Investigating Patients' Education on the Role of Footwear in Diabetic Foot-Care

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Abstract

There is evidence that appropriate footwear plays pivoted role in the management of diabetic foot problems and inappropriate footwear causes foot ulceration. Therefore, this work was aimed at investigating how footwear could be used to prevent or reduce diabetic foot problem. Structured questionnaires were designed and used to gather information from diabetic patients. The study was carried out at different hospitals in Kaduna State. The results obtained from the survey showed that up to 75% of the diabetic subjects have not received information about the type of footwear they should wear most often. The outcome of this research further showed very poor choice of footwear by people suffering with diabetes in Kaduna State, Nigeria. It was discovered that up to 53% female and 37% male of the patients were wearing slippers most often. Only 17% male and 13% female respondents wear shoes. Up to 29% male and 19% female were using sanders. The results also showed that 14% male and 15% female were wearing half-shoe. Only 2% and 1% male participants were using sneakers and boots respectively. None of the patients used custom-moulded footwear. The paper also highlights key areas that would require further research.

Keywords: Footwear, Health Impacts, Diabetic Patients.

1.0. INTRODUCTION

Diabetic patients, up to 37%, wear ill-fitting shoes that result in foot ulcerations (Nathan and Singh 2008 and Jerry *et al.*, 2016). Even in non-diabetic patients, 24% wear shoes that are the wrong size. Ill-fitted footwear has been found to be associated with most of diabetic foot problems.

Repeated emphasis on foot care (proper trimming of toe nails, not walking bare foot, and avoidance of trauma, etc.) and correct selection of shoes are two basic strategies that could be adopted by people living with diabetes in order to avoid foot problems such as wound, gangrene and amputation (Caselli, 2011).

Generally, it is recommended that people living with diabetes should not wear shoes that have certain features. These features include; backless, open toe or slip on shoes, soft shoes that would not allow inversion and eversion and that would flex at points other than the location of the metatarsal heads (Tyrrell and Carter, 2009). Therefore, to help protect and give comfort to diabetes foot, custom-made shoe that takes into consideration the various deformities in diabetes foot and that can accommodate the foot very well must be prescribed for diabetic patients (Ulbrech and Cavanagh, 2008).

Footwear needs can vary in different cultures. There is a marked difference in footwear habits in developed countries compared to that of underdeveloped countries. In underdeveloped countries, people tend to wear sandals and slippers and some do not wear shoes at all due to poverty or religious reasons (Nathan and Singh, 2008). To help patients make informed choices of self-care, particularly in relation to footwear, provision of relevant knowledge, education, and information would go a long way in improving their foot health (Vernon *et al.,* 2007 and Jerry *et al.*, 2014). It was further stressed that patients should be given information and assistance on how to recognize footwear broadly suitable to the maintenance or improvement of foot health and the type of footwear that should be avoided as being potentially detrimental. Prescription of protective footwear has been shown to have the potential to reduce the incidence of footwear-related ulcers and amputations (Igiri, *et al.,* 2019; Gregory *et al.*, 1999; Bus, 2008 and Bus, 2020).

A study to determine the causes of lower extremity amputations identified nearly half of the amputees in their various study groups, that the initial event that led to the amputation was either shoe-related or might have been averted by

wearing appropriate shoes (Caselli, 2011 and Lefrancois, *et al.*, 2017). In addition, it had been explained that wearing unsuitable shoes which do not accommodate deformities caused by ulcers and other complications poses great risk for diabetes patients (Edmonds and Foster, 2005). Therefore, to help protect and give comfort to diabetes foot, special or custom-made shoes that take into consideration the various deformities in diabetes foot and that can accommodate the foot very well must be prescribed for diabetic patients (Ulbrech and Cavanagh, 2008). The belief within podiatry is that footwear can have a significant influence on the foot, and that such influence can be good or bad, depending on whether the footwear is appropriate for the wearer or not.

There is evidence that appropriate footwear plays pivoted role in the management of diabetic foot problems and inappropriate footwear causes foot ulceration (Tyrrell and Carter 2009). This study therefore investigates the level of diabetic patients' knowledge on the role of footwear in the prevention of diabetic foot problems and, how footwear could be used to prevent or reduce diabetic foot problem.

2.0 MATERIALS AND METHODS

A questionnaire was developed and used to gather data from diabetic patients at different hospitals in Kaduna State, Nigeria from December 2012 to March 2013. The researcher and/ or his research assistants approached each diabetic patient in the hospital waiting room and asked them to complete the questionnaire while waiting to see the doctor. An oral explanation of the research was given to each respondent in addition to a written explanation that accompanied the questionnaire. Questionnaires were not given to patients who refused. In most cases, completed questionnaires were returned to the researcher immediately. Overall, 180 questionnaires were given out to people living with diabetes and 164 were collected back, but 8 were rejected or excluded from the analysis because they were not properly completed. Therefore, 156 (75 male and 81 female) completed questionnaires were analyzed and presented.

Ethical approval for this study was obtained from the Ministry of Health, Kaduna State and Ahmadu Bello University Teaching Hospital, Zaria, Nigeria.

3.0 RESULTS AND DISCUSSION

Selected comments made by the respondents during the study were:.

i) The simple comment I have is that, at times one foot may be bigger than the other due to swollen, so something like elastic grip can be considered on slip on shoes.

ii) Sometimes I walk barefooted without knowing because my shoes can go off my feet and I will not know.

iii) I use slippers and even the slippers go off my feet without knowing that they have gone off my feet.

iv) The blisters due to diabetes is not yet severe to stop me from wearing my shoes.

v) My ulcered foot caused by diabetes has deprived me from wearing any type of shoes I like.

vi) My condition has made me scared of wearing shoes, less my feet get blistered and wounds.

vii) Prolong putting on of shoes with for 4 days made me have blisters, and subsequently complications. Now I cannot put on shoes.

viii) Because of the wound on my left foot, I find it difficult to put on shoes.

The comments by the respondents indicated that ill-fitting footwear is a common trigger for foot problems because wearing inappropriate footwear exposes diabetic patients' feet to the direct effects of friction and/ or irritation. Therefore, all patients with diabetics should be offered foot care education aimed at improving footwear-related knowledge and practice to reduce the risk of diabetic foot problems.

The result presented in Table 1 gives personal data of diabetic patients that participated in this research work. The percentage of female participants (52%) was slightly higher than that of the male (48%) and up to 67% of the patients did not know whether they were suffering with Type 1 or Type 2 diabetes. However, it had been previously reported that the relative prevalence of diabetics among the sexes varies from population to population and no clear view had emerged (Krentz and Bailey, 2001).

Of the 156 studied diabetic patients, 50% were found to be in the age group 51-65 years and up to 31% were in the age bracket of 36-50 years. The mean age is 54.1 years old. The result obtained is at variance with the findings of an earlier study (Anselmo *et al.,* 2010) on the 'effectiveness of educational practice in diabetic foot: a view from Brazil' have shown a mean age of 62 years in the diabetic population in that country.

Table 2 provides data from the survey on footwear fitting and features. It was found that up to 34% patients were not able to wear regular shoes due to foot problems. Research has also shown that the prevalence rates of the disease in Africa are

Table 1. Respondents' personal information.

Enquiry		Males % (n=75)	Females % (n=81)	Overall % (n=156)
1. Sex		48	52	100
2. Age (years)	≤ 20	0	0	0
	21-35	08	05	06
	36-50	24	42	33
	51-65	49	38	44
	≥ 66	19	15	17
	Mean	55.3	52.9	54.1
3. Occupation	Employed	34	28	31
	0wn business	23	31	27
	Unemployed	03	03	03
	Retired	23	05	14
	Student	0	0	0
	Farmer	15	0	07
	housewife	NA*	33	18
4. Residency	Rural	16	22	19
	Urban	84	78	81
5. Type ofdiabetes	type 1	07	04	05
	type 2	36	20	28
	Do not know	57	76	67
6. Duration of living with diabetics	≤5yrs	45	38	41
	6-10yrs	25	38	32
	11-15yrs	15	15	15
	16-20yrs	10	06	08
	≥21yrs	05	03	04
	mean	7.7	9.0	7.5

*NA-Not Applicable

Table 2. Footwear Fitting/ Features.

Enquiry	Male		Female		Overall	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
1. Regular shoes not able to accommodate patients' feet due to foot problems	38	62	30	70	34	66
2. Shoes need modification in order to accommodate feet well	28	72	34	66	31	69
3. Find it difficult to put on shoes or to take off shoes	31	69	28	72	29	71
4. Patient needs different sizes of shoes for left and right feet	12	88	06	94	09	91
5. Receive information about type of footwear to wear most often	25	75	34	66	25	75

increasing and foot complications are rising in parallel (Abbas and Archibald 2007). Type 1 diabetes in Africa is still uncommon but fatal, whereas type 2 diabetics is increasing in epidemic proportions (Beran and Yudkin, 2006).

Footwear is probably one of the major reasons for the lack of progress in reducing foot ulceration and amputation rates (Boulton and Jude, 2004). In agreement with their assumption, up to 75% of the diabetic subjects that participated in this study reported that they have not received information about the type of footwear they should wear most often (see Table 2). Some comments by the patients (see selected comments made by the patients above) indicate that footwear cause and/or complicate their foot problems.

However, Table 3 provides information on recommended footwear for people living with diabetes based on their risk categorization for developing foot ulcer. All health care providers involved in the care of diabetic patients need to define the level of risk for developing foot problems and thus give footwear advice accordingly.

Furthermore, Figures 1 and 2 have shown the nature of foot problems usually experience by diabetic patients and the causes of pain or injury as a result of wearing inappropriate footwear respectively. Twenty-four percent of male had foot ulcer and 18% female participants reported that they had similar foot problem. Gangrene was found to be more prominent among female patients with up to 35% reported cases. On the other hand, the cases of severe pains at the foot were more common among the male participants.

The findings indicate that almost half (43% and 42% for male and female respectively) of the cause of pain or foot injury for participants was as a result of wearing shoes that are too tight. Other reasons with significant impact for causing foot pain and injury due to using footwear were attributed to shoes rubbing feet or pinching the feet of the wearer. Nevertheless, in order to accommodate changes in diabetic foot structure, diabetic footwear is designed to re-distribute and reduce pressures underneath the foot and avoid mechanical stress on the dorsum of the foot (see Table 4).

An important finding of this study is the nature or type of footwear worn by diabetic patients in this part of the world. Figures 3, 4 and 5 showed very poor choice of footwear by people suffering with diabetics in Kaduna State. Patterns of footwear were generally similar for both male and female except for the more frequent use of slippers by female. In addition, it was also observed that the type of footwear considered most appropriate for patients with diabetes to use (custom-molded shoes) were the least frequently worn. Poor knowledge of the diabetic foot complications, use of inappropriate footwear and lack of knowledge of the management of the disease are seen as the major reasons for the high percentage of diabetic patients experiencing foot complications in this part of the world. Therefore, it has been advocated that patients' education on avoidable complications of diabetes and awareness of appropriate footwear for maintenance of good foot health should be emphasized by health care providers (Chandalia *et al,* 2008; Tyrrell and Carter, 2009).

Serious foot problems including foot ulceration can arise in the at-risk population due to ill-fitting footwear. Proper fitting footwear is therefore very important in the prevention of injuries. It has been pointed out that proper fitting footwear involves an understanding of feet, footwear and the correct selection of footwear to achieve a required fit (Goonetilleke, 2003). It has also been suggested that footwear should be fitted only by practitioners trained in fitting footwear for diabetic foot (Wooldridge *et al.,* 1996).

The data provided in this paper (Table 2) shows that up to 29% of the subjects found it very difficult to put on shoes or to take off shoes and 31% agreed that their footwear needed modification in order to easily accommodate their feet. This percentage could have been higher but for the fact that the majority of the subjects were wearing slippers as it had shown that most of the patients wore slippers (straps without back support) and sandals (Figure 3) and just 17% and 13% male and female subjects respectively wore shoes.

Figures 4 and 5 further showed that up to 77% female and 62% male respondents used footwear that do not have any form of fastening mechanism. Lace-up shoes were used by 28% of the male participants and only 12% of female patients used a similar type of footwear. Recommended footwear with appropriate fastening mechanism (buckle and Velcro fastening) were the least popular type of footwear used by the research subjects (Tyrrell and Carter, 2009).

On this issue of type of footwear worn by the patients, one of the patients stated that "I use slippers and even the slippers go off my feet without knowing that they have gone off my feet". Generally, the majority of people within the study area wear open footwear (Figures 3-5). We therefore support recommendations that all patients with diabetes should be offered foot-care education aimed at improving footwear related knowledge and practice to reduce the risk of foot complications

Table 3: Footwear recommendation for people with diabetes based on their risk stratification for developing foot ulceration.

Category	Foot assessment	Recommendations
Low risk	No peripheral neuropat	Off the shelf footwear is likely to be appr
	No peripheral arterial disease	Encourage patients to have their feet meas and professionally fitted
	Normal foot shape and history of amputation	Encourage patients to wear footwear that meets the criteria in Table 4
Medium risk	Peripheral neuropathy	Off the shelf footwear is likely to be appr
	OR peripheral arterial disease	Encourage patients to have their feet meas and professionally fitted
		Encourage patients to wear footwear that meets the criteria in Table 4
	Normal foot shape	Footwear must be worn at all times to pro feet from injury
	No history of amputati	Fit footwear in the afternoon to ensure any dependent edema is accommodated. New footwear should be worn gradually. Check regularly for signs of trauma when wearing new shoes
High risk	Abnormal foot shape, including history of amputation	Footwear assessment by an appropriately health professional is recommended
		Medical grade footwear and custom-molded foo orthoses will be required
		Foot orthoses to be supplied prior or toget with prescribed footwear
		Footwear must be worn at all times to pro feet from injury Fit footwear in the afterno ensure any dependent edema is accommodat
		New footwear should be worn gradually
		Check feet regularly for signs of trauma w wearing new shoes

Adapted from Bergin *et al*. (2013)

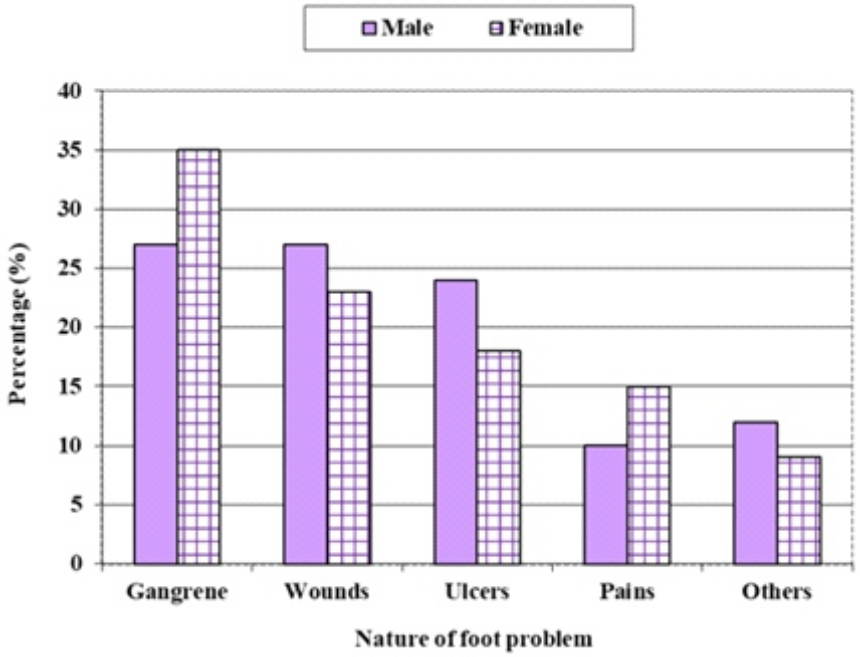

Figure 1. Nature of foot problems among diabetic patients.

Table 4: Shoe features that diabetic patients should be aware of when purchasing footwear

Shoe features	Criteria for choosing appropriate footwear features
Upper part of shoe	These should be made from leather or a combination of materia (such as those used in sports shoes) with smooth inner lining a without bulky seams at the toe area These should be made from leather or a combination of materials (such as those used in spo shoes) with smooth inner lining and without bulky seams at the area
Correct length	1 cm from end of the longest toe when the patient is standing
Correct depth	Should accommodate all the toes without causing pressure
Correct width	The sides of the shoe should not bulge over the sole when com
Low heels	Should be less or equal to 2 cm
Fastening	Adequate fastening such as laces or straps to keep foot from sliding forward
Cushioned outer and inner soles	Approximately 0.5-1 cm thick under the forefoot
Enclosed heel	Shoes with an open back can result in injury to the skin around heel and usually require the individual to claw their toes in order keep them on, also increasing risk of ulceration
Soles	Should not be slippery

Adapted from Bergin SM et al (2013)

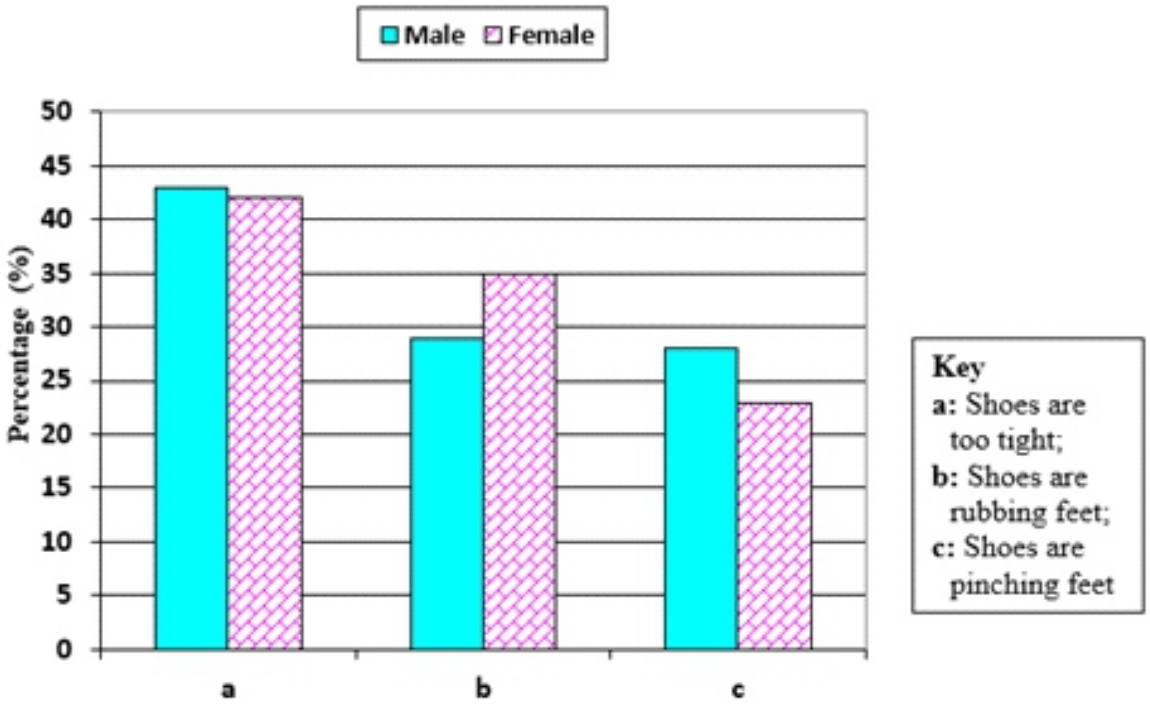

Figure 2. Causes of pain/ injury as a result of wearing inappropriate footwear.

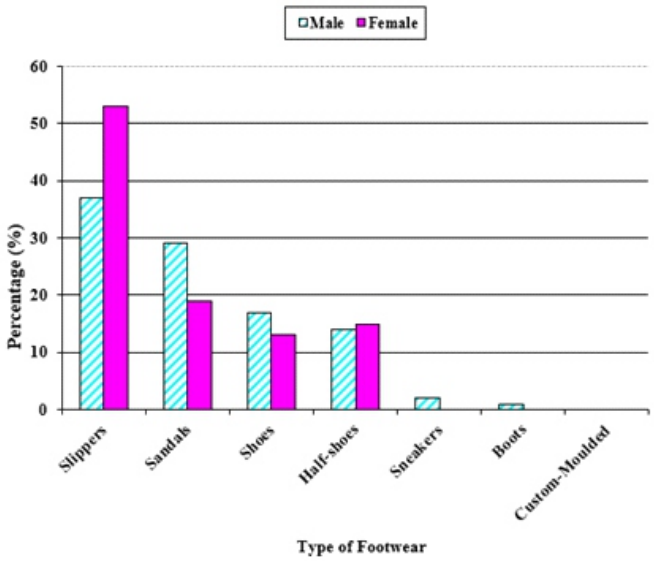

Figure 3. Type of footwear most often used by participants.

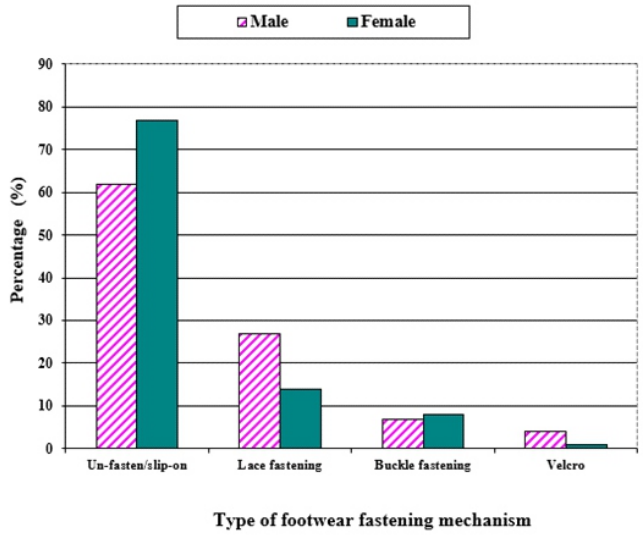

Figure 4. Style of footwear used most often.

(Jerry *et al.*, 2014). All clinicians involved in the care of patients with diabetes need to define the level of risk for developing foot complications and thus tailor footwear advice accordingly (see Table 2 and 3).

This finding also points to the fact that a significant number of diabetic patients in Nigeria are wearing footwear that do not fit properly and lack the basic knowledge of proper fitting of footwear. It is believed that patients' foot-care education, particularly in regards to footwear, will significantly improve the poor choice of footwear by both male and female patients in this part of the world. Health care providers have a big role to play in this by making extra emphasis on good foot-care practices and by giving patients information on avoidable complications and prevention.

4.0 CONCLUSION

This research work points out the need to educate diabetic patients in Kaduna State and probably in the entire country on the role of footwear in managing or preventing diabetic foot problems. Majority of the patients that participated in this research work had poor knowledge of type of footwear they should use more often. Diabetic patients' foot-care education, particularly in respect to footwear, will significantly improve the poor choice of footwear by both male and female patients. The authors therefore recommend that all patients with diabetes should be offered foot-care education aimed at improving footwear knowledge and practice in order to reduce the risk of foot complications.

Figure 5. Photo of patients at a diabetic clinic showing the types of footwear they wear often.

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