

Knowledge and Practice of Self Foot Care among Type 2 Diabetic Patients Attending Aladil Primary Health Care Center in Makkah, Saudi Arabia

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ABSTRACT

Background: Diabetic foot is one of the main complications of Diabetes Mellitus of high socioeconomic impact, characterized by foot lesions and finally leg amputation in most of the cases. Foot care education is the most crucial tool for preventing lower leg amputation.

Objectives: To assess the self-foot care knowledge and practice among Saudi type 2 diabetic patients attending Aladil primary healthcare center, Makkah as well as to determine factors associated with them.

Subjects and Methods: A cross-sectional analytical study was adopted. It included a representative sample of type 2 diabetic patients registered at Aladil PHC center, Makkah. Systematic random sampling technique was adopted. The data were collected through filling an interview questionnaire. It includes socio-demographic data, clinical data, general knowledge data, knowledge of foot care practice data and source of information. Regarding practice, a check list was used by the investigator after examination of the patient and observing his/her feet.

Results: Out of 170 eligible type 2 diabetic patients invited to participate in the study, 160 responded, giving a response rate of 94.1%. Almost two-thirds of them (69.4% aged between 45 and 64 years. Male patients present 56.3% of them. Majority of them (85%) were married. Diabetes duration ranged between 5 and 10 years among more than half of the participants (53.8%). The majority of them (88.8%) were treated by oral hypoglycaemic drugs. The overall knowledge score mean was 14.7 ± 2.9 out of 29. The overall knowledge score mean was 14.7 ± 2.9 out of 29. The mean knowledge percentage score was $50.5 \pm 7.5\%$. The mean of the overall practice score was 23.5 ± 3.2 out of 28. The mean practice percentage score was $83.9 \pm 11.4\%$. Older patients (≥ 65 years) were at almost significant double risk for having insufficient knowledge compared to younger patients (30-44 years) (OR: 2.01 95% CI: 1.11-6.31). Compared to illiterate patients, those

with secondary school or university education were at significant decreased risk for insufficient self-foot care knowledge (OR: 0.14 95% CI: 0.07-0.078 and OR: 0.06 95% CI: 0.02-0.39, respectively). Compared to patients who reported health care center/hospital as a source of their information about foot care, those who depend on other sources even with health care center/hospital were more likely to have poor practice of self-foot care (OR: 1.93 95% CI: 1.02-4.15). Patients treated with insulin only were at three-folded risk for poor practice of self-foot care opposed to those treated with oral hypoglycemics alone (OR: 3.51 95% CI: 1.36-6.05).

Conclusion: The result of this study showed that a considerable proportion of diabetic patients had a poor knowledge and practice of diabetic foot care. Endocrinologists and family physicians were the persons who will be sought by diabetic patients regarding diabetic self-care in the future. Role of health educators was very minimal in this regard.

Keywords: Foot Care, Diabetes Mellitus, Knowledge, Practice.

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INTRODUCTION

Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels.¹

Several pathogenic processes are involved in the development of diabetes. These range from autoimmune destruction of the β -cells of the pancreas with consequent insulin deficiency to abnormalities that result in resistance to insulin action. The basis of the abnormalities in carbohydrate, fat, and protein metabolism in diabetes is deficient action of insulin on target tissues. Deficient

insulin action results from inadequate insulin secretion and/or diminished tissue responses to insulin at one or more points in the complex pathways of hormone action. Impairment of insulin secretion and defects in insulin action frequently coexist in the same patient, and it is often unclear which abnormality, if either alone, is the primary cause of the hyperglycemia.² Peripheral neuropathy (PNP) is one of the degenerative complications of diabetes. It is a destructive disease of peripheral nerves leading to symptoms of pain or paresthesia or problems arising from neurological deficit.³

Diabetic peripheral neuropathy is the most common complication of long-standing diabetes mellitus (DM) and through its much-feared sequel, the diabetic foot, is responsible for most diabetes-related hospitalizations.³ During its natural course it progresses from initial functional to late structural changes. The main morphological features of established neuropathy include a combination of demyelination and axonal degeneration of myelinated fibers, degeneration with regeneration of unmyelinated fibers and endoneurial microangiopathy, with nerve fiber loss in its final stage.⁴ Neuropathy frequently results in clinically significant morbidities, such as pain, loss of sensation, foot ulcers, gangrene and amputations.

Optimal metabolic control is the only available measure with proven efficacy in preventing or at least halting the progression of diabetic neuropathy.⁵ However, to be effective it should be instituted at an early stage since, as is the case with other late complications of diabetes, the late phases of diabetic neuropathy are poorly reversible or even irreversible. Moreover, ample evidence of defective nerve regeneration in DM is available.⁶⁻⁸

Diabetic foot (DF) is defined as a full-thickness penetration of the dermis of the foot in a person with diabetes. Studies suggest that 2.5% of diabetic patients develop DF each year, and 15% of them develop DF during their life.⁹

In Saudi Arabia, DF was prevalent in 13.5% of the diabetic patients referred to the nephrology clinic,¹⁰ and 7.7% of the patients undergoing chronic hemodialysis.¹¹ Diabetic foot is the most frequent cause of hospitalization for the patients with diabetes, representing up to 25% of all diabetic hospital admissions.¹² Also, it is the most common cause of non-traumatic lower limb amputation,¹³ and precedes 85% of the cases.⁹ The mortality rate is higher in the patients with DF, and represents approximately twice the number of diabetic patients without DF.¹³

Foot examination and risk categorization were among the least concerning examination by most of the physicians dealing with diabetes in the developing countries. In a cross sectional study conducted in Gurayat province, Saudi Arabia among primary care physicians to evaluate the current referral system between the diabetic center and the primary health care centers, only 3 referral forms (from a total of 215 forms) contained data about foot examination.¹⁴ According to the American Diabetes Association, there are certain guidelines to be followed by diabetic persons.¹⁵

This study aimed to evaluate the knowledge and practices of foot care in patients with diabetes mellitus and to stress upon the importance of such knowledge and practices in decreasing morbidity associated with diabetic foot disease.

SUBJECTS AND METHODS

A cross-sectional analytical study was conducted based on patients registered at Aladil primary healthcare center, Makkah

Almukarramah which is the holy capital located in Makkah region, in the western region of the Kingdom of Saudi Arabia (KSA). Total population in Makkah city in the last statistics at 2010 is approximately 1,675,368.¹⁶ Aladil PHC center is one out of 76 PHC centers in Makkah Almukarramah city.¹⁷ Total diabetic type 2 patients covered by this center at 2013 was 657.

The sample size was computed from the total number of type 2 diabetic patients registered in Aladil PHCC is 657 (299 females and 358 males) using the single proportion equation in Raosoft software package,¹⁸ the required sample size was 152 patients at 95% confidence intervals (expected frequency 15%,¹⁹ margin of error accepted was 5%). The sample was increased to 170 to compensate for drop out (77 females and 93 males).

Systematic random sampling technique was adopted. Every fourth patient was chosen in order to get 164 patients out of 657 registered type 2 diabetic patients while the remaining six patients were selected by simple random technique.

The data were collected through filling an interview questionnaire. This questionnaire has been used previously in Taif and proved to be valid and reliable. It includes socio-demographic data (age, residence, marital status, highest educational level, occupation and income), clinical data (duration of diabetes, type of management, compliance with diabetic diet and treatment), knowledge data (symptoms of diabetic foot, methods of foot care, benefits getting from foot care. In addition to knowledge of foot care practice data (frequency, foot wear, proper ways of foot care, proper action after discovering foot changes, foot washing details) and source of information. The total knowledge score was computed. It ranged between 0 and 29 where correct or best answers were given score of 1 while other answers were given score of zero. Sufficient knowledge was considered for score equal or over 50% (~median value) while insufficient knowledge was considered for score <50%.

Regarding practice, a check list was used by the investigator after examination of the patient and observing his/her feet. The check list consists of 6 main groups. Each group consist of items regarding foot wear, foot observation, the way of cutting the toes nail, the way of checking the foot, the way of washing feet and the way of applying lotion on the feet. The total score of practice was collected (ranged between 0 and 28). Good practice was considered for score equal or over 50% (~median value) while poor practice was considered for score <50%.

Approval from Joint Program of Family Medicine in Makkah was obtained and permission of the Director of Aladil PHC center was obtained. Participation was considered consent after explaining the aim of the study to participants.

Data were entered to a personal computer and analyzed by using Statistical Package for the Social sciences (SPSS) program version 20. Quantitative variables were presented as mean and standard deviation and qualitative variables as frequency and percentage. Chi-square test was utilized to test for the association and/or difference between two categorical variables. P value equal or less than 0.05 was considered statistically significant. Knowledge score categorized as insufficient or sufficient and practice score categorized as poor and good were treated as dependent variables in two separate logistic regression analysis models. All significant variables from bivariate analysis (age, education, occupation, income, duration of diabetes and its treatment in case of knowledge score and type of therapy and

source of information in case of practice score) were treated as independent variables. Multiple associations were evaluated based on the backward stepwise selection. This procedure allowed the estimation of the strength of the association between each independent variable while taking into account the potential confounding effects of the other independent variables. Each

category of the predictor variables was contrasted with the initial category (reference category). The adjusted measures of association between risk factors and insufficient knowledge or poor practice score were expressed as the odds ratios (OR) with 95% Confidence Intervals (95% CI). Adjusted ORs with 95% CI that did not include 1.0 were considered significant.

Table 1: Socio-demographic characteristics of the participants (n=160).

		Frequency	Percentage
Age (Years)	30-44	36	22.5
	45-64	111	69.4
	≥65	13	8.1
Gender	Male	90	56.3
	Female	70	43.7
Marital status	Single	3	1.9
	Married	136	85.0
	Divorced	7	4.4
	Widowed	14	8.7
Educational level	Illiterate	9	5.6
	Primary	14	8.8
	Intermediate	22	13.8
	Secondary	78	48.7
	University	33	20.6
	Postgraduate	4	2.5
Occupation	Professional	5	3.1
	Clerical	67	41.9
	Military	20	12.5
	Business	3	1.9
	Retired	26	16.3
	House wife	39	24.3
Income (SR/month)	≥10,000	27	16.9
	5,000-<10,000	91	56.8
	<5,000	42	26.3

Table 2: Type 2 diabetic patients' knowledge regarding self-foot care

Items of knowledge	Categories	Frequency	Percentage
Knowledge of symptoms related to diabetic foot disease	Numbness	85	53.1
	Burning foot	71	44.4
	Tingling	41	25.6
Knowledge of protective measures from foot infection and amputation	Control blood sugar level	53	33.1
	Stop smoking	3	1.9
	Take care of feet	125	78.1
	Visit physicians on time	29	18.1
Knowledge of benefits of self-foot care	Decrease rate of sepsis	38	23.8
	Decrease rate of hospitalization	9	5.6
	Decrease rate of amputation	133	83.1

RESULTS

Out of 170 eligible type 2 diabetic patients invited to participate in the study, 160 responded, giving a response rate of 94.1%. As summarized in table 1, almost two-thirds of them (69.4% aged between 45 and 64 years. Male patients present 56.3% of them. Majority of them (85%) were married. Almost a fourth of them (23.1%) were at least university graduated. Regarding occupation, 41.9% of them were clerical employees while 24.3% were house wives. The income ranged between 5,000 and 10,000 SR/month

among 56.8% of them. Diabetes duration ranged between 5 and 10 years among more than half of the participants (53.8%) whereas it was more than ten years among 16.9% of them. The majority of them (88.8%) were treated by oral hypoglycaemic drugs whereas only 13.1% were treated by insulin. Almost a third of them (31.9%) reported following a diet regimen to manage their diabetes. Less than half of type 2 diabetic patients (47.5%) reported that they always compliant with diet regimen and medication whereas 18.1% of them were compliant with

medication only and 4.4% were never compliant with diet and medication of diabetes.

KNOWLEDGE OF DIABETIC FOOT CARE

As shown in table 2, the knowledge of diabetic foot care is summarized into the following items:

Knowledge of Symptoms Related to Diabetic Foot Care:

The commonest reported symptom recognized by patients was

numbness (53.1%) followed by burning foot (44.4%).

Knowledge of Protective Measures from Foot Infection and Amputation:

Taking care of foot was reported by most of patients (78.1) while controlling blood sugar was reported by almost a third of them (33.1%).

Knowledge of Benefits of Self-Foot Care: Decrease the rate of amputation was the most recognized benefit (83.1%).

Table 3: Type 2 diabetic patients' knowledge of proper practice of foot care

	Categories	Frequency	Percentage
Frequency of feet checking	Daily	12	7.5
	Weekly	68	42.5
	Monthly	65	40.6
	None	15	9.4
Procedure to check sole of foot	Using mirror	6	3.8
	Checking as much as possible	50	31.3
	Family member help	28	17.5
	Physician examination is enough	73	45.6
Action in case of abnormality during checking feet	Never check feet sole	7	11.7
	Wait and see	63	39.4
	Inform physician next visit	43	26.9
	Inform physician immediately	49	30.6
Frequency of washing feet	Don't know	5	3.1
	Once or more daily	20	12.5
	Twice or more weekly	27	16.9
Temperature of water used for washing feet	Once weekly	113	70.6
	Hot water	1	0.6
	Cold water	1	0.6
	Warm water	157	98.2
Frequency of using soap to wash feet	Any type of water	1	0.6
	Daily	27	16.9
	Weekly	79	49.3
	Monthly	36	22.5
Features of proper shoes for diabetic patients	Don't know	18	11.3
	Open shoes	24	15.0
	Leather closed shoes	18	11.3
Frequency of checking inside the shoes just before wearing it	Fit closed shoes with wide toes	118	73.7
	Every time	5	3.1
	Sometimes	56	35.0
Frequency of changing socks	Never	99	61.9
	Every day	10	6.3
	Once a week	62	38.7
Walking barefoot	Twice a week	68	42.5
	Never used	20	12.5
	Sometimes	4	2.5
	Most of time	1	0.6
Method of warming feet in cold weather	Always	6	3.8
	Never	149	93.1
	Heating bad	3	1.9
Method of warming feet in cold weather	Wearing thick socks	154	96.2
	Electrical heater	3	1.9

KNOWLEDGE OF PROPER PRACTICE OF FOOT CARE AMONG DIABETICS

As demonstrated in table 3, the knowledge of the proper practice of foot care is summarized into the following items:

Frequency of Feet Checking: Daily feet checking were reported by only 7.5% of the participants whereas 9.4% of them never checked their feet.

Procedure to Check Sole of Foot: Six patients (3.8%) reported using of a mirror and 31.3% reported checking as possible as they can whereas 11.7% never checked their feet sole.

Action in Case of Abnormality: Only 30.6% of patients reported that they will inform their physicians immediately in case of abnormality during feet examination whereas 39.4% reported that they will wait and see.

Frequency of Washing Feet: Only 12.5% of them reported once or more daily feet washing whereas the majority (70.6%) reported once weekly.

Temperature of Water Used for Washing Feet: The vast majority of patients (98.2%) properly recognized that warm water is suitable for washing feet.

Frequency of Using Soap to Wash Feet: Twenty seven patients (16.9%) reported daily using of soap to wash feet.

Features of Proper Shoes for Diabetic Patients: Fit closed

shoes with wide toes was reported by most of patients (73.7%) whereas Leather closed shoes was reported by 11.3% of them as proper shoes for diabetic patients.

Frequency of Checking Inside the Shoes Just Before Wearing It: Only 3.1% of patients reported that they checked inside the shoes just before wearing it everytime whereas 61.9% of them reported that they never did this behavior.

Frequency of Changing Socks: Only 6.3% of patients reported changing socks everyday whereas 12.5% of them reported never using of socks.

Walking Barefoot: The majority of patients (93.1%) reported that they never walk barefooted.

Method of Warming Feet in Cold Weather: Wearing thick sockets was reported by the majority of patients (93.2%).

The overall knowledge score mean was 14.7 ± 2.9 out of 29. The mean knowledge percentage score was $50.5 \pm 7.5\%$.

As obvious from figure 1, the overall knowledge of type 2 diabetic patients regarding self-foot care was sufficient (score over or equal 50%) among almost two thirds of them (63.1%).

Figure 2 shows that the source of information among the vast majority of patients (98.8%) was health care center/hospital either alone or combined with other sources. The second frequent source was media and reported by 29.4% of patients.

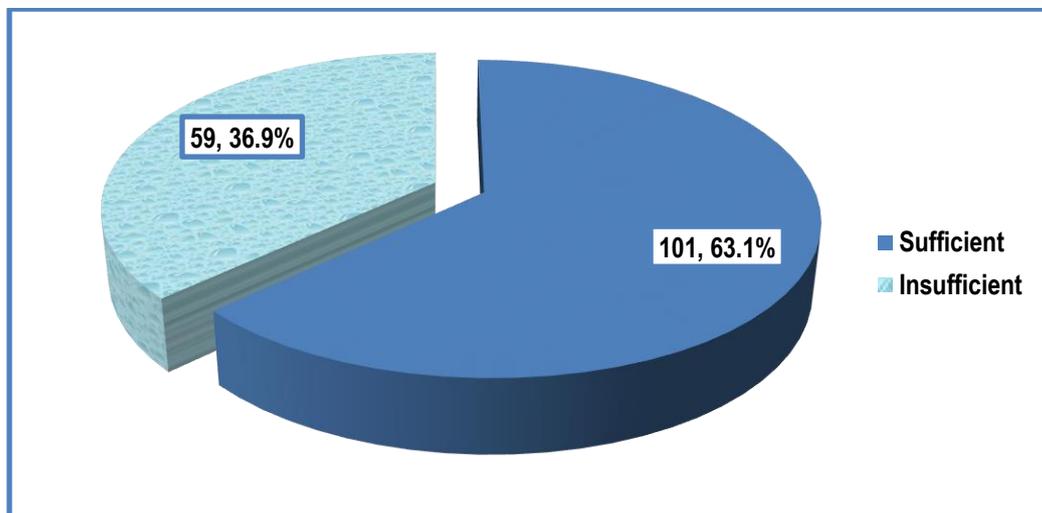


Figure 1: Overall knowledge of type 2 diabetic patients about self foot care.

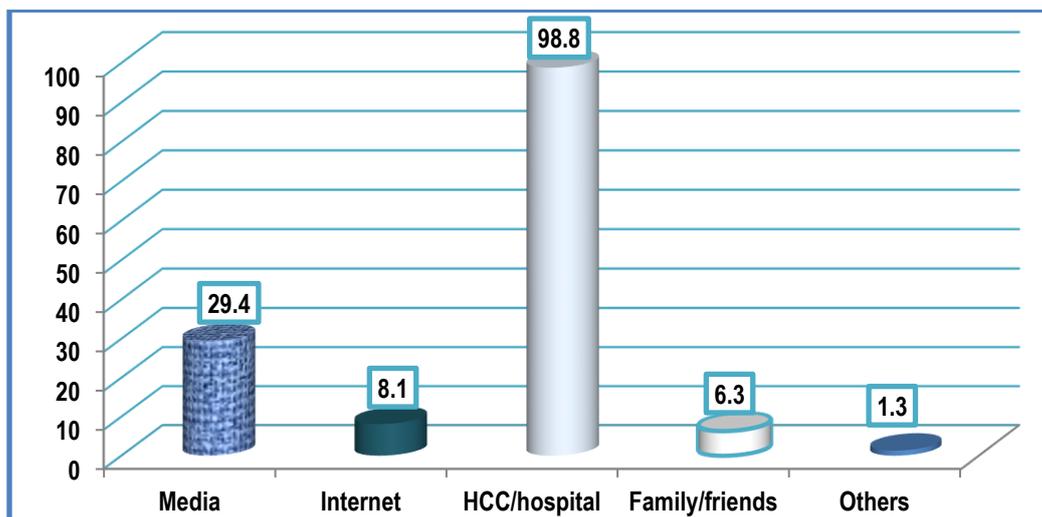


Figure 2: Source of information about foot care among type 2 diabetic patients. (Others: newspapers/magazines and pamphlets; HCC: Health care center)

Table 4: Type 2 diabetic patients' practice of foot care.

Items	Categories	Frequency	Percentage
Foot wear	Wearing shoes	150	93.8
	Low heeled shoes	141	88.1
Foot observation	Wearing socks	138	86.3
	Foot is clean	136	85.0
	Fungal infection between toes	59	36.9
	Wounds, ulcers	57	35.6
	Corn	84	52.5
	Calculus	110	68.8
	Nail cut in a proper way	146	91.3
	Foot skin is dry	151	94.4
The way of cutting the toes nail	Cut nails straight across	123	76.9
	Doesn't cut the corner of the nails	119	74.4
	Doesn't cut the nail shorter than the underline soft tissue	89	55.6
The way of checking the foot	Checking the sole	152	95.0
	Checking the top of foot	154	96.3
	Checking between the toes	149	93.1
	Checking the heel	146	91.3
	Looking for the Change of colour	148	92.5
	Looking for wounds	152	95.0
The way of washing feet	Checking the temperature of water	160	100
	Washing top and bottom	160	100
	Washing between toes	146	91.3
	Washing the heel	140	87.5
	Drying the foot after wash	106	66.3
	Drying between toes	96	60.0
The way of applying lotion on the feet	On the top	160	100
	On the bottom	155	96.9
	Between toes	84	52.5

Table 5: Predictors of insufficient knowledge regarding diabetic self-foot care: Logistic regression analysis.

		Adjusted OR	95% CI	p-value
Age (years)	30-44 (n=36) ^a	1.0	---	
	45-64 (n=111)	1.81	0.77-3.15	0.119
	≥65 (n=13)	2.01	1.11-6.31	0.031
Educational level	Illiterate (n=9) ^a	1.0	---	
	1ry school (n=14)	0.71	0.38-17.05	0.736
	Intermediate school (n=22)	0.24	0.19-3.19	0.114
	2ry school (n=78)	0.14	0.07-0.87	0.020
	University+ (n=37)	0.06	0.02-0.39	0.002

^a: reference category; OR: Odds ratio; CI: Confidence interval; Variables of occupation, income, diabetes duration and therapy were removed from the final logistic regression model

Table 6: Predictors of poor practice of diabetic self-foot care: Logistic regression analysis

		Adjusted OR	95% CI	p-value
Source of information	Health care/hospital only (n=104) ^a	1.0	---	
	Other sources with or without health care/hospital (n=56)	1.93	1.02-4.15	0.039
Treatment	Only oral hypoglycemics (n=96) ^a	1.0	---	
	Only insulin (n=13)	3.51	1.36-6.05	0.026
	Oral hypoglycemics and diet (n=43)	1.22	0.33-5.19	0.314
	Insulin and diet (n=5)	3.25	0.12-12.87	0.632
	All (n=3)	2.66	0.10-15.21	0.556

^a: reference category; OR: Odds ratio; CI: Confidence interval

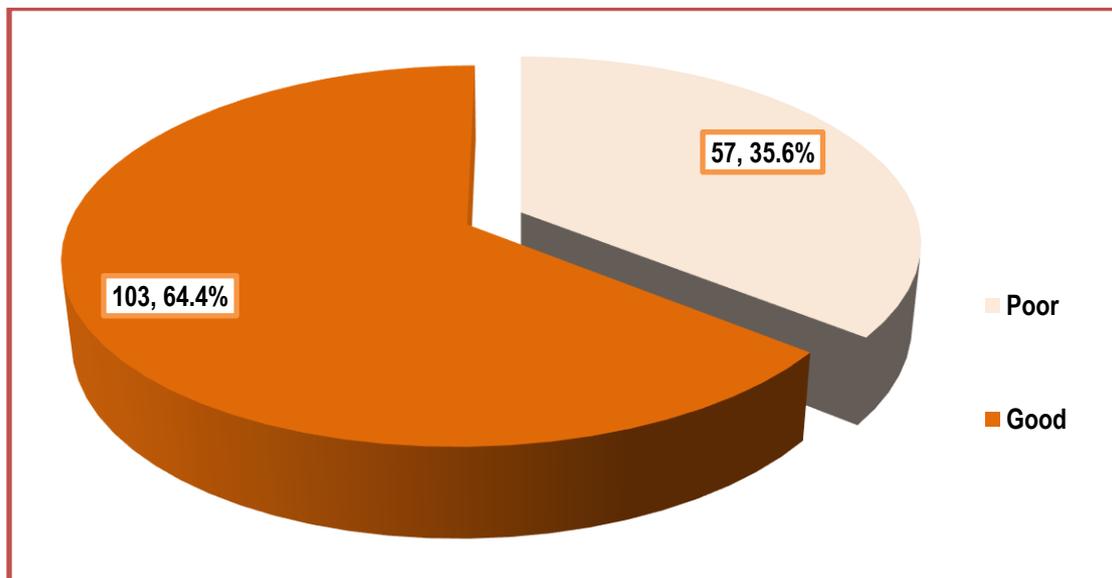


Figure 3: Overall practice of type 2 diabetic patients regarding self-foot care

PRACTICE OF FOOT CARE AMONG DIABETICS

Table 4 demonstrates the patients' practice of foot care as observed by the investigator during their examination. This can be summarized in the following 6 main items:

Foot Wear: Majority of patients wear shoes (93.8%), low heeled shoes (88.1%) and wear socks (86.3%).

Foot Observation: Feet were clean in most cases (85%), nails were cut in a proper way among majority of them (91.3%) and foot skin was dry among 94.4% of them. On the other hand, fungal infection between toes was reported among 36.9% of them.

The Way of Cutting the Toes Nail: It was observed that 74.4% of patients didn't cut the corner of the nails and 55.6% of them didn't cut the nail shorter than the underline soft tissue.

The Way of Checking the Foot: The vast majority of patients did proper checking for the all aspects of foot (checking for foot sole, top, between the toes and heel in addition to looking for the change of colour and wounds).

The Way of Washing Feet: All patients checked the temperature of water before foot washing. However, 66.3% of patients dried the foot after wash and 60% dried between toes.

The Way of Applying Lotion on the Feet: All of patients applied lotion on the top of foot and majority of them (96.9%) applied it on the bottom. Almost half of them (52.5%) applied it between toes.

The mean of the overall practice score was 23.5 ± 3.2 out of 28. The mean practice percentage score was $83.9 \pm 11.4\%$. The overall practice of type 2 diabetic patients regarding self-foot care was good (score over or equal 50%) among almost two thirds of them (64.4%) as illustrated in figure 3.

MULTIVARIATE LOGISTIC REGRESSION ANALYSIS

Insufficient Knowledge of Self-Foot Care: As shown in table 5, older patients (≥ 65 years) were at almost significant double risk for having insufficient knowledge compared to younger patients (30-44 years) (OR: 2.01 95% CI: 1.11-6.31). Compared to illiterate patients, those with secondary school or university education were at significant decreased risk for insufficient self-foot care knowledge (OR: 0.14 95% CI: 0.07-0.078 and OR: 0.06 95% CI: 0.02-0.39, respectively). Patient's occupation, income, diabetes duration and therapy were not significantly associated with knowledge of self-foot care.

Poor Practice of Self Foot Care: Compared to patients who reported health care center/hospital as a source of their information about foot care, those who depend on other sources even with health care center/hospital were more likely to have poor practice of self-foot care (OR: 1.93 95% CI: 1.02-4.15). Patients treated with insulin only were at three-folded risk for poor practice of self-foot care opposed to those treated with oral hypoglycemics alone (OR: 3.51 95% CI: 1.36-6.05). (Table 6)

DISCUSSION

The available scientific knowledge concerning diabetes mellitus is an important resource to guide and educate diabetes patients concerning self-care. In the present study, the mean score of knowledge was 14.6 out of 29 (50.5%). In a similar study conducted by Al-Juaid in Taif (2005),²⁰ a main knowledge score of 66% has been reported. In Najran, the main knowledge score was 6.5 out of 11 (60%).¹⁹ In USA, Southeastern State, the main score of knowledge of a group of diabetic patients without foot ulcer was 13.75 out of 20 (68%) whereas it was 13.88 out of 20 among those with foot ulcer (69.4%).²¹

This study reveals that 35.6% of the respondents had poor practices for foot care (<50%) which indicates an alarming situation and one should take appropriate action for it. It does not require costly measures but simple preventive measures to prevent the persons to suffer from disability. Another striking feature which is revealed in this study is that 36.9% of the respondents had insufficient knowledge (<50%). Moreover, the mean knowledge percentage score was $50.5 \pm 7.5\%$ while that of practice score was 83.9 ± 11.4 . This increase in practices with less knowledge indicates that people are doing good practices without knowing that they are good for health. This may be explained on the basis of Islamic rituals which they are performing religiously without knowing that some of these activities are a part of good foot care practices. In addition, foot hygiene level was high in our population (85%). Other studies conducted in Spain²² and India²³ reported levels of 64% and 63.3%, respectively. This could be attributed to religious background of our people as they are washing their feet regularly more than once for prayer.

This study has shown a marked gap in the knowledge and practices of the diabetic patients regarding foot care in a primary health care center in Makkah, Saudi Arabia. This also reflects indirectly a grim situation in the primary health care facilities. Diabetic foot is one of the main complications of Diabetes Mellitus of high socioeconomic impact, characterized by foot lesions and finally leg amputation in most of the cases. Foot care education is the most crucial tool for preventing lower leg amputation. Thus low cost, low technology evaluation and preventive processes are enough to substantially reduce the rates of risk.¹ An individualized educational intervention can lead to improved foot care knowledge; self-care practices and confidence in performing foot related self-care. There is a need to reorient and motivate health personnel in educating diabetics about self-care and also practicing by themselves proper foot examination when and where required.

In the current study, after controlling for confounders in multivariate logistic regression analysis, younger patients were more knowledgeable than the older patients. The same has been reported by Al-Juaid in another previous Saudi study.²⁰ This could be attributed to the fact that, younger patients were healthier and they can take care of themselves.

In accordance with other studies,^{20,24,25} higher educated patients were more knowledgeable than others. The knowledge of appropriate foot care has been suggested to be positively influenced by patient education which in turn reduces the risk of foot ulceration and amputation in high-risk diabetics.²⁶ The association between education and knowledge may be due to the fact that, educated patient were able to read and understand some of educational supportive materials and also use information technology to obtain more information about the disease. In addition, in a study conducted in India, it was concluded that low knowledge scores were common with poor formal education, thus confirming relationship between education and knowledge.²⁷ Role of formal/school education is further confirmed by a study from Italy where the presence of foot complications was correlated with insulin treatment, cigarette smoking and low levels of school education.²⁸

Regarding practice, patients who got their knowledge from only health care center and/or hospital showed better practice of foot hygiene compared to those who got their information from other sources even if accompanied with health care facilities. This may be due to the fact that health education is an essential task in primary health care centers as well it is one of the important task and responsibility of primary health care physicians.

The role of physicians is very important in improving the knowledge and practices regarding foot care. In a study from Italy, more than 50% of the patients reported that they did not have their feet examined by their physician and 28% referred that they had not received foot education. Thus patients' knowledge and practices are strongly related to physicians' attitudes.²⁸ In USA, a prospective, randomized, single center, two group design was used to test the effectiveness of an educational intervention to improve patient's foot care knowledge, self-efficacy, and self-care practices. This educational intervention improved patient's knowledge, confidence and reported foot care behaviours. Thus incorporating such interventions into routine home care services may enhance the quality of care and decrease the incidence of lower-extremity complications.²⁹ Similarly a study was conducted

in UK to assess the knowledge and practices of foot care in people with diabetes. The patients at high risk of ulceration were compared with those at low risk. The mean knowledge score was 6.5 ± 2.1 out of possible 11. There was a positive correlation between the score and having received advice on foot care.³⁰

Diabetic patients in the present survey who treated with oral hypoglycemic reported better foot care practice than those treated with insulin. This could be an outcome and not a cause as usually complicated and sever cases of type II patients are treated with insulin and consequently they had more diabetic complications including diabetic foot.

Patient's gender has shown no relationship regarding knowledge and practices of foot care whereas in another study conducted in India, low scores for foot care knowledge were more common in women (78.5%) than in men (62.5%). However this can be explained on the basis that in that particular study, there were more women with low educational status.²⁷ It can be deduced that the results are consistent with our study. Thus, education has a strong relationship with knowledge of foot care. Whereas in another study, multivariate analysis showed that age, years of schooling and sex were independent determinants of the knowledge score in the respondents with type 2 Diabetes.³¹

Furthermore, the education of physician is highly imperative to complement and reinforce the behaviours of patient with regards to foot care; they need to learn and imbibe the skills of counseling and risk assessment.

The present research has some limitations. First, our sample was recruited from attendee of one primary health care center in Makkah region which limits the generalizability of the study to all type 2 diabetic patients in Makkah and in different regions of the kingdom. These data are cross-sectional and limit our ability to make causal inference among studied risk factors. In spite of that, our study has been able to determine the knowledge and practice of foot care among diabetic patients in Makkah, Saudi Arabia.

In conclusion, the result of this study showed that a considerable proportion of diabetic patients had a poor knowledge and practice of diabetic foot care. Younger and more educated patients were more knowledgeable regarding self-foot care. Patients who got their information from health care centers and/or hospitals and those treated with oral hypoglycaemics showed better practice of foot hygiene than others. Establishment of a patients and physician friendly educational programmes that will enhance and sustain the good knowledge and practice of foot care is highly recommended.

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