

## Research Article

## Effect of Nurse-led Education on Knowledge of Leg Ulcer Prevention among Diabetes patients in Selected Public Hospitals in Ondo State, Nigeria

Mary Olabisi Oyekanmi<sup>1</sup>, Olaolorunpo Olorunfemi<sup>2\*</sup>, Rasidi Akinade Salawu<sup>3</sup>, Funke Elizabeth Akintunde<sup>4</sup><sup>1</sup>RN, Msc, Department Of Nursing Science, Federal Medical Center, Owo, Ondo State, Nigeria<sup>2</sup>RN, PhD (Student), Department of Medical Surgical Nursing, School Of Nursing, University Of Benin Teaching Hospital, Benin Edo State, Nigeria<sup>3</sup>Professor, RN, PhD, Department of Medical Surgical Nursing, Babcock University Illisha Remo Ogun State, Nigeria<sup>4</sup>RN, Msc, Department of Medical Surgical Nursing, Adeleke University. Ede, Osun State, Nigeria.**Article History**

Received: 30.09.2020

Accepted: 15.10.2020

Published: 20.10.2020

**Journal homepage:**<https://www.easpublisher.com/easjnm>**Quick Response Code**

**Abstract:** *Aims:* Diabetes leg ulcer is the ulceration of the leg associated with diabetes and in most cases result into amputation. Studies showed inadequate knowledge of the disease and this is why most of the patients only seek healthcare services after the Leg ulcer is already infected and seems not to be healing. Consequently, this study aims to examine the effect of nurse-led education on knowledge of leg ulcer prevention. *Materials and methods:* A pre and post-test quasi experimental design was conducted with a multi-stage sampling technique to select forty participants through a convenient sampling method, and then allocated them into two groups by simple randomization (n=30 control, and n=30 experimental group). A modified structured questionnaire from preventive aspects of leg care practices used in America Diabetes Association and the National Diabetes Education were used to measure the knowledge level. Participants in experimental group were educated based on European Wound Management Association educational package. Data collected were analysed using frequency, mean, standard deviation, and independent paired t-test at 0.05 significant levels. *Results:* Result showed pre-intervention knowledge mean score of 5.2±2.3 and 5.1±2.0 with mean different of 0.1, while the Post-intervention knowledge means score of 12.5±3.2 and 5.4±2.6 with mean different of 7.1, in experimental and control respectively. Significant different was observed between the control and experimental group, after the intervention (t=11.82, < 0.001). *Conclusions:* The nurses must provide a continuous and focused training program on leg ulcer for the diabetes patients to improve their knowledge on prevention of the diseases.

**Keywords:** Diabetes, education, knowledge, leg ulcer, nurse, prevention, Nigeria.

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### INTRODUCTION

Diabetes leg ulcer is the breakdown in the skin that may involve the subcutaneous tissues, muscle or bone. Leg ulcer is a common complication of diabetes resulting from persistent high blood sugar level and one of the major reasons for loss of leg among diabetes patients [1]. Diabetes mellitus (DM) is a chronic medical illness that poses a lot of health burdens on people such as leg ulcer [2]. Leg ulcer remain the commonest cause of hospital admission among diabetes patients in Western countries [3]. The risk of a patient with diabetes developing leg ulcer is 25% and up to 85% of all lower limb amputations among diabetes patients are preceded by leg ulcer [4]. Fifty percent of older patients with type 2 diabetes have the risk of developing leg ulcer [5]. Regular screening through careful clinical examination is essential for early diagnosis of leg ulcer [6]. In the clinic the nurse should

advised that meticulous attention to leg care is key to preventing leg ulcer formation among diabetes patients [7].

Diabetes patients' education on early report of blisters, cut, wound and injury for prompt treatment are vital to prevent leg ulcer and in turn reduce the significant morbidity and mortality associated with leg ulcer [8]. Health education among diabetes patients on prevention of leg ulcer is an important aspect of nurse-led education in preventing leg ulcer among diabetes patients, because most diabetes patients lack adequate knowledge on care of the leg, a nurse-led education among diabetes patients through provision of specific health education on prevention of leg ulcer should be a common clinical practice [9]. Infected and gangrenous leg ulcer among diabetes patients often result to loss of leg, disability and mortality [10].

According to American Diabetes Association (ADA), leg ulcer among diabetes patients is often due to inadequate knowledge of prevention of leg ulcer among diabetes patients [11]. The burden of leg ulcer is expected to increase due to inadequate knowledge of prevention of leg ulcer among diabetes patients given the increasing global prevalence of type 2 diabetes [12]. The development of leg ulcer and amputations are preventable, and prevention of leg ulcer can directly or indirectly reduce the burdens on the society [13]. Diabetes patients must make important daily decisions on their own regarding leg care and general medical care, and these decisions determine in large extent on how well blood glucose is controlled and thus reduce its likely complications especially leg ulcer [14]. Therefore a need for knowledge-based intervention such as Nurse-led education among diabetes patients is important [15]. Nurse-led education such as patients' guidance, counselling, teaching, supporting and advice are important for the prevention of leg ulcer [16]. In a retrospective study of diabetes related death, 8.8% of diabetes patients were with infected leg ulcer with 70% of death in the first week of admission due to late presentation related to inadequate knowledge on prevention of leg ulcer [17]. The global diabetes leg ulcer prevalence was about 25% in Africa due to inadequate knowledge of prevention of leg ulcer, among diabetes patients [18]. Unhealthy practices such as walking bare-footed, application of hot compress to numb leg and delay in seeking health care at the onset of leg ulcer can be prevented if diabetes patients have adequate knowledge on prevention of leg ulcer [19]. Although, other health care providers such as doctors, dietitians and physiotherapists are involved in diabetes patients care, nurse-led intervention through specific and adequate education on prevention of leg ulcer is essential to reduce the prevalence of leg ulcer among diabetes patients [20]. Hence the aims of this study is to determine the effect of a nurse-led education on knowledge of prevention of leg ulcer among diabetes patients.

## **MATERIALS AND METHODS**

### **Research Design and Setting**

This was a quasi- experimental research design which was conducted, and adopted two group pre-test and post-test quasi-experimental designs in 2019. The settings were two tertiary hospitals; Federal Medical Centre, Owo (FMC, Owo) and State specialist Hospital, (SH), Akure, Ondo State, South west, Nigeria. The target population was diabetes outpatients who referred to these hospitals.

The inclusion criteria include diabetes patients, age 18years and above, both males and females and being willing to participate in the study. The exclusion criterion was diabetes patients who were trained medical and health personnel such as medical doctors, nurses and other health care workers, and diabetes patients with previous history of leg ulcer.

### **Sample size and sampling procedure**

A multi-stage sampling technique was used where Forty participants were selected by convenient sampling method, and then allocated to two groups by simple randomization (n=30 control, and n=30 experimental group).

### **Data collection tools and procedure**

The instrument for data collection was a structured questionnaire modified from "Preventive aspects of leg care practices used in America Diabetes Association and the National Diabetes Education to gather pre and post data on prevention of leg ulcer for both control and experimental groups." [14] Section A consists of demographic data with 6 questions while section B consists of 15 questions on knowledge of prevention of leg ulcers. The scoring of the questionnaire was 1 and 0 for correct and incorrect answer respectively. Knowledge score of participants were categorized as 0-5, 6-10, 11-15, for inadequate, average and adequate knowledge level respectively [21]. This questionnaire was developed from reviewed literature to cover the content of the research and also presented to the researcher's supervisor and panel of experts in the field of study who ascertained the content and face validity of the instrument [22]. The reliability of the questionnaire was ascertained using split-half method. The correlation coefficient (r) between two split was 0.73. Therefore the instrument for the study was reliable. The health education learning modules used was adopted from European Wound Management Association (EWMA) educational package on prevention of leg ulcer among diabetes patients with leg ulcer [23].

In the visiting week of the study, the researcher and research assistance visited the clinics Monday to Friday, to listen to health talk given to diabetes patients, gaps were identified which was also used to modified the training module. This program has three modules in a group training which is shown in Table-1. The three modules were taught in three weeks, each module was taken for a week, because their clinic period is once in a week for the two selected hospital but different days. Participants were follow-up via phone calls (at least a call per week for the period of the training) and text messages, reminding them to come for training programme [24]. Participants were met with at the seminar room of the clinic, 20 participants were available in the first second and third week of the training program using teaching aids and other incentives such as helping them to get their cards ready and assist them to see the doctor early, produced a good result.

## **DATA ANALYSIS**

The Data obtained was coded and analyzed using (SPSS) statistical software version 21.00 (IBM corp released 2012 Armonk, NY: IBM Corp). Variables and research questions were analyzed through mean and

standard deviation and analytic statistic including chi-square and independent and paired t test, hypothesis tested at  $P \leq 0.05$ .

**Ethical code and informed consent**

Ethical approval was given by the Babcock University Research Ethical Committee to conduct the research (NHREC/24/01/2018). Letter of introduction for permission to collect data was collected from School of nursing Science, Babcock University, Ilishan-remo, Ogun state. Authorisation to carry out the study was obtained from Federal Medical Center, Owo, Ondo State Nigeria (FMC/OW/380/VOL.LVIII/127). Written informed consent stating the purpose and benefits of the study and their right to withdraw from the study was obtained from participants and confidentiality was maintained.

**RESULTS**

Demographic characteristic of the participant is show in Table-2: shows in both groups, the most patients were female, married, employed and for most

of them the duration of diabetes was 6-10 years. Table 3 shows the mean score of pre- intervention of knowledge level of the participants in the experimental and control groups ( $5.2 \pm 2.3$ ,  $5.1 \pm 2.0$  respectively) with a mean different 0.1, which means that there were no significant mean difference in the Knowledge of Leg Ulcer Prevention among Diabetes patients between the two groups before intervention. The data also shows that the mean score of post- intervention of knowledge level of the participants in the experimental and control groups ( $12.5 \pm 3.2$ ,  $5.4 \pm 2.6$  respectively) with a mean different 7.1, which means that there is a significant mean difference in the knowledge of leg ulcer prevention among Diabetes patients between the two groups after intervention as reported in Table-4.

Finally, Table-5 shows that, there is a statistical different between the knowledge of leg ulcer prevention among Diabetes patients between the control and experimental group after application of training program to the experimental group, with the t and p-value ( $t=11.82$ ,  $p < 0.001$ ).

**Table-1: Modified European Wound Management Association (EWMA) educational package on prevention of leg ulcer among diabetes patients**

Goals	Learning Content	Teaching Aids
<p>After the health teaching, the participants will be able to have sufficient knowledge required to equip him or her on prevention of leg ulcer. And specifically to:</p> <p>First module: Objectives:</p> <ol style="list-style-type: none"> <li>1. Discuss diabetes leg ulcer correctly.</li> <li>2. Describe the components of therapeutic, developmental and universal self-care prevention of leg ulcer among diabetes patients.</li> </ol> <p>Second module: Objectives: By the end of the module, participants will:</p> <ol style="list-style-type: none"> <li>1 Analyses of prevention of diabetes leg ulcer aimed at health-deviation self-care.</li> </ol> <p>Third module: Objectives: By the end of the module, participants would</p> <ol style="list-style-type: none"> <li>1. Describe the components of prevention of leg ulcer involving leg care among diabetes patients.</li> </ol>	<p><b>WEEK ONE</b></p> <ol style="list-style-type: none"> <li>1. Introduction and Definition of diabetes leg ulcer: Diabetes leg ulcer is the breakdown in the skin that may involve the subcutaneous tissues, muscle or bone. It is a common complication of diabetes disease and most time result to amputation of leg and other major complications.</li> <li>2. Therapeutic developmental universal prevention of leg ulcer among diabetes patients: This focussed on specific health education of leg ulcer that aimed at therapeutic developmental and universal self-care such as wearing of shoes inside and outside their homes, involve in leg exercise, limit alcohol consumption and avoid smoking, recommended exercise, avoid walking bare footed inside and outside their homes, wearing of recommended open front space footwear, wearing of dark tight stockings, engaging in self-daily leg examination, leg care such as washing, drying and application of moisturizer on the leg to avoid cracking and callus formation.</li> </ol> <p><b>WEEK TWO</b></p> <p>This involved the use of educational package on prevention of diabetes leg ulcer aimed at health-deviation self-care such as:</p> <ul style="list-style-type: none"> <li>• Adherence to instructions</li> <li>• Adherence to type of Food or diet</li> <li>• Adherence to medication,</li> <li>• Regular screening for other diseases such as hypertension through routine</li> <li>• Regular checking of blood pressure, blood glucose level, and other laboratory investigations to detect early and prevent high blood glucose level that can eventually lead to development of leg ulcer.</li> </ul>	<ol style="list-style-type: none"> <li>1. Lecture and discussion.</li> <li>2. Question and answer.</li> </ol>

	<p><b>WEEK THREE</b></p> <p>This involve health educating diabetes patients on safety arrangement of homes</p> <ul style="list-style-type: none"> <li>• Safety home keeping</li> <li>• Proper waste disposal especially sharps (needles, ampoules and vials), broken bottles, plates that can cause wounds.</li> <li>• Early preventive measures of cleaning wounds (injury, cut or blisters)</li> <li>• Education on dressing lotions for diabetes wounds</li> <li>• How to use a clean dressing materials and how to remove corns and calluses on the leg.</li> <li>• proper keeping of dressing packs,</li> <li>• Education on proper disposal of soiled materials and infectious waste at home.</li> <li>• Encourage the Diabetes patients should avoid wound by keeping the environment safe in and outside their homes.</li> </ul> <p>Summary on Health educational on prevention of Leg Ulcer among Diabetes patients.</p> <ol style="list-style-type: none"> <li>1. Prevention of the leg, feet and toes.</li> <li>2. Care of leg, feet and toes and avoiding callus formation.</li> <li>3. Use of diabetes foot wear; footwear appropriateness, shoe shape and fitting.</li> <li>4. Self -assessment and regular checking of footwear, stockings.</li> <li>5. Self-examination of the skin including the nails and in-between the toes for dryness, cracking, swelling and wound.</li> <li>6. Risk factor management; regular moderate exercise such as walking to avoid obesity as risk factor for developing diabetes leg ulcer.</li> <li>7. Nutritional assessment/management: low salt, low fat, low carbohydrates, high fiber, moderate protein diet.</li> <li>8. Management of swellings and blisters- prevention and symptomatic control.</li> <li>9. Lifestyle modifications avoiding smoking, alcohol, fast and junk diet high in fat, salt, spices and preservatives.</li> <li>10. Regular clinic attendance to monitor blood pressure and blood sugar level.</li> <li>11. Patient education – hygiene, inspection, temperature and trauma avoidance</li> <li>12. Prevention of wound that may result to leg ulcer among diabetes patients.</li> <li>13. Self-emergency care strategies for cut, blisters, injury and wounds using of wound management products, lotions, and anti-septic solution.</li> <li>14. Selection of cleansing agents for wound dressing selection including product availability relative to local circumstances.</li> <li>15. Early clinical presentation of wounds for clinical assessment, investigation and management.</li> <li>16. Patient involvement in their own care, adherence to treatment and economic implications of leg ulcer among diabetes patients.</li> </ol>	
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**Table-2: Demographic data of diabetes patients in experimental and control groups**

Variables	Classification	Experimental (N=30) %	Control (N=30) %
Age	30-39	3(15)	2(10)
	40-49	8(40)	6(30)
	50-59	6(30)	8(40)
	60-69	3(15)	4(20)
Gender	Female	13(65)	14(70)
	Male	7(35)	6(30)
Marital Status	Married	13(65)	12(60)
	Single	2(10)	2(10)
	Divorced	1(5)	1(5)
	Widowed	4(20)	5(25)
Educational Qualification	No Formal Education	2(10)	2(10)
	Primary Education	4(20)	3(15)
	Secondary Education	5(25)	5(25)
	Tertiary Education	9(45)	10(30)
Occupation	Self Employed	7(35)	11(55)
	Employed	5(25)	3(15)
	Financial Dependent	4(20)	1(5)
	Trading	3(15)	3(15)
Duration of Illness	Farming	1(5)	2(10)
	1-5	2(10)	1(5)
	6-10	9(45)	12(60)
	11-15	5(25)	5(25)
	16-20	4(20)	2(10)

**Table-3: Mean and standard deviation of pre-intervention knowledge of prevention of leg ulcer among diabetes patients in experimental and control groups**

	Control		Experimental	
	(N=20) (%)	Mean Score(SD)	(N=20) (%)	Mean Score(SD)
Adequate(11 - 15)	2(10)	5.1±2.0	2(10)	5.2±2.3
Average (6 - 10)	7(35)		8(40)	
Inadequate(1 - 5)	11(55)		10(50)	

**Table-4: Mean and standard deviation of post-intervention knowledge of prevention of leg ulcer among diabetes patients in experimental and control group**

	Experiment		Control	
	(N=20) (%)	Mean Score(SD)	(N=20) (%)	Mean Score(SD)
Adequate (11 - 15)	16(80)	12.5±3.2	3(15)	5.4±2.6
Average (6 - 10)	2(10)		8(40)	
Inadequate(1 - 5)	2(10)		9(45)	

**Table-5: t-test analysis for post-intervention knowledge on prevention of leg ulcer among diabetes patients between experimental and control group**

Variables	N	Mean	Std. Deviation	t	P
Experimental Group	20	12.50	3.20	11.82	< 0.001
Control Group	20	5.40	2.00		

## DISCUSSION

The data revealed that prior to the nurse-led education, there was inadequate knowledge and no difference on knowledge of prevention of leg ulcer among diabetes patients in the experimental and control. This result are in line with a study conducted a study to determine the prevalence and pattern of leg ulcer among diabetes patients in Nigeria, 17.3%-34.9% of diabetes patients developed leg ulcer due to inadequate knowledge of prevention of leg ulcer [25]. Moreover, a

study also revealed that 72.7% of diabetes patients had inadequate knowledge on prevention of leg ulcer due to poor nurse-led health education [26]. Also, a study conducted which revealed that 56% of diabetes patients had inadequate knowledge of leg ulcer among diabetes patients [18]. Puncture injuries to the feet while walking barefooted in and outside their homes, thermal injury from application of hot compress to numb leg are due to inadequate knowledge on prevention of leg ulcer [27].

In the present study, there was a significant difference in the post-intervention knowledge mean score on prevention of leg ulcer between experimental and control groups. It is important that nurses include self-care evaluation of leg, recommended diet, regular exercise and healthy lifestyle adjustment during health education among diabetes patients [28]. Findings from a study revealed that patients' education on prevention of leg ulcer among diabetes patients improved patient's knowledge when the outcome was accessed [29]. Another study from a retrospective study of diabetes related death in Nigeria revealed that health education among diabetes patients improved knowledge on prevention of leg ulcer [30]. Improved knowledge on prevention among diabetes patients reduced prevalence and burden of leg ulcer [12]. The most important ways of preventing leg ulcer among diabetes patients is through nurse-led education, sensitization and awareness and also involving families and societies [31]. The actions of preventing leg ulcer among diabetes patients involve health education for diabetes control, early diagnosis and proper care of the leg [32]. To lessen the high and costly incidence of morbidity, increase quality of life due to frequent admissions and death among diabetes patients, regular and thorough leg examination will be of benefits for preventing leg ulcer [33]. Routine examination of the leg among diabetes patients is essential for early discovery of leg ulcer [32]. The need for preventive measures, such as regular nurse-led education among diabetes patients is important to reduce complication of diabetes [33]. Findings revealed that focused educational program is effective in preventing leg ulcer among diabetes patients in the experimental group [34]. The interventional programme on nurse-led health education provided a sustainable and effective approach to targeted education for prevention of leg ulcer among diabetes patients. This study also revealed that specific nurse-led education was effective in the experimental group compared to the control group. A similar study revealed, there was statistical significant difference pre and post-intervention knowledge through specific and focused nurse-led education in the experimental group [35]. Previous study conducted in India on effectiveness of a patients' education module on diabetes leg care in out-patients setting, revealed significant post-intervention knowledge score among diabetes patients in experimental group compared to control group, this indicates the effectiveness of nurse-led education [26]. Inadequate and unspecific approach education leads to inadequate knowledge on prevention of leg ulcer among diabetes patients resulting to complications [26]. Necrosis, infection, near-to-amputation leg ulcer are complications resulting from lack of leg care among diabetes patients. Hence, the need for adequate knowledge through nurse-led education on prevention of leg ulcer among diabetes patients to reduce the incidence of lower limb amputation is important, and it is recommended that nurses should regularly involve in

specific and intensive nurse-led education on prevention of leg ulcer [36].

Finally, some limitations were encountered in the course of the study despite the research objective being met. This study do not assessed the long term effect of nurse-led education on knowledge of prevention of leg ulcer among diabetes patients, which could limit the generalization of this study.

## CONCLUSION

The study revealed that majority of participants in the experimental and control groups had inadequate pre-intervention knowledge on prevention of leg ulcer. The findings of this study revealed that nurse-led education improved the knowledge on prevention of leg ulcer among diabetes patients. Nurse-led education through specific health education session such as guidance, counselling and advice improved knowledge on prevention of leg ulcer among diabetes patients. Thus, diabetes patients should be health educated intensively on prevention of leg ulcer. Although, diabetes patients are occupied with various activities during clinic appointment, nurses should ensure quality and intensive health education sessions among diabetes patients on prevention of leg ulcer. The health education session by nurses should include leg examinations and assessment for early detection of cracks, injuries and wounds to prevent leg ulcer. As a suggestion for further research, continuous training should be organized for nurses on current trends on prevention of leg ulcer among diabetes patients. Also, further research should be carried out on impact of increased knowledge regarding prevention of leg ulcer among diabetes patients posts- intervention. The findings from this study have implication for nursing practice, nursing education and administration. Nurses should engage diabetes patients on intensive and specific health education on prevention of leg ulcer. Continuous training should be organized for nurses on prevention of leg ulcer among diabetes patients. This might improve the quality of life and reduce the prevalence of leg ulcer among diabetes patients.

**Conflicts of interest:** There are no conflicts of interest.

### Authors' Contributions

All authors contributed equally to the writing of the scientific proposal, data collection, and manuscript drafting. The final manuscript was reviewed and approved by all the authors.

**Financial support and sponsorship:** Nil.

## ACKNOWLEDGMENT

The authors gratefully acknowledge all the participants in this study for their cooperation during data collection periods.

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