ISSN: 2157-7145

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Assessment of Foot Care Interventions in Combating Diabetic Foot Syndrome: A Quality Improvement Project

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Abstract

Diabetes mellitus and its complications have a severe impact on individual and society. Diabetic foot amputation shows the devastating nature of its complications. Early diagnosis and patient education are vital in successful care of diabetic foot ulceration. The objective of this study was to implement a multidisciplinary approach in health care services in the prevention and management of diabetic foot infections. The study evaluated the impact of foot screening practices in combating diabetic foot syndrome. A prospective study was conducted in Community Health Center Nedumonkavu and NCD clinics of Kollam (South India), included 252 DFU patients. The symptoms were screened and identified through WCDH-DFAQ questionnaire, monofilament testing and vibration sensing test. Wilcoxon rank test was used to test the differences in mean scores. The Monofilament testing results indicated had identified 22 (8.73%) patients with absence of sensations. Regarding foot checkup, the mean score was 0.29 in baseline data vs 0.59 in intervention data. The results were significant with improvement in foot screening practices among patients (p<0.001). The study paves the way for a multidisciplinary approach in health care services in the prevention and management of diabetic foot syndrome.

Keywords: Diabetic foot syndrome • Foot screening practices • Patient education • Monofilament testing • Multi-disciplinary approach

Introduction

Diabetes mellitus is a spectrum of heterogeneous ailments and a chronic, lifelong status that impairs the body's ability in the metabolism of food. International Diabetes Federation (IDF) Diabetes Atlas, Seventh Edition, 2015, spots outs that one in 11 adults will be afflicted by diabetes. Among the diabetic population, the developing and underdeveloped countries contribute about 75% of hyperglycemic patients. Repeated or prolonged hyperglycemia can initiate a risk of adverse outcomes like acute myocardial infarction, diabetic limb amputations. The worse consequence of diabetes mellitus is diabetic foot ulcers. Lifetime prevalence estimations of foot ulceration in people with DM are as high as25%. Peripheral neuropathy, PVD, limited joint mobility and repeated trauma due to abnormal load distribution on foot are the leading causes of foot ulcers, the majority of foot ulcers are neuropathic [1].

India has a dubious distinction of having 2nd largest number of diabetic patients in the world. In India, its socioeconomic and demographic properties are also contributing to the rapid rise in hyperglycemic persons. India has 61million of its population estimated to be suffering from diabetes which constitutes about 15%

of the total diabetic population in the world. The government of India had taken significant measures to improve the public health care and treatment of diabetes mellitus. Specialized diabetic care centres were opened in different parts of the country. Despite all these efforts, there is an alarming inadequacy of diabetic care in India. Diabetic foot ulcers are the most devastating, chronic and costliest complication of diabetes. DFU as defined by WHO is "ulceration of foot associated with different grades of ischemia, neuropathy and infection". If diabetic foot ulcer is left snubbed it can lead to its devastating complication, that is, lower limb amputation.

India leads their way in a number of diabetic patients with foot infections. Lack of awareness and care had also contributed to the increasing number of diabetic patients with foot ulcers. Many believe that amputation is inevitable if ulceration has developed. Approximately 45000 legs are amputated in India every year and these numbers are drastically rising. 75% of these amputations in India are carried out on the neuropathic feet with infections which are preventable on proper diagnosis. The minimal awareness of the primary care physicians about diabetic foot related` symptoms and consequences and it appears as a major drawback of Indian DFI treatment. The cultural scenario, as well as cultural practices in India, is a major contributing factor to the ever-rising number of diabetic foot

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Received: 08 September, 2021; Accepted: 22 September, 2021; Published: 29 September, 2021.

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infections. Walking barefoot, selection of inappropriate footwear, late presentations of patients in the hospital and low socio-economic levels are a few. In India, podiatrists are available only in important city's which makes them unavailable for 90% diabetic patients of India. National Institute of Clinical Excellence (NICE) guideline insists that there is a need of patient-centred care for foot ulcers with type1 and type 2 diabetes patients. The patients are treated and they have cared concerning their symptoms and complications. Studies conducted in different parts of the world suggest that lack of proper awareness and education is a major riskfactor that has lead to diabetic foot ulceration.Diabetic foot ulcer management centres have documented reductions in amputation rates up to 50% after coordinating the multidisciplinary efforts and by incorporation of evidence-based wound care management. Health care professionals with proper training and awareness of diabetic foot care can improve the status of diabetic patients [2]. In this study, the community pharmacists of health centres and clinics were provided with an extended health care service. They were trained and educated to create awareness among the DFU patients about lifestyle, the importance of foot care, the need for foot screening, the effect of regular checkup's and hospital visits, selection of footwear and taking care of feet. The ultimate aim of foot care education is to prevent the ulceration of foot as well as the diabetic amputations. Pharmacists were provided with the international guidelines of foot screening and training for conducting foot screening practices.

Methodology

The Researcher employed a hospital-based cross-sectional, prospective and observational study and had carried out among type 2 diabetes patients (N=252). Community and primary health centres of Kollam district in Kerala were selected for the study after obtaining ethical clearance.

Study subjects and setting

The study was conducted in the CHC Nedumonkavu and the Primary health centres of Pullamala, Ezhukone, Vappaala, Neduvathoor and Maruthamonpally which comes under it. Family welfare centres under CHC Nedumonkavu were also selected for the study. It involves a population of 73% of low to middle income. The community health centre manages nearly 3000 patients a week and among which there are about 700-800 patients with hyperglycemia. The clinical permanent staff involves 5 selected from the pharmacists. Other pharmacists were PHC's and FWC's. The community pharmacists appointed under NHRM project was also selected for the study. The study was conducted for 14 months. This prospective study was carried out between October 2018 and December 2019. The patients selected involved type 2 diabetes patients with foot ulcers as well as those who have shown signs of developing ulcers [3].

Selection of patients

The diabetic foot ulcer patients that visited the hospitals and clinics were interviewed and 252 patients were recruited for the study. Patients above 18 years of age were considered for the study. Pregnant women and patient with impaired cognition were excluded from the study. All the patients were informed about the objectives

and the nature of the study and consent was taken. A data collection form was used to obtain the details on socio-demographic data, behavioural data and clinical parameters.

Diabetic foot assessment questionnaire by the western cape

The DFAQ-WCDH helps in identifying diabetic foot ulcers in type2 diabetes mellitus patients. The questionnaire is composed of yes/no questions regarding the presence of symptoms and history of ulcers. It is a self-administered questionnaire which helps in identifying the self-history of a patient. The DFAQ is categorized as category A (symptoms) and category B (History and assessment). Category A questions analyzed symptoms regarding bone and joint abnormalities, presence of skin changes like ulcerations and calluses, etc. Questions in category B goes through the history of ulcerations and amputations and need for monofilament testing. The responses from the patients and analysis of the symptoms were used for determination of the severity of the diabetic foot ulcers [4].

Foot ulcer assessment using mono filamenttest

Monofilament testing apparatus is an instrument used in screening the foot for diagnosing diabetic neuropathy. The monofilament is applied to the wrist of the patient to give a mock of the examination.



Figure 1: Monofilament testing.

The monofilament is held perpendicular to the foot and the skin is touched smoothly with its filament providing sufficient force to bend the buckle. The duration between contact and release of filament should be approximately 2 seconds. There are 10 sites in the plantar surface that can be examined for pedal pulses. The filament should not be contacting the ulcer sites, callus, corns, necrotic areas and scars in the foot. Absence of feeling or sensation in the majority of sites can be regarded as neuropathic symptoms. The patients are asked to respond to the application of monofilament. If the patients are unable to sense 8 out of 10 sites they are in a higher risk of foot ulcers and it indicates a higher prevalence of foot ulcers.

Vibration sensation testing

A 128Hz tuning fork is used for performing vibration sensation testing. The fork is placed on the bony projections present in the greater toe. The results of the study are analyzed by the response of patients. They are asked to keep their eyes closed and respond to the vibration of the fork. The examination is carried out as a mock on the distal forefinger. The patient is assessed to identify whether they could feel the vibration for 5s or longer. The examination is performed for 10s and the patient response towards the study is noted. If the patient can respond for 10s, it can be considered as a response to sensation. A score scale is used for determination of sensation where a score of 1 indicates the presence of sensation, 2 indicates reduced sensation and 3 indicates absence of sensations.



Figure 2: Tuning fork apparatus.

Statistical methods

The demographic and clinical parameters were analyzed by descriptive statistics and by using Mean. Willcoxon signed-rank test was used for the analysis of the domains. P-value <0.01 was considered significant. The results were assessed in SPSS software.

Results

The basic demographic details of the patients, for instance, gender, lifestyle variables, characteristics of diabetes etc are presented in table Gender-based analysis of 252 patients recruited for the study found out that 184 (73%) were men and 68 (27%) were women. The result indicated that men were more vulnerable to foot ulcer than women. Among the age group of the patients (5.6%) belonged to an age group of, (39.7%) in age group, the age group of contributed nearly half (46.8%) of the recruited population, patients there in the age group of was 7.9%. The assessment of the educational profile of suggested that secondary education (47.2%) was predominant among the study population. 46 patients (18.3%) were educated up to primary levels and (33.3%) had higher education.

Variable	Frequency	Percentage
Foot sensations		
Normal	128	0.5079
Reduced	102	0.4047
Absent	22	0.087

Table 2: Monofilament testing results.

Foot sensations were assessed using Monofilament testing. The filament was kept on plantar surface and responses to the sensations were recorded. The results indicated that normal sensation was seen in 128 (50.82%) of patients. 40.8% had difficulties in sensing pedal pulses. Monofilament testing reports had identified 22 (8.73%) patients with absence of sensations [5].



Figure 3: Monofilament testing.

Vibration testing was analyzed using a tuning fork and patients were asked to respond to the vibration sensing. The reported results were assessed. Most of the patients (145) exhibited sensory responses. Among the patients, 89(35.31%) have shown reduced responses towards vibration sensing. In 19 patients (7.53%) the study had reported the absence of sensations.

Variable	Frequency	Percentage
Normal	145	0.5753
Reduced	89	0.3531
Absent	19	0.0753

 Table 3: Vibration sensing.



Figure 4: Vibration test results.

Variable	Mean (baselin e)	Mean (after intervention	-ve ranks)	+ve ranks	Z-value	P value	
Foot check	0.29	0.59	64	64	-6.655	<.001	

Table 4: Foot screening after intervention. Regarding foot checkup, the mean score was 0.29 in baseline data and after interventions, the mean score has increased to 0.59. The Wilcoxon test has found out that there were significant differences in foot checkup before and after the intervention. The results were significant with z=6.655 and p value=<0.001.



Figure 5: Foot screening after intervention.

Conclusion

This study highlights the potency of patient education in combating diabetic foot ulcers. The study was designed and executed for developing foot care practices, ensuring early diagnosis and preventing lower extremity amputations. Diabetic foot disorders and its devastating effects are little known to uneducated people of rural areas. It deprives the patients of their health and livelihood. Education about diabetic foot care had imparted positive outcomes on improving productivity, reducing long stretches of hospitalization, increasing self-care and preventing lower extremity amputations. The study has shown a significant increase in foot care practices and response towards self-care. The strength of the study was the dedicated efforts from the pharmacists and patients in health care. The patients had perceived the need for effective foot care and realized that it can be acquired through simpler and affordable modalities. The educational interventions had raised adherence to foot care practices and lifestyle modifications. Health care in India is predominantly under the guidance of physicians with a trivial role for other health care professionals. The study paves the way for a multidisciplinary approach in health care services in the prevention and management of diabetic foot infections. Besides being affordable and least resource purposive, the study opens up relief in social, financial and emotional deprivations due to diabetic foot syndrome.

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How to cite this article: Satheesh, Subodh S, KR Rakesh, Philip Subash. "Assessment of Foot Care Interventions in Combating Diabetic Foot Syndrome: A Quality Improvement Project." J Forensic Res 12 (2021) : 466