to diabetic foot care. The study emphasizes the importance of diabetic foot care as a key primary preventive strategy to decrease the overall burden of the disease, psychological, economical, and decreasing an overall morbidity associated with diabetic foot.

The study strongly recommends that all physicians and paramedical staff need to spread awareness and education related to the diabetic foot and its primary care which would help sensitize the patient, thereby making a major global impact on reduction of morbidity and mortality related to diabetic foot and other complications on the whole.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Mohan V, Mathur P, Deepa R, Deepa M, Shukla DK, Menon GR, *et al.* Urban rural differences in prevalence of self-reported diabetes in India-The WHO-ICMR Indian NCD risk factor surveillance. *Diabetes Res Clin Pract* 2008;80:159-68.
- Dixit S, Maiya A, Khetrpal H, Agrawal B, Vidyasagar S, Umakanth S. A questionnaire based survey on awareness of diabetic foot care in Indian population with diabetes: A cross-sectional multicentre study. *Indian J Med Sci* 2011;65:411-23.
- Abbott CA, Carrington AL, Ashe H, Bath S, Every LC, Griffiths J, *et al.* The North-West diabetes foot care study: Incidence of, and risk factors for, new diabetic foot ulceration in a community-based patient cohort. *Diabetic Med* 2002;19:377-84.
- Ramsey SD, Newton K, Blough D, McCulloch DK, Sandhu N, Reiber GE, *et al.* Incidence, outcomes, and cost of foot ulcers in patients with diabetes. *Diabetes Care* 1999;22:382-7.
- Boulton AJ, Armstrong DG, Albert SF, Frykberg RG, Hellman R, Kirkman MS, *et al.* Comprehensive foot examination and risk assessment: A report of the task force of the foot care interest group of the American diabetes association, with endorsement by the American association of clinica endocrinologists. *Diabetes Care* 2008;31:1679-85.
- Singh N, Armstrong DG, Lipsky BA. Preventing foot ulcers in patients with Diabetes. *JAMA* 2005;293:217-28.
- Bonner T, Foster M, Spears-Lanoix E. Type 2 diabetes-related foot care knowledge and foot selfcare practice interventions in the United States: A systematic review of the literature. *Diabet Foot Ankle* 2016;7:29758.
- Seid A, Tsige Y. Knowledge, practice, and barriers of foot care among diabetic patients attending Felege Hiwot Referral Hospital, Bahir Dar, Northwest Ethiopia. *Adv Nurs* 2015;2015:934623.
- Matricciani L, Jones S. Who cares about foot care? Barriers and enablers of foot self-care practices among non-institutionalized older adults diagnosed with diabetes: An integrative review. *Diabetes Educ* 2015;41:106-17.
- Lincoln NB, Jeffcoate WJ, Ince P, Smith M, Radford K. Validation of a new measure of protective footcare behaviour: The Nottingham assessment of functional footcar (NAFF). *Pract Diab Int* 2007;24:207-11.
- Krejcie RV, Morgan DW. Determining sample size for research activities. *Educational and Psychological Measurement* 1970;309:607-10.
- International Diabetes Federation. *IDF Diabetes Atlas- 2015*, 7th ed. IDF, 2015. Available from: www.diabetesatlas.org/resources/2015-atlas.html.
- Lazzarini PA, Hurn SE, Fernando ME, Jen SD, Kuys SS, Kamp MC, *et al.* Prevalence of foot disease and risk factors in general inpatient populations: A systematic review and metaanalysis. *BMJ Open* 2015;5:e008544.
- American Diabetes Association. Epidemiology and impact of peripheral arterial disease in people with diabetes. *Diabetes* 2003;26:3333-41.
- American Diabetes Association. 11. Microvascular complications and foot care: Standards of medical care in diabetes-2019. *Diabetes Care* 2019;42(Suppl 1):S124-38.
- Ministry Health and Family Welfare of India. Standard treatment guidelines: The diabetic foot: Prevention and management in India, 2016. Ministry Health and Family Welfare, India. 2016. Available from: www.nhm.gov.in/nrhm-instate/520-standard-treatment-guidelines.html.
- Bus SA, van Netten JJ, Lavery LA, Monteiro-Soares M, Rasmussen A, Jubiz Y, *et al.* IWGDF guidance on the prevention of foot ulcers in at-risk patients with diabetes. *Diabetes Metab Res Rev* 2016 Jan;32 Suppl 1:16-24.
- Dorresteijn JAN, Valk GD. Patient education for preventing diabetic foot ulceration. *Diabetes Metab Res Rev* 2012;28(Suppl 1):101-6.

19. Jinadasa CVM, Jeewantha M. A study to determine the knowledge and practice of foot care in patients with chronic diabetic ulcers. *International Journal of Collaborative Research on Internal Medicine & Public Health*. 2011; 3:115-22.
20. Gole TT, Naidoo M. Awareness of diabetic foot disease amongst patients with type 2 diabetes mellitus attending the chronic outpatients department at a regional hospital in Durban, South Africa. *Afr J Prm Health Care Fam Med* 2016;8:1170.
21. Muhammad-Lutfi AR, Zaraiyah MR, Anuar-Ramdhan IM. Knowledge and practice of diabetic foot care in an in-patient setting at a Tertiary medical center. *Malays Orthop J* 2014;8:22-6.
22. Alhuqayl AA, Alaskar MS, Alsahli FM, Alaqil SA. Awareness of foot care among diabetic patients. *IJMDC*. 2019;3:154-8.
23. Saber HJ, Daoud AS. Knowledge and practice about the foot care and the prevalence of the neuropathy among a sample of type 2 diabetic patients in Erbil, Iraq. *J Family Med Prim Care* 2018;7:967-74.
24. Sutariya PK, Kharadi A. Knowledge and practice of foot care among the patients of diabetic foot: A hospital based cross-sectional study. *Int Surg J* 2016;3:1850-5.
25. Aldawish, SN, Alsomali AH, Alotaibi AJ, Alkhars AA. Knowledge and awareness of diabetic foot complications in diabetic patients. *Egypt J Hosp Med* 2018;72:5371-4.
26. Kishore S, Upadhyay AD, V P J. Awareness of foot care among patients with diabetes attending a tertiary care hospital. *Natl Med J India* 2015;28:122-5.
27. Selvakumar S, Shah PB. Awareness and practice regarding foot self-care among patients of known type 2 diabetes mellitus in a rural area. *Int J Community Med Public Health* 2016;3:861-4.