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Socio-economic impact on families with diabetic foot ulcer and amputation patients

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ABSTRACT

Background: The price of a one admission to treat acute diabetic foot infection is approximately 7717.39US Dollar per year. *Objective:* To detect the social and financial influence of diabetic foot ulcer and amputation patients on their families, in Arar city, KSA. *Methods*: This study was a cross-sectional survey study. The data was collected during a period of two months from April 1st to May 31st, 2021, from all adult DM patients and their relatives who will attend the diabetes center during the study period. *Results*: Discussing the relation between diabetic foot and socioeconomic status we found that age, educational level, marital status, and average household monthly income were the most significant parameters that affected diabetic foot and socio-economic status related to this complication (P value <0.005). The low socio-economic condition was associated with worse results in patients with diabetes. Also, patients with average household monthly income who claimed that diabetic foot disease affected their economic condition were 45.7% gained less than 5000, patients with monthly income from 5000 to 10000 who were 28.3%, and patients with monthly income greater than 10000 were 26.1% (P=0.002). *Conclusion:* This study demonstrates the high burden and cost of amputation, which is why there is a direct correlation between socioeconomic status and diabetic foot and amputation. Prevention of diabetic complications particularly diabetic foot is mandatory, through adherence to treatment and access to proven pathways for early assessment when diabetes complications increased, especially for patients from low socioeconomic groups.

Keywords: Socio-economic, Impact, Families, Diabetic Foot Ulcer, Amputation.

1. BACKGROUND

Diabetes mellitus (DM) is a common epidemic chronic metabolic disorder causing loss in health and economic load on patients and healthcare apparatus all over the world (Al-Rifai & Aziz, 2018). Due to the high rates of morbidity and disability related to chronic complications of both type 1 and type 2 diabetes, the International Diabetes Federation (IDF) has focused on the complications associated with DM. Type 2 DM is more prevalent in adults and

is generally associated with overweight, sedentary lifestyle, smoking habits and family history of the disease (American Diabetes Association, 2015). Diabetic foot ulceration is the most common and prevalent complication in diabetes patients, and it was known to be the most effective DM complication in the socio-economic status and the quality of the patient's life (Frykberg & Banks, 2016). The IDF has now declared, with a power of attorney, more active in raising awareness of DM-related foot complications in social, personal, clinical and economic cost scenarios. In 2005, IDF promised to implement a management approach for diabetic foot ulcer (Gale, 2004). The risk of developing foot ulcers in diabetic patients is 25%, and it has been reported worldwide that amputations of the lower limbs of diabetic patients occur once every 30 seconds (Singh et al., 2005; Bakker et al., 2005). In addition to inducing pain and morbidity, foot lesions in diabetics have considerable economic consequences, as well as the direct cost of foot complications, as well as reduced productivity, individual. There are also indirect costs associated with patient and family costs and loss of health-related quality of life (Raghav et al., 2018).

The lifetime risk of a person with diabetes developing a foot ulcer could be up to 25%, and it is estimated in diabetic patients that of all amputations, 85% are contributed by foot ulceration which further deteriorates to chronic infection and severe forms of gangrene (Lepäntalo et al., 2011). The price of a one admission to treat acute diabetic foot infection is approximately 7717.39 US Dollar per year or 45.82 US Dollar per patient per year (Ragnarson et al., 2004). In another previous study related to the costs of lower limb amputations, the range was found to be between US$16,488 and US$66,215 (1998 currency) (Apelqvist et al., 1994). The cost was found to be very high in the amputation operation and higher in its associated nursing and recognized up keep likened with costs comprised in the operating technique. It was reported that for minor amputation in the level of foot in the lower limb, the price was US$43,800, although the chief lower limb amputations (above ankle) was US$66,215 (Apelqvist et al., 1994). The main amputation is the overwhelming complication of diabetes, and although it has been reported in recent years that the incidence of amputation in diabetics has decreased, there are still significant differences in amputation rates between countries and the population (Kennon et al., 2012; Jeffcoate, 2005).

Diabetic foot complications also have a negative effect on patient's health related quality of life based on the SF36 questionnaire. Numerous preceding studies have shown that lower socioeconomic status is associated with diabetic foot ulcers and amputations (Nather et al., 2010; Venermo et al., 2013).

Study rational

Diabetic foot ulceration and amputation is a common dangerous complication of DM. There is many previous studies admitted a non-negligible number of cases had been exposed to diabetic foot amputation operation with sequel may lead to death. The effect of diabetic foot ulceration and amputation on the socio-economic status and quality of life of the patients and their families is underestimated in Arar city, KSA.

Study objectives

To detect the social and economic impact of diabetic foot ulcer and amputation patients on their families, in Arar city, KSA.

2. PARTICIPANTS AND METHODS

Study design, period and population

This study was a cross-sectional survey study. The data was collected during a period of two months from April 1st to May 31st, 2021, from all adult DM patients and their relatives who will attend the diabetes center during the study period and consenting to complete the questionnaire.

Sampling

The sample size of this study is calculated by using the formula: n= P (1-P) * $Z\alpha^2$ / d^2, (Charan & Biswas, 2013), assuming $Z\alpha$ = 1.96, d= 0.05, P: An estimated prevalence of having a socio-economic problems as 50% since there is no specific figure for that. So, the calculated minimum sample size was 384. By adding 10% for incomplete questionnaires, the minimum final sample was 423 individual.

Inclusion criteria

Age 18-75 years
Both genders
Saudi

Exclusion criteria

Younger than 18 or more than 75 years

Non-Saudi

Data collection technique

Systematic random sampling methodwas followed. The data come from all adult participants, men and women, in the Diabetes Center in the Ararcity. We will include all the diabetic patients and their relatives, not only the patents. After identifying the first participant randomly, every 2nd attendant was interviewed to be included in the study till the required sample is covered. Data was collected through personal interviews with the sampled population and filling the questionnaire which guided us to the required data according to the study objectives.

Data collection tool

A predesigned questionnaire was used for data collection. It is composed of three main sections. Section 1 includes socio-demographic characteristics of the participants (age, gender, marital status, educational level and occupation). The second sections will ask about diabetic foot as a complication of DM, the effect of diabetic foot and its treatment cost on the social and economic status of the patient and his family. The data collectors will give a brief introduction explaining the nature of the research and confidentiality of the information that given to participants.

Data management and analysis plan

All data was entered and analyzed using SPSS 23 with using appropriate statistical methods for description and analysis. P-value less than 0.05 were considered for statistical significance.

Ethical considerations

The research proposal was approved by the Regional Research and Ethics committee of the Northern Border University. Permission from directors of the involved PHC centers was obtained with approval letter number (1936589) and researchers' number (22879).

3. RESULTS

The study was conducted among 843 participants who attended the diabetes center in Arar, KSA. More than half of the participants, 50.5% (n=426) aged less than 41 years, 189 participants (22.4%) aged 41-50 years old, 144 participants (17.1%) aged 51-60 years old, and 84 participants (10%) aged more than 60 years old. 807 participants (95.7%) were Saudi, where only 36 of the participants (4.3%) were Non-Saudi. 90 participants (10.7%) were widowed or divorced, 213 participants (25.3%) were single, and 540 participants (64.1%) were married. Regarding educational level of the participants, 69 participants (8.2%) were illiterate, 126 participants (14.9%) were primary or intermediate education, 120 participants (14.2%) were secondary, and 528 participants (62.6%) were university or more. 237 of the participants (28.1%) were males, where 606 of the participants (71.9%) were females. The household monthly income (in Riyals) of 285 participants (33.8%) was less than 5000, 282 of the participants (33.5%) gained 5000-10000, where 276 of the participants (32.7%) gained more than 10000. 738 of the participants (87.5%) lived in urban places, where 105 participants (12.5%) lived in rural areas. According to MBI, 225 participants (26.7%) have MBI below 18.5 (underweight), 387 participants (45.9%) have MBI ranged from 18.5 to 24.9 (healthy weight), 174 participants (20.6%) have MBI ranged from 25 to 29.9 (overweight), and 57 participants (6.8%) have MBI ranged from 30 to 39.9 (obese) (Table 1).

Table 1 Sociodemographic features of contributors (n=*843*), mean±SD age of menopause, years (n=*843*), and association p-values.

Parameter		No.	Percent
Age (years)	Less than 41	426	50.5
	41-50	189	22.4
	51-60	144	17.1
	More than 60	84	10.0
Nationality	Saudi	807	95.7
	Non-Saudi	36	4.3
Marital status	Widowed, Divorced	90	10.7

	Single	213	25.3
	Married	540	64.1
Educational level	Illiterate	69	8.2
	Primary Intermediate	126	14.9
	Secondary	120	14.2
	University or more	528	62.6
Gender	male	237	28.1
	female	606	71.9
Average household monthly income (in Saudi riyals)	Less Than 5000	285	33.8
	10000-5000	282	33.5
	10000 <	276	32.7
Living	In urban	738	87.5
	In a rural area	105	12.5
BMI	Underweight (below 18.5)	225	26.7
	the healthy weight range (between 18.5 and 24.9)	387	45.9
	The overweight range. (between 25 and 29.9)	174	20.6
	The obese range. (between 30 and 39.9)	57	6.8

Table 2 shows that, of the participants, 552 (65.5%) were type I diabetes, and 291 (34.5%) were type II diabetes. In regards to developing complications of diabetes, 108 of the participants (12.8%) developed retinopathy as a complication, 24 (2.8%) developed nephropathy, 36 (4.3%) developed neuropathy, 120 (14.2%) developed more than one complication, and 555 (65.8%) developed nothing. Complying with diabetic medications, 78 of the participants (9.3%) compliance was weak, 276 (32.7%) compliance was middle, and 489 (58%) compliance was Hassan. 585 of the participants (69.4%) followed up diabetes regularly in normal manner, 60 (7.1%) followed up abnormally, and 198 (23.5%) did not follow-up. Doing regular clinical foot examination, 330 of the participants (39.1%) checked it regularly, where 513 (60.9%) did not checked it regularly (Figure 1).

Table 2 Knowledge of participants of online nutritional applications and tele-dietetics (n=*843*).

Parameter		No.	Per cent
Diabetes period	less than 5 years	360	42.7
	5-10 years	225	26.7
	more than 10 years	258	30.6
Age at diagnosis	Less than 20 years old	300	35.6
	20-50 years old	429	50.9
	More than 50 years	114	13.5
Type of diabetes	type 1	552	65.5
	type 2	291	34.5
Diabetes treatment	Oral tablets	492	58.4
	Insulin injection	351	41.6
Complications of diabetes	retinopathy	108	12.8
	nephropathy	24	2.8
	neuropathy	36	4.3
	combined (more than one)	120	14.2

	nothing	555	65.8
Associated high blood pressure	Hypertension	321	38.1
	Not accompanied by high blood pressure	522	61.9
Level of compliance with diabetes medication	weak	78	9.3
	middle	276	32.7
	Hassan	489	58.0
Attending a diabetes clinic to treat diabetes	weak	177	21.0
	middle	264	31.3
	Hassan	402	47.7
Regular follow-up for diabetes	Normal	585	69.4
	abnormal	60	7.1
	No attendance	198	23.5
Doing exercise	Less than once a week	429	50.9
	At least once a week	414	49.1
Regular clinical foot examination	Check it regularly	330	39.1
	Not checked regularly	513	60.9

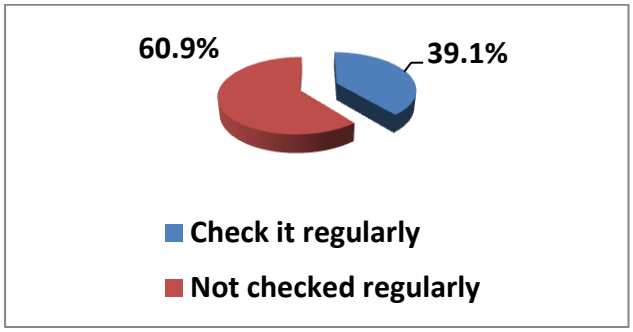

Figure 1 Regular clinical foot examination among studied diabetic patients

Table 3 illustrates that, according to attitude parameters, 252 participants (29.9%) claimed that diabetes affected their social relationships, and 321 participants (38.1%) claimed that diabetes affected their economic conditions. Of the participants, 129 (15.3%) are smokers, and 51 (6%) are drinking alcohol. Of the patients participated, 147 (17.4%) developed diabetic foot. 267 participants (31.7%) said that diabetic foot affected their social relationships, 276 (32.7%) said that diabetic foot affected their economic status, and 273 (32.4%) said that diabetic foot affected the economic status of their families. Of the participants, 117 (13.9%) had diabetic foot amputation, 306 (36.3%) claimed that foot amputation affect social relationships, 297 (35.2%) claimed that foot amputation affect economic conditions, 342 (40.6%) claimed that foot amputation affect economic conditions of the family (Figure 2), and 324 (38.4%) claimed that foot amputation affect social relationships of the family (Table 4).

Table 3 Attitude of participants of online nutritional applications and tele-dietetic (n=*843*)

Attitude parameter	Yes	No
Does diabetes affect your social relationships?	252 29.9%	591 70.1%
Does diabetes affect your economic conditions?	321 38.1%	522 61.9%
Does diabetes affect the economic conditions of the family?	327 38.8%	516 61.2%

Eating heavy sugar and fat?	303 35.9%	540 64.1%
Eating vegetables and fruits?	735 87.2%	108 12.8%
Smoking?	129 15.3%	714 84.7%
Drinking alcohol?	51 6.0%	792 94.0%
Physical activity (walking 0.5 hours / day / 5 / week)?	534 63.3%	309 36.7%
Knowing about diabetes?	645 76.5%	198 23.5%
Diabetic foot?	147 17.4%	696 82.6%
Does diabetic foot disease affect your social relationships?	267 31.7%	576 68.3%
Does diabetic foot disease affect your economic conditions?	276 32.7%	567 67.3%
Does diabetic foot disease affect the economic conditions of the family?	273 32.4%	570 67.6%
Diabetic foot amputation?	117 13.9%	726 86.1%
Does diabetic foot amputation affect your social relationships?	306 36.3%	537 63.7%
Does diabetic foot amputation affect your economic conditions?	297 35.2%	546 64.8%
Does diabetic foot amputation affect the economic conditions of the family?	342 40.6%	501 59.4%
Does diabetic foot amputation affect the social relationships of the family?	324 38.4%	519 61.6%

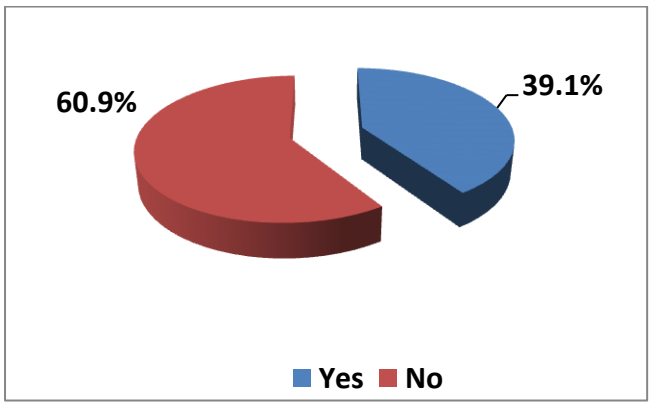

Figure 2 Does diabetic foot amputation affects the economic conditions of the family among studied diabetic patients

Table 4 Relationship between educational level and use of tele-dietetics or online nutritional counselling applications (n=843)

		Regular clinical foot examination		Total (N=1070)	P value
		Check it regularly	Not checked regularly		
Age	≤40	162	264	426	0.0001
		49.1%	51.5%	50.5%	
	41-50	60	129	189	
		18.2%	25.1%	22.4%	
	51-60	81	63	144	
		24.5%	12.3%	17.1%	
	> 60	27	57	84	
		8.2%	11.1%	10.0%	
Gender	male	93	144	237	.972
		28.2%	28.1%	28.1%	
	female	237	369	606	
		71.8%	71.9%	71.9%	
Marital status	Single	84	129	213	.004
		25.5%	25.1%	25.3%	
	Married	225	315	540	
		68.2%	61.4%	64.1%	
	Widowed , Divorced	21	69	90	
		6.4%	13.5%	10.7%	
Nationality	Saudi	312	495	807	.173
		94.5%	96.5%	95.7%	
	Non-Saudi	18	18	36	
		5.5%	3.5%	4.3%	
Living	In urban	282	456	738	.141
		85.5%	88.9%	87.5%	
	In a rural area	48	57	105	
		14.5%	11.1%	12.5%	
Educational level	Illiterate	39	30	69	.0001
		11.8%	5.8%	8.2%	
	PrimaryIntermediate	63	63	126	
		19.1%	12.3%	14.9%	
	Secondary	60	60	120	
		18.2%	11.7%	14.2%	
	University or more	168	360	528	
		50.9%	70.2%	62.6%	
Average household monthly income (in Saudi riyals)	Less Than 5000	120	165	285	.178
		36.4%	32.2%	33.8%	
	5000-10000	114	168	282	
		34.5%	32.7%	33.5%	
	> 10000	96	180	276	
		29.1%	35.1%	32.7%	

Upon questioning the participants (n=1070) about regular clinical foot examination we found, participants who checked it regularly and aged 40 years or less were 162 out of 426 patients (49.1%), participants who checked it regularly and aged 41-50 years were 60 out of 189 patients (18.2%), participants who checked it regularly and aged 51-60 years were 81 out of 144 patients (24.5%),

and participants who checked it regularly and aged more than 60 years were 27 out of 84 (8.2%) (P=0.0001). Concerning the marital status of patients who checked their foot regularly, 84 out of 213 patients (25.5%) were single, 225 out of 540 (68.2%) were married, and 21 out of 90 (6.4%) were widowed or divorced (P=0.004). Educational level statistics of the patients who checked their foot regularly were 39 out of 69 patients (11.8%) were illiterate, 63 out of 126 (19.1%) were primary or intermediate, 60 out of 120 (18.2%) were secondary, and 168 out of 528 (50.9%) were university or more (P=0.0001). There is a high correlation between age, marital status, and educational level and checking foot regularly (Table 5).

Table 5 Relationship between educational level and use of tele-dietetics or online nutritional counselling applications (n=843)

		Diabetic foot		Total (N=1070)	P value
		No	Yes		
Age	≤40	357	69	426	0.001
		51.3%	46.9%	50.5%	
	41-50	168	21	189	
		24.1%	14.3%	22.4%	
	51-60	105	39	144	
		15.1%	26.5%	17.1%	
	> 60	66	18	84	
		9.5%	12.2%	10.0%	
Gender	male	189	48	237	.178
		27.2%	32.7%	28.1%	
	female	507	99	606	
		72.8%	67.3%	71.9%	
Marital status	Single	174	39	213	.689
		25.0%	26.5%	25.3%	
	Married	450	90	540	
		64.7%	61.2%	64.1%	
	Widowed , Divorced	72	18	90	
		10.3%	12.2%	10.7%	
Nationality	Saudi	672	135	807	.010
		96.6%	91.8%	95.7%	
	Non-Saudi	24	12	36	
		3.4%	8.2%	4.3%	
Living	In urban	612	126	738	.141
		87.9%	85.7%	87.5%	
	In a rural area	84	21	105	
		12.1%	14.3%	12.5%	
Educational level	Illiterate	51	18	69	.0001
		7.3%	12.2%	8.2%	
	PrimaryIntermediate	84	42	126	
		12.1%	28.6%	14.9%	
	Secondary	99	21	120	
		14.2%	14.3%	14.2%	
	University or more	462	66	528	
		66.4%	44.9%	62.6%	
Average household	Less Than 5000	225	60	285	.002
		32.3%	40.8%	33.8%	

monthly income (in Saudi riyals)	5000-10000	225	57	282	
		32.3%	38.8%	33.5%	
	> 10000	246	30	276	
		35.3%	20.4%	32.7%	

Concerning participants who developed diabetic foot we found that, participants who developed diabetic foot, aged 40 years or less were 69 out of 426 participants (46.9%), aged 41-50 years were 21 of 189 (14.3%), aged 51-60 years were 39 of 144 (26.5%), and aged 60 or more years were 18 of 84 (12.2%) (P=0.001). Educational level results of the patients who developed diabetic foot were 18 out of 69 (12.2%) were illiterate, 42 of 126 (28.6%) were primary or intermediate, 21 of 120 (14.3%) were secondary, and 66 of 528 (44.9%) (P=0.0001). Average household monthly income (in Riyals) of the patients who developed diabetic foot was: 60 out of 285 (40.8%) gain less than 5000, 57 of 282 (38.8%) gain 5000-10000, and 30 of 276 (20.4) gain more than 10000 (P=0.002). Age, educational level, and average household monthly income are the most significant parameters that affect the developing of diabetic foot (Table 6).

Table 6 Relationship between educational level and use of tele-dietetics or online nutritional counselling applications (n=843)

		Does diabetic foot disease affect your economic conditions?		Total (N=1070)	P value
		No	Yes		
Age	≤40	291	135	426	0.867
		51.3%	48.9%	50.5%	
	41-50	126	63	189	
		22.2%	22.8%	22.4%	
	51-60	93	51	144	
		16.4%	18.5%	17.1%	
	> 60	57	27	84	
		10.1%	9.8%	10.0%	
Gender	male	156	81	237	.578
		27.5%	29.3%	28.1%	
	female	411	195	606	
		72.5%	70.7%	71.9%	
Marital status	Single	135	78	213	.013
		23.8%	28.3%	25.3%	
	Married	381	159	540	
		67.2%	57.6%	64.1%	
	Widowed , Divorced	51	39	90	
		9.0%	14.1%	10.7%	
Nationality	Saudi	549	258	807	.024
		96.8%	93.5%	95.7%	
	Non-Saudi	18	18	36	
		3.2%	6.5%	4.3%	
Living	In urban	498	240	738	.718
		87.8%	87.0%	87.5%	
	In a rural area	69	36	105	
		12.2%	13.0%	12.5%	
Educational level	Illiterate	48	21	69	.247

		8.5%	7.6%	8.2%	
	Primary Intermediate	90	36	126	
		15.9%	13.0%	14.9%	
	Secondary	87	33	120	
		15.3%	12.0%	14.2%	
	University or more	342	186	528	
		60.3%	67.4%	62.6%	
Average household monthly income (in Saudi riyals)	Less Than 5000	159	126	285	.0001
		28.0%	45.7%	33.8%	
	5000-10000	204	78	282	
		36.0%	28.3%	33.5%	
	> 10000	204	72	276	
		36.0%	26.1%	32.7%	

4. DISCUSSION

Diabetes mellitus is a common epidemic chronic metabolic disorder causing harm in health and financial load on patients and healthcare apparatus all over the world. Diabetes mellitus is a disorder that affects how our body utilizes glucose, which is the main fuel of the brain and an important source of energy that makes up the cells of muscles and tissues of the body (Kharroubi & Darwish, 2015). Chronic diabetes mellitus include type I, and type II. Diabetes mellitus can lead to excess sugar in the body which in turn led to serious health complications as diabetic foot ulcers and amputation. Diabetic foot complications are the main reason for non-traumatic lower extremity amputations. The risk of lower limbs amputation is 15 to 46 times higher in diabetics than in individuals who do not gain diabetes mellitus in their lifetime (Majid et al., 2020).

Our cross-sectional study discuss the socio-economic impact on families with diabetic foot ulcer and amputation patients, the relation between the sociodemographic of the patient and the patient's family and the clinical follow up for diabetic foot, the relation between the sociodemographic of the patient and the occurrence of diabetic foot, the relation between the sociodemographic of the patient and the effect on the economic status for the patient, and other parameters. Discussing the relation between diabetic foot and socioeconomic status we found that age, educational level, marital status, and average household monthly income were the most significant parameters that affected diabetic foot and socio-economic status related to this complication. In Finland, a study was made to measure amputations and socioeconomic position amongst persons with diabetes mellitus, and there are three main outcome results 1- the incidence of first major amputation, 2- the ratio of first minor/major amputations, and 3- the 2-year survival with preserved leg after the first minor amputation. The risk of first major amputation in the lowest socio-economic group was 2.16 times greater than the risk in the highest socio-economic group, there was a stronger relative decline in the highest compared with the lowest socio-economic group (p=0.0053), and the proportion of chief minor/major amputations was that the higher the socio-economic group, the higher was the proportion. After the first minor amputation, the 2- and 10-year amputation-free survival rates for the lowest socioeconomic group were 55.8% and 9.3%, respectively, and the highest socioeconomic group was 78.9% and 32. 3% respectively (Venermo et al., 2013).

Another study designed as a non-randomized case study using two cohorts of patients with similar proportions of gender to assess the socioeconomic profile of diabetic patients with and without foot problems, seen at the National University Hospital, the first cohort involved 122 patients with diabetes mellitus and diabetic foot diseases and the other cohort consisted of 112 patients with diabetes mellitus but not diabetic foot diseases. The results was Malay ethnicity (p<0.001), education level up to secondary school (p=0.021), low average monthly household income less than SGD $2,000 ($p$=0.030), lack of exercise (at least once weekly, p=0.04), and high HbA1C level (>7.0%; p=0.015) were found to be considerably greater in the cohort with diabetic foot problems than the cohort without (Nather et al., 2010). Regarding these results, there is a strong correlation between diabetic foot and socio-economics of diabetic foot and low income patients as the lower the socio-economic condition was associated with worse results in patients with diabetes. Also in our study this strong correlation and impact of socio-economic status are seen in results, as patients with average household monthly income who claimed that diabetic foot disease affected their economic condition were 126 out of 285 patients (45.7%) gained less than 5000, patients with monthly income from 5000 to 10000 who were 78 out of 282 patients (28.3%), and patients with monthly income greater than 10000 were 72 out of 276 patients (26.1%) (P=0.002).

A prospective study was conducted to examine the socioeconomic risk factors for diabetic foot ulcers & amputations, at King Saud Medical City, Riyadh, KSA, from January 1st to 30th June 2014. Differences between the 2 study cohorts concerning the presence of diabetic complications, high sugar, and fat diet (P=0.000). Over 40% of participants without foot ulcers informed no complications compared by 8% only of patients with ulcers. Over 88% of patients affected with ulcers informed high darling and heavy diet likened with only half of this percentage in patients without ulcers. There was also significant difference obtained in patient informationaround diabetes (P=0.003). Cases of foot ulcers, their net household monthly income (in Riyals) varied greatly, 41.3% of the participants gained 5000, 36.5% gained 5000-10000, and 22.2% gained more than 10000 (P=0.101) (Anderson et al., 2018). Opposite to the results of our cross sectional study in Arar, KSA, a study in Riyadh, KSA showed no strong correlation between socio-economic risks and amputations due to foot ulcers of diabetes. Socioeconomic conditions correlated to foot ulcers of diabetesin Saudi casesnecessities further more studies (Al-Tawfiq & Johndrow, 2009).

Diabetic foot diseases are common in the world, resulting in major economic concerns for the patients, their families, and society. Foot ulcers are avoidable, in evolvingnations that will develop the highest rise in the incidence of type II diabetes in the upcoming 20 years. An incorporated health care method with steady screening and instruction of high risk patients necessitates little costs and likely to diminish the price of health maintenance (Boulton et al., 2005). Another retrospective group study conducted in Qatar, it was reported that, total of 871 patients went through 1102 amputations. The assessed total cost for amputations (UEA & LEA) were US$3 797 930 & US$2 344 439, respectively. Direct medical costs include the total cost of all amputations, hospital days, and prosthetic costs, and are estimated at US $ 52,126,496. The cost of direct medical procedures was found to be 59,847 US dollars per patient. The total cost of the directly related treatment is estimated to be US $ 26,096,046 and the cost per patient is US $ 29,961. Overall, the cost of amputation per patient is estimated at US $ 89 to US $ 808. Research results indicate that the economic burden of amputation needs to be further developed to develop better management strategies to reduce the medical cost of amputation (Al-Thani et al., 2019).

5. CONCLUSION

This study shows the burden and high cost of amputations, and this explains why there is a direct correlation between socio-economic condition and diabetic foot and amputation.It is mandatory to give attention to anticipate diabetes complications especially diabetic foot, by compliance to treatment and access to the proven pathways for early assessment when diabetic complications increased, with a superior consideration to patients of lesser socioeconomic clusters.

Author's contribution

All the authors contributed in the selection of the idea, proposal writing, data collection, data entry and analysis, results and discussion writing and final revision of the article.

Conflicts of interest

The authors declare that they have no conflict of interest.

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Data and materials availability

All data associated with this study are present in the paper.

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