The prevalence and risk categorization of diabetic foot complications in cohort group in, Beni Suif, Egypt, 2010-2012

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Abstract: Background: Foot problems are common complications in diabetics; fortunately they can be prevented. **Aim of the study:** to detect prevalence and categorization of diabetic foot in diabetics in Beni Suif, Egypt from 2010 to 2012. **Subjects and methods:** A cross-sectional study of 1000 diabetics who underwent thorough history and examination. **Results**: Peripheral neuropathy (PN), was found in 73.7% of patients. High levels of HbA1c, creatinine, cholesterol, triglycerides, FBS, 2hPPS, BMI, SBP, albumin and insulin therapy were predictors of PN. Peripheral arterial disease (PAD) was found in 49.3% of patients. Duration of DM, HbA1c, creatinine, cholesterol, FBS, 2hPPS, BMI, BP, albumin and insulin therapy were predictors of PAD. Foot ulcers were found in 4.1%, while only one case had amputation. 19% of cases were categorized as high, 20% as moderate, and 11% as low risk while 50% had no risk. High risk cases had more advanced age, higher BMI, higher BP. Neuropathy, age > 55, insulin therapy and high HBA1c, creatinine, cholesterol and TGs were considered the most significant predictor of risk to diabetic foot ulcer. **Conclusion:** About fifth of cases had high risk for development of diabetic foot ulcers in Beni Suif hospital from 2010-2012. PN is the major cause, while PAD was found in minority.

[Nagwa Saad, Khaled Elhadedy, Nagwa Ramadan, Osama Mohmady and Mahmoud Farid **The prevalence and risk categorization of diabetic foot complications in cohort group in, Beni Suif, Egypt, 2010-2012.** *Life Sci J* 2013;10(3):933-942] (ISSN: 1097-8135).http://www.lifesciencesite.com. 137

Key Words: Diabetic foot, type II diabetes.

1. Introduction:

The incidence of diabetes mellitus is increasing at epidemic proportion worldwide **(1).** By 2030, it will grow to 366 million because of longer life expectancy and changing habits of diet **(2)**. Egypt will have at least 8.6 million adults with diabetes and will be the tenth largest population of diabetics in the world **(3).**

The eleventh most important cause of premature mortality in Egypt is diabetes mellitus. It's responsible for 2.4% of all years of life lost. Also, diabetes is the six most important cause of disability burden in Egypt **(4).** It is associated with impaired quality of life **(5).** Diabetes is responsible for blindness, end stage renal disease, and non traumatic amputation in the United States **(6).**
Availability of data on the epidemiology of diabetes in Egypt is little with the highest prevalence among older persons **(7).**

The diabetic foot represent a spectrum of disorders ranging from neuropathy (somatic and autonomic), vascular insufficiency and infection which cause gangrene and amputation **(8),** but the most important predisposing factor is neuropathy which produce loss of sensation and deformity. This neuropathy with impaired proprioception causes joint destruction in the feet leading to Charcot's arthropathy which can lead to severe foot ulceration **(9).**

Developing of foot ulcer in diabetic patients may be as high as 25% with an annual incidence of about 3%; however, in some studies this figure may be as high as 10% **(10).** Healing of some diabetic feet may occur without complication, but others undergo amputation due to progressive wounds **(11).** Diabetes related lower limb amputation is associated with considerable morbidity and mortality and it is usually preceded by foot ulceration **(12).**

The aim of the present study is to detect prevalence of diabetic foot complications in Beni Suif, Egyptian adult with type II diabetes mellitus and categorization of patients according to risk for developing diabetic foot ulcer into low, moderate and high risk.

2. Subjects and methods

The current study is a cross-sectional study, carried out in Beni Sueif University Hospital, faculty of medicine, Beni Sueif University, over a 24 month period (October 2010- October 2012).

Analysis was confined to 1000 Egyptian Adult (500 males and 500 females) aged 20-80 years, with type II diabetes mellitus according to **ADA, 2011 (13)**, both hospitalized as well as outpatients. Informed consent was taken from each patient and study protocol confirms to the ethical guidelines of the Declaration of Helsinki and was approved by the Beni Sueif University Hospital research ethics committee (REC). Patients with traumatic foot complication were excluded from study.

All patients were subjected to detailed medical history. Body mass index (BMI) was

calculated as body weight in kilogram divided by height squared (Kg/m²). Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were recorded.

Foot examination was done by inspection of the feet for ulcer, area of abnormal erythema, inter-digital laceration, presence of callus (particularly with hemorrhage), nail dystrophy, onychomycosis, onychocryptosis, onychauxis and paronychia. Presence of Foot deformities (hallux rigidus, hallux valgus, limited joint mobility, Charcot and claw toes) and detection of foot type (normal, high arch and flat foot).

Palpation of peripheral arterial pulsation was done e.g. (dorsalis pedis and posterior tibial).

Patients were examined for the presence of diabetic peripheral neuropathy (DPN); we use modified Neuropathy disability score criteria (NDS) for diagnosis of diabetic neuropathy. The maximum deficit score is 10, which would indicate complete sensory loss to all sensory modalities and absent reflexes. NDS of ≥ 6 was used for diagnosis of diabetic PN (14).

Table A: Neuropathy disability score (14).

Neuropathy disability score			
		Right side	Left side
Vibration perception threshold	Normal=0 Abnormal=1		
Temperature perception on dorsum of foot			
Pin- prick			
Achilles reflex	Present=0 Present with reinforcement=1 Absent=2		
	NDS total out of 10		

The following tests were done:

- 10-g monofilaments test to asses neuropathy **(15).**
- Assessment of vibration sense by using 128-HZ tuning fork, **(16).**
- Temperature perception on dorsum of foot, using tuning fork with beaker of ice/warm water **(14).**
- Ankle Brachial Index (ABI) is measured by imminent professor in vascular lab, blood pressure at the ankle (dorsalis pedis or posterior tibial arteries is measured using a standard Doppler Ultrasonic probe, the ABI is obtained by dividing the ankle systolic pressure by the higher of the two brachial systolic pressure **(17).** An ABI > 0.9 is considered normal, <0.8 is associated with claudication and <0.4 is commonly associated with ischemic rest pain and tissue necrosis **(18).**

Investigations included FBS, 2hPPS, HbA1c, complete blood count (CBC) with erythrocyte sedimentation rate (ESR), serum albumin, lipid profile [total cholesterol, LDL cholesterol, HDL cholesterol and triglycerides (TGs)], blood urea, serum creatinine, urine analysis, fundus examination, and electrocardiogram (ECG).

Then diabetic patients participate in the study underwent foot risk assessment according to foot risk score **(19):**

Table B: Risk assessment of diabetic foot (19):

Low risk	Moderate risk	High risk
Able to detect at least one pulse per foot And Able to feel 10-g monofilament And No foot deformity, physical or visual impairment. No previous ulcer	Unable to detect both pulses in a foot Or Unable to feel 10g-monofilament Or Foot deformity Or Unable to see or reach foot (No history of previous ulcer)	Previous ulceration or amputation Or Absent pulse and unable to feel 10g-monofilament Or One of above with callus or deformity

Statistical methodology

The collected data was organized, tabulated and statistically analyzed using SPSS software version for quantitative data, the range, mean and standard deviation were calculated. For qualitative data comparison between two groups was done using chi -square test (χ^2). For comparison between mean of two groups student t-test was used. For comparison between more than two means the F value of analysis of variance and schafee test was calculated. Multivariate analysis (logistic regression analysis) was used to find out the most significant independent predictors for outcome by using backward likelihood ratio technique. Correlation between various variables was done using Pearson moment correlation equation for linear relation and Spearman rank correlation equation for non-linear relation.

3. Results:

Table (1) Distribution of the studied cases as regard general data and history suggestive of complications:

Variables	No	%
Gender		
Female	500	50%
Male	500	50%
	Mean±SD	**Range**
Age	57±6	(38-77)
Weight	81.7±7	63-110
Height	167±6.7	150-181
BMI	28.9±2.4	21-40.4
SBP	134±17	100-180
DBP	82±12	55-115
Nephropathy	252	25.2%
Retinopathy	344	34.4%
PAD	16	1.6%
CVS	330	33%
Abdominal	81	8.1%
Neurological	312	31.2%
Dermatological	2	0.2%
Muscloskeletal	0	0
Pulmonary symptoms	58	5.8%

Table (2) Distribution of the studied cases as regard foot ulcer

Variables	No	%
History of ulcer	41	4.1%
Amputations	1	0.1%
Fractures	0	0
Vascular Surgical intervention	14	1.4%

Table (3) Distribution of the studied cases as regard laboratory data

Variables	Mean±SD	Range
HbA1c	9.2±1.1	7.6-13.7
Creatinine	1.19±0.5	0.8-12.6
Cholesterol	227±36	121-608
TGs	199±34	59-365
Albumin	3.9±0.5	2.4-4.8
FBS	193±28	136-752
2hPPS	263±48	182-396

Table (4) Distribution of the studied cases as regard vascular and skin assessment

Variables	Right		Left	
	Number	Percentage	Number	Percentage
Dorsalis pedis artery pulsation				
• Absent	17	1.7	17	1.7
• Weak	257	25.7	310	30.1
• Palpable	726	72.6	673	67.3
Posterior tibial artery pulsation				
• Absent	0	0	0	0
• Weak	59	5.9	88	8.8
• Palpable	941	94.1	912	92.1
Skin temperature				
• Cold	2	0.2	2	0.2
• Warm	35	3.5	55	5.5
• Normal	963	96.3	943	94.3
	No		**%**	
Skin color				
• Normal	963		96.3%	
• mottled	33		3.3%	
• cyanosed	2		0.2%	
• rubber	2		0.2%	
Skin texture				
• Normal	754		75.4%	
• Atrophic	5		0.5%	
• Dry and Xerotic	106		10.6%	
• Loss of turgor	33		3.3%	
• Loss of elasticity	102		10.2%	
Hair growth				
• Normal	572		57.2%	
• Diminished	312		31.2%	
• Absent	116		11.6%	
Condition				
• Well hydrated	641		64.1%	
• Interdigital Maceration	18		1.8%	
• Dry	58		5.8%	
• Peeling	47		4.7%	
• Tinea pedis	236		23.6%	
	Mean±SD		**Range**	
Left ankle BP	126±11		75-185	
Right ankle BP	125.9±13		85-190	
Left ankle brachial index	0.94±0.08		0.7-1.7	
Right ankle brachial index	0.95 ± 0.07		0.7-1.4	

Table (5) Comparison between cases with and without neuropathy as regard various risk factors.

	Negative neuropathy N=263		Positive Neuropathy N=737		t	*P* value
Sex	**Number (%)**		**Number (%)**		Fisher	0.52
Female	127(48.3%)		373(50.6%)			
Male	163(51.7%)		364(49.4%)			
	Mean	**SD**	**Mean**	**SD**		
Age	60.82	5.32	55.74	5.87	12.36	0.28
Duration of DM	10.60	2.54	5.16	2.51	30.09	0.99
HbA1c	10.38	1.199	8.85	0.72	24.49	<0.001*
Creatinine	1.47	0.51	1.10	0.52	10.05	<0.001*
Cholesterol	250.29	29.93	219.21	35.22	12.76	0.03**
TGs	214.48	32.27	194.08	33.97	8.44	0.03**
FBS	208.24	26.81	187.61	26.64	10.76	<0.001*
2hPPS	308.75	41.11	247.88	40.24	20.94	0.006*
Height	168.58	4.11	167.45	5.00	3.28	<0.001*
Weight	84.56	8.01	80.66	6.80	7.61	0.001*
BMI	29.76	2.82	28.68	2.19	6.36	0.001*
SBP	149.90	15.24	128.59	14.01	20.69	0.005*
DBP	92.79	10.53	78.23	10.18	19.74	0.65
Albumin	3.63	0.44	4.01	0.43	-12.28	<0.001*

* Highly significant ** Significant

Table (6) Comparison between cases with and without neuropathy as regard examination results.

	Negative neuropathy		Positive Neuropathy		*P* value
	Number	**Percentage**	**Number**	**Percentage**	
No insulin dependence	66	25.1	615	83.4	<0.001*
Insulin dependence	197	74.9	122	16.6	
Negative head&neck examination	216	82.1	649	88.1	0.02**
Positive head&neck examination	47	17.9	88	11.9	
Negative chest examination	210	79.8	682	92.5	<0.001*
Positive chest examination	53	20.2	55	7.5	
Negative cardiac examination	211	80.2	685	89.6	<0.001*
Positive cardiac examination	52	19.8	104	10.4	
Negative abdomen examination	263	100	656	89	<0.001*
Positive abdomen examination	0	0.0	81	11	
Negative neurological examination	8	3	642	87.1	<0.001*
Positive neurological examination	255	97	95	12.9	
Negative joint examination	249	94.7	737	100	<0.001*
Positive joint examination	14	5.3	0	0.0	

Table (7) Comparison between cases with and without PAD as regard various risk factors.

	Negative PAD N=507		Positive PAD N=493		t	*P* value
Sex	**Number (%)**		**Number (%)**		Fisher	0.57
Female	249 (49.1%)		251 (50.9%)			
Male	258 (50.9%)		242 (49.1%)			
	Mean	**SD**	**Mean**	**SD**		
Age	56.18	5.49	57.99	6.64	-4.70	<0.001*
Duration of DM	5.08	2.08	8.14	3.92	-15.50	<0.001*
HbA1c	8.84	0.66	9.67	1.30	-12.72	<0.001*
Creatinine	1.06	0.16	1.34	0.73	-8.35	<0.001*
Cholesterol	221.09	36.71	233.85	35.27	-5.60	<0.001*
TGs	197.71	28.53	201.23	40.22	-1.60	0.11
FBS	186.34	15.84	199.93	35.51	-7.85	<0.001*
2hPPS	246.84	39.40	281.42	50.78	-12.05	<0.001*
Height	167.43	4.78	168.09	4.82	-2.17	0.03**
Weight	80.30	6.46	83.10	7.90	-6.14	<0.001*
BMI	28.53	2.10	29.40	2.64	-5.80	<0.001*
SBP	127.44	12.45	141.15	18.48	-13.80	<0.001*
DBP	77.22	9.25	87.04	12.68	-14.02	<0.001*
Albumin	4.02	0.41	3.79	0.49	-8.37	<0.001*

* Highly significant
** Significant

Table (8) Comparison between cases with and without PAD as regard examination results.

	Negative PAD		Positive PAD		*P* value
	Number	%	Number	%	
No insulin dependence	419	82.6	262	53.1	<0.001*
Insulin dependence	88	17.4	231	46.9	
Negative head&neck examination	445	87.8	420	85.2	0.03**
Positive head&neck examination	62	12.2	73	14.8	
Negative chest examination	479	94.5	413	83.8	<0.001*
Positive chest examination	28	5.5	80	16.2	
Negative cardiac examination	461	90.9	435	88.2	0.16
Positive cardiac examination	46	9.1	58	11.8	
Negative abdomen examination	449	88.6	470	95.3	<0.001*
Positive abdomen examination	58	11.4	23	4.7	
Negative neurological examination	449	88.6	20	40.8	<0.001*
Positive neurological examination	58	11.4	292	59.2	
Negative joint examination	507	100	479	97.2	<0.001*
Positive joint examination	0	0	14	2.8	
Negative neuropathy	29	5.7	234	47.5	<0.001*
Positive neuropathy	478	94.3	259	52.5	

Table (9) Comparison between cases with no risk versus risky for diabetic foot ulcer as regard general data.

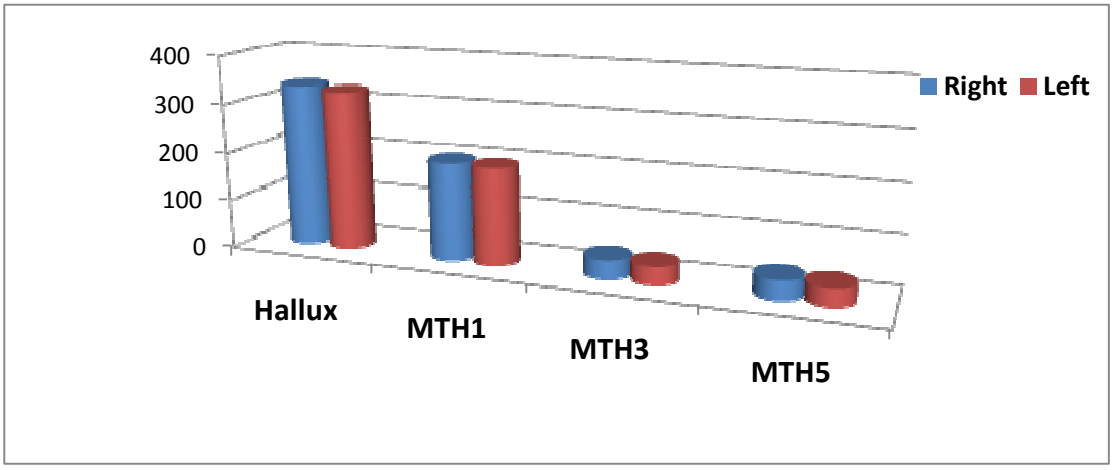
Variables	Risk		T	*P*
	No	Yes		
Gender			Fisher	
Female	300(60%)	280(56%)		>0.05
Male	200(40%)	220(44%)		
Age	55±5	59±6	**12**	**<0.001***
Weight	79±6	84±7	**10**	**<0.001***
Height	167±5	168±5	1.9	>0.05
BMI	28±4	29±6	**2.5**	**<0.05****
SBP	126±11	144±18	**18**	**<0.001***
DBP	77±8.9	88.9±12	**17**	**<0.001***
HbA1c	8.7±3	9.9+3	**21**	**<0.001***
Creatinine	1.08±0.2	1.35±0.4	**7**	**<0.001***
Cholesterol	215±33	243.6±30	**12**	**<0.001***
TGs	194.5±34	206±34	**5**	**<0.001***
Albumin	4.1±0.3	3.5±0.5	**18**	**<0.001***
FBS	185±28	203.6±24	**10.6**	**<0.001***
2hPPS	242+38	294±45	**19**	**<0.001***

Table (10) Comparison between cases with no risk versus risky for diabetic foot as regard abnormal physical signs

Variables	Risk		*P*
	No	Yes	
Head and neck	48(8.3%)	87(20.7%)	**<0.001***
Chest	13(2.2%)	95(22.6%)	**<0.001***
Cardiac	12(2.1%)	92(21.9%)	**<0.001***
Abdominal	47(8.1%)	34(8.1%)	**>**0.05
Neurological	1(0.2%)	349(83.1%)	**<0.001***
Joint	0	14(3.3%)	**<0.001***

Table (11) Relation between risk of diabetic foot versus different predictors by logistic regression

Variables	Beta-coefficient	*P*	Odd's(95%CI)
Neuropathy	0.98	<0.001*	3(1-10.9)
Age >55yrs	0.49	<0.05 **	2.5(0.8-9.2)
Insulin dependence	0.33	<0.05**	1.6(0.2-6)
HbA1c>8	0.26	<0.05**	1.4(0.3-5.5)



MTH: Metatarsal head

Figure (1) Distribution of the studied cases as regard positive monofilament tests in right and left foot.

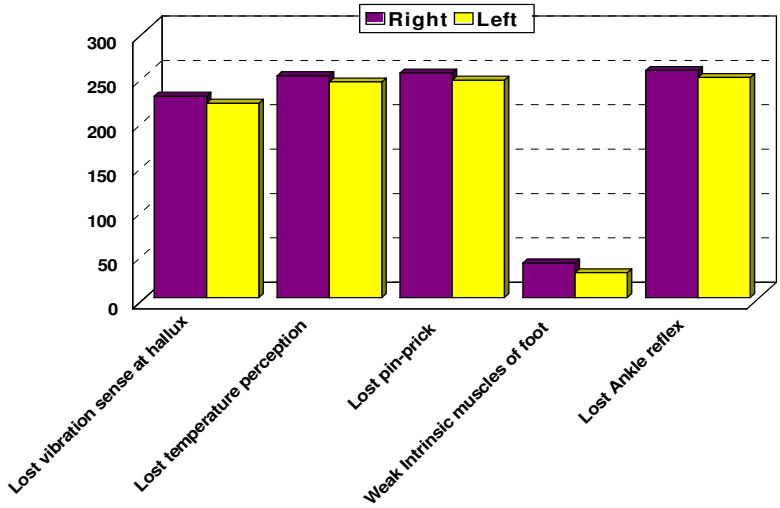


Figure (2) Distribution of the studied cases as regard vibration sense, temperature perception, pin-prick, intrinsic muscles and ankle reflexes.

4.Discussion:

The aim of this study is to detect prevalence and categorization of diabetic foot complications on one thousands of Egyptian with type II diabetes mellitus in Beni Sueif Hospital, faculty of medicine from 2010 to 2012.

In present study we found 73.7% of studied cases with underlying PN and 49.3% had PAD. Study done by **Leese (20)** he found that underlying neuropathy is presented in about 60% of diabetic foot ulcers and underlying peripheral arterial disease, often in tibial and peroneal arteries in 50% of foot ulcers as contributing factor, so that prevention in high risk patients is vital.

Diabetic neuropathy is one of the most common complications of diabetes mellitus, and its morbidity and mortality is a large part of the cost of diabetes care **(21),** affects approximately half of diabetic patients **(22)** which is lower than percentage finding in current study.

High levels of (HbA1c, serum creatinine, cholesterol, TGs, FBS, 2hPPS), height, weight, BMI, SBP and serum albumin was significant risk factors for development of PN with statistically significant difference but there was non-significant difference as regarding sex, age, duration of DM and DBP.

Also there was highly significant difference between cases with neuropathy, insulin dependence and positive examination finding in the chest, cardiac, abdominal, neurological and joint.

Study done by **Kiani *et al.* (21)** concluded that age, weight, duration of diabetes and diastolic blood pressures were associated with DPN. Study done by **Bruce and KueYoung (23)** reported that patients with neuropathy were older than those without neuropathy. However in multiple logistic modeling proper control of blood sugar was a strong predictor of neuropathy than age **(24).** Population with neuropathy were more likely to have other foot problems in comparison with those without neuropathy, presence of foot problems increase risk for foot ulceration due to increased pressure load and shearing forces **(24).**

Study done by **Shawky and El Din (7)** stated that there is high prevalence of risk factors of complication of diabetes in diagnosed diabetic patients in Egypt with poor level of control of hypertension, over weight and obesity.

On other hand, **ADA (6)** stated that there was no association between neuropathy and height or BMI.

The prevalence of neuropathy increased significantly by increased glucose level **(23).** This finding is consistent with population-based studies of **Greeg *et al.* (25).**

Also PAD is a risk factor for lower limb amputation in patients with DM, however even for asymptomatic patients it is considered as marker for systemic vascular disease involving coronary, cerebral and renal vessels causing an increased risk of events as myocardial infarction, stroke and death **(26).**

There was statistically highly significant difference as regarding duration of DM, HbA1c, serum creatinine, cholesterol, FBS, 2hPPS, weight, BMI, SBP, DBP and serum albumin and considered as significant predictors of PAD and non-significant difference as regarding sex, triglycerides.

Also there was highly significant difference between cases with PAD, insulin dependence and positive examination finding in the chest, abdominal, neurological, joint and neuropathy.

Current study agreed with **Agarwal and his colleagues (27).** They found high incidence of PAD with poor glycemic control. Also **Adler and his team, (28)** showed glycemic control is a predictor of PAD. Good glycemic control has showed to improve micro-vascular disease **(17).** An elevated HbA1c is associated with elevated risk of PAD **(29).**

However our study disagrees with **Agarwal and his team, (27)** as they reported no correlation between obesity and PAD, and this can be explained as our patients with PAD overweight and few were class 1 obesity. Also other studies **(30 & 31)** didn't found such correlation.

Agarwal *et al.* (27) found no significant difference between serum total cholesterol, LDL, HDL, or triglycerides levels between PAD group and non-PAD subgroups. While other studies **(32 & 29)** found serum total cholesterol, LDL and HDL levels are a predictor for PAD.

Moreover, hypertension not known to be a factor in decreasing risk of amputation due to PAD but decreasing hypertension reduces myocardial infarction and stroke in patients with diabetes **(33).** In study done by **Agarwal *et al.* (27)** found that in the Fremantle diabetes study, age, duration of diabetes, higher SBP and higher BMI were found to be significant predictor of PAD

In our study we demonstrated that 19% of the studied cases were categorized as high risk for diabetic foot. High risk cases had more advanced age, higher BMI and higher blood pressure with significant difference in comparison with no risk cases.

Presence of hypertension in diabetic is very common and it's linked to cardiovascular diseases (CVD), stroke **(34)**, progression of renal disease **(35)** and diabetic retinopathy **(36).** Proper control of hypertension is beneficial in diabetic patients, with the United Kingdom Prospective Diabetes Study conclude that each 10 mmHg reduction in SBP was associated with average reductions in rate of diabetes related mortality (15%), myocardial infarction (11%), and retinopathy or nephropathy (13% each) **(37).**

There were statistically highly significant difference between positive risk and positive examination findings in the head and neck, chest, cardiac, neurological and joints and statistically non significant difference between positive risk and positive examination findings in the abdomen

We found that statistically significant positive correlation between positive risk and higher HbA1c, creatinine, cholesterol, TGs, and blood glucose and lower level of albumin compared to no risk cases with highly significant difference. This was in agreement what was published in 2013 by **Lee *et al.* (11)** they found that serum creatinine was considered a risk factor for amputation. Among them, the serum creatinine level was found the most important predictive risk factor, as serum creatinine represents the kidney function, so that thorough care is required for feet of diabetic persons with impaired kidney function.

Cases with positive risk had higher frequency of insulin use and longer duration of DM compared to no risk cases with significant difference.

On the contrary **Aguiar *et al.* (38)** in their study found that percentage of foot ulcers decrease with increased age while increased with longer duration of diabetes, obese and insulin users. We found that neuropathy, age above 55, insulin dependence, poor DM control and HBA1c > 8 were considered the most significant independent predictor of risk to diabetic foot.

Boyko *et al.* (39) showed that greater body mass, and both sensory and autonomic neuropathy independently influence risk to foot ulceration, there by providing support for a multifactorial etiology for foot ulceration in diabetic patients and this in agreement with our results.

Also was in agreement with **Moura *et al.* (40)** reported in their research that was published in 2012 that the predictors for diabetic foot were the presence of neuropathy. The combination of neuropathy and peripheral vascular disease adds significantly to the risk of amputation in patients with diabetic foot syndrome.

These results were agreed by **McWilliams *et al.* (41)** they showed that the majority of diabetic patients in Egypt, and especially females who are not covered by health insurance, so that studies in Egypt and other areas not covered by health insurance is associated with poor control and higher risk for complications in diabetic population**.**

Although **Akther *et al.* (42)** stated in their study that patients from rural area of India shows a high incidence of foot ulcers in diabetic patients with poor glycemic control, poor patients education with few knowledge of the importance of self inspection of feet and living in an area with no structured foot screening for diabetic persons**.**

These results were agreed by **Akbar & Belal (43)** who found that the incidence of diabetic foot lesion strongly correlates with poor glycemic control which is in itself best manifested by glycoslated haemoglobin levels**.**

Conclusion:

Prevalence of diabetic peripheral neuropathy in our study was found in 73.7%, PAD in 49.3% and diabetic foot ulcers in 4.1% with type 2 diabetic patients. 19% were categorized as high risk cases, 20% as moderate risk, 11% as low risk and 50% has no risk for development of foot ulcer. About fifth of cases had high risk for development of diabetic foot ulcer, which need special care and education to reduce morbidity and mortality of this clinical problem. A significant increase in the risk for diabetic foot ulcers was found in patient with advanced age, higher BMI and blood pressure. High risk group had positive examination findings in the head and neck, chest, cardiac, neurological and joints. Cases with positive risk had higher frequency of insulin use and longer duration compared to no risk cases with significant difference.

Neuropathy, age above 55, insulin dependence, poor glycemic control and high HBA1c, creatinine, cholesterol and TGs were considered the most significant independent predictor of risk to diabetic foot ulcer.

Recommendations:

- Further studies are needed to elucidate the prevalence of diabetic foot disorders in other governorates.
- Promote patient education and self-inspection of feet to reduce the frequency and morbidity of diabetes related foot disorders.
- Emphasize the importance of regular comprehensive foot examination in the clinic.
- Proper glycemic control & control of other risk factors in diabetic patients (blood pressure, body weight and dyslipidemia) in diabetic patients to prevent occurrence of complications.

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