Assessment of Peripheral Vascular Disease Degree among Diabetic Patient Who Attend in Out-Patient Clinics

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Abstract

Background: Diabetes mellitus has increased the risk of peripheral vascular diseases by causing endothelial and smooth muscle cell dysfunction in peripheral arteries. The ankle-brachial index (ABI) is a simple, noninvasive and widely used test that detects peripheral arterial disease (PAD).**Aim:** the study aims to assess peripheral vascular disease degree for diabetic patients. **Design**: Descriptive research design. **Sample:** Purposeful samples with number of 50 diabetic patients were selected. **Setting**: the present study was conducted at the diabetic out-patient clinic at Minia university hospital. **Tools**: Data were collected using two tools; the first tool included questions related to demographic characteristics, medical and life style data. The second tool is ankle brachial index. **Results:** The main finding of the study were two thirds were females with mean average age were 50.9 ± 10.5 years and two thirds of the studied sample have mild obstruction while the other third were had a moderate obstruction of peripheral vascular disease. There statistical significance relation between the duration of type 2 diabetes and accompanied medical illness among studied sample regarding their ankle brachial index levels ($p \leq .03$&.02) respectively. **Conclusion:** Around two thirds of the studied sample had mild level of peripheral arterial obstruction and there was significant difference between the duration of type 2 diabetes and accompanied medical illness regarding their ankle brachial index. **Recommendation*:*** Planning a program that helps diabetic patients about of peripheral vascular disease management.

Key words: Diabetes mellitus, Peripheral Vascular disease.

Introduction:

Diabetes mellitus is one of the leading non-communicable diseases of the 21st century. Diabetes imposes a heavy toll on the vascular system, with both macro-vascular and micro-vascular complications. Peripheral arterial disease is one of the macro-vascular complications of Type 2 diabetes mellitus; its prevalence is higher among diabetics and has a predilection for lower limbs. It has been hypothesized that the metabolic abnormality in the pre-diabetic phase predisposes to a more distal and aggressive atherosclerosis. Once diabetes has developed, this process is accelerated due to chronic hyper glycaemia, endothelial damage, non-enzymatic glycosylation and poly-neuropathy which in turn could lead to impaired vascular remodeling and collateral formation ***(Jakovljevic & Milovanovic, 2015)***. Peripheral arterial disease (PAD) also referred to as peripheral vascular disease (PVD), is a condition characterized by a gradual reduction in blood flow to one or more limbs secondary to atherosclerosis. ***(Edwards et al., 2017)***.

Peripheral neuropathy, peripheral vascular disease and infection are three major factors for diabetic foot ulcer that can lead to gangrene and amputation. However, peripheral neuropathy is solely responsible for more than 80% of foot ulcers in diabetic patients. This not only is important for neurological examination as the first criterion for screening patients at risk for foot ulcers, but also is indirectly emphasized on nurse's role in performing a diabetic foot examination ***(Kumarasinghe et al., 2018)***.

The use of ankle-brachial-pressure index (ABI) in the clinic and bedside provide a measure of blood flow to the ankle. This could help early detection, initiate early therapy and may thus reduce the risk of critical limb ischemia and limb loss ***(Edwards et al., 2017)***. The ankle-brachial index is a simple and inexpensive test that can identify patients with PAD by determining the ratio of systolic blood pressure at the ankle arteries relative to that at the brachial arteries blood pressure at the ankle arteries relative to that at the brachial arteries **(Qu, B et al., 2015)**. **& Kim E S, 2012)**.

It has been observed that nurses have an effective role in prevention of foot ulcers and lower limb amputation by educational interventions, screening high-risk people and providing health care **(Bethel, 2015).** However, the nurse educators can evaluate patient requirements and design a particular educational program for each of patients and their families. Nurses can facilitate active participation of patients and family members in care and they can also teach patients about the importance of regular visits to the clinic, blood tests at specified intervals and the primary principle of diabetes care and prevention of its complication **(Ammendola et al., 2017).**

Significant of study:

Diabetes mellitus is the one of the important health issue in today's world which may affect the entire life pattern of an individual. It is a global chronic public health problem and is now growing as an epidemic in both developed and developing countries. In individuals with diabetes, peripheral arterial disease (PAD) typically presents at an earlier age and is associated with a more rapid progression than in non-diabetic **(Park et al., 2013)**

In 2013, 382 million adults were diagnosed with diabetes mellitus worldwide; this number is expected to grow to 592 million in 2035. People with diabetes are at increased risk of macro vascular and micro vascular complications, as well as early mortality. In Egypt, diabetes mellitus is a fast growing public health problem with a significant impact on morbidity, mortality, and health care resources. Currently, the prevalence of type II diabetes (T2D) is around 15.6% of diabetic Egyptian adults aged twenty (20) to seventy nine (79) years of age **(International Diabetes Federation, 2013 & Hegazi et al 2015).**

Peripheral arterial disease (PAD) is one of the macro-vascular complications of type 2 diabetes mellitus. It has received little detection especially among the community setting. Hence, the present studies assess the degree of peripheral vascular disease among type II diabetic patients.

Aim of the Study

To assess peripheral vascular disease degree for diabetic patients.

Research question:

- Is there a different degree of peripheral vascular disease among type II diabetic patients?
- Is there relation between socio demographic data, medical data and degree of peripheral arterial disease?

Research Design:

Descriptive research design was utilized in the current study.

Setting:

The study was conducted at the diabetic out-patient clinic, Minia university hospital. The hospital located on the western bank of the Nile River and in the face the upper bridge on the Nile south of Minia City.

Sample size:

Purposeful sample technique was utilized in this study. Selected number of patients with type II Diabetes Mellitus who attend the outpatient clinics and whose who met the inclusion criteria. The total numbers of patients attending the diabetes clinic during the year are five hundred (500) patients and the sample was calculated using the following equation:-

The determination of the sample size based upon the following sample calculation formula:

$$N = \frac{t^2 \times p(1-p)}{m2} = \frac{(1.96)^2 \times 0.034(1-0.034)}{(0.05)^2} = 50 \text{ patient}$$

Description:

- N = required sample size.
- t = confidence level at 95 % (standard value of 1.960).
- p = estimated prevalence of type 2 diabetes mellitus at Minia University Hospital 2016 (0.07).
- m = margin of error at 5 % (standard value of 0.05).

Inclusion Criteria:

- Patients who are medically diagnosed as Type II Diabetes Mellitus and with regular treatment.
- Ankle Brachial Index (ABI) score is less than 0.90 – 0.40
- Diabetic patients for more than 4 years.

Exclusion criteria:

- Patients who have sever foot ulcer or amputated.

Tools of data Collection:

The current study data was collected by two tools. Study tool was revised by five experts in the field of nursing at the faculty of nursing; Assuit and Minia University, to test its content validity and feasibility, the necessary modifications were done.

This includes two tools:-

Tool 1: Structured interviewed data:

It was collected by the researcher at the first interview and covers two main parts:

Part (I): socio demographics characteristics assessment:

This part included six (6) items as five (5) items including socio demographic data such as age, sex, occupation, level of education, residence.

Part (II): medical status assessment:

This part included six (6) items as duration of diabetes mellitus, health problem, body mass index, accompanied medical illness with diabetes II, diabetes treatment, family history of peripheral arterial disease and receive medical treatment for PAD.

Tool 2: Ankle-brachial index (ABI):

It was originally adopted by (**Winsor T. 1950**):- this test is a simple, noninvasive tool which standard for the diagnosis and screen of lower-extremity peripheral artery disease (PAD). ABI test was done individually for every studied subject by using:

- Standard manual sphygmomanometer with appropriately sized cuff(s) for arm and ankle, standard Handheld Doppler device with vascular probe 8.0M HZ, Conductivity gel.
- Ankle brachial index was measured by placing BP cuff tied on upper arm, palpate the brachial pulse, then place the doppler after applying gel and inflate at about 20 -30 mmHg where pulse is not audible and then deflate and mark the first heard pulse as the systolic blood pressure and repeat for the other arm . then repeat the same steps on the legs by placing BP cuff tied on 2.5 cm above the malleolus, palpate the dorsalispedis or posterior tibial pulse, then place the Doppler after applying gel and inflate at about 20 -30 mmHg where pulse is not audible and then deflate and mark the first heard pulse as the systolic blood pressure and repeat for the other extremity.
- ABI test is calculated by dividing the higher of the dorsalispedis systolic pressures for each ankle by the higher of the two upper extremity brachial systolic pressures to obtain the ankle brachial index for each of the lower extremities. Ankle brachial Index = Highest ankle pressure / Highest brachial arm pressure

Score Interpretation:

Above 0.90 – Normal
0.71 – 0.90 – Mild Obstruction
0.41 – 0.70 – Moderate Obstruction
0.0 – 0.40 – sever obstruction

Content validity and Reliability: The tools and scales content validity was done to identify the degree to which the used tools measure what was supposed to be measured. Developed tool and ABI test were examined by a panel of five

experts' opinion in the field of community health nursing specialties

Procedure

- An official permission taken from the dean of the faculty for conducting the study. An official letter from the faculty of nursing was delivered to the director (s) of the intended study setting (director of Minia University Hospital and director of outpatient clinics).
- **The study duration** lasted for 3 months; the study started at the beginning of November 2018, and was completed by the end of January2019.
- Selected sample who attend the diabetic outpatient clinic was chosen and informed by the researcher individually about purpose and nature of the study, then researcher obtained oral consent and telephone number from those who accepted to participate in this study.
- Prepare equipment were needed to assess peripheral vascular disease (PVD) and measure ankle brachial index (ABI) for the studied sample through two days per week according to diabetic outpatient scheduling which start regularly then the selected study sample were ranged from 3-5 diabetic clients in each visit.
- The researcher has started a collection of data from the study sample by using the study tool which consisted of two tools (tool 1) socio-demographic characteristics and medical data (tool 2) ABI test in the first meeting. This step lasted for 20-30 minutes for each participants based on number of selected studied sample in every diabetic outpatient clinic schedule.

Pilot study

To assess the clarity, reliability and applicability of the study sample tools which were used in the study for data collection; a pilot study was conducted on 10% (n= 5 diabetic) of the sample. Based on results of the pilot study there is not modification was done. Those cases of the pilot study were included in the study sample.

Statistical Analysis

Data were summarized, tabulated, and presented using descriptive statistics in the form of frequency distribution, percentages, means and the standard deviations as a measure of dispersion. A statistical package for the social science (SPSS), version (25) was used for statistical analysis of the data, as it contains the test of significance given in standard statistical books. Numerical data were expressed as mean and SD. Qualitative data were expressed as frequency and percentage. Probability (P-value) is the degree of significance, less than 0.05 was considered significant. The smaller the P-value obtained, the more significant is the result (*), less than 0.001 was considered highly significant (**).

Ethical consideration

Informed oral consent was obtained from each diabetic patient to be included in the study. It was included full explanation of the tool, rights for privacy, confidentiality and rights to withdraw at any time.

Results

Table (1): Distribution of the studied sample according their Socio demographic characteristics (n= 50).

Socio demographic data	No.	%
Age/ year		
20-	1	2.0
30-	5	10.0
40-	16	32.0
50-	20	40.0
60-	5	10.0
70-	3	6.0
Mean ± SD	50.9 ± 10.5 years	
Sex		
Male	20	40.0
Female	30	60.0
Educational level		
Illiterate	26	52.0
Read and write	10	20.0
Secondary	11	22.0
University	3	6.0
Occupation		
Not working	38	76.0
Working	12	14.0
Residence		
Rural	34	68.0
Urban	16	32.0

Table (1) showed that, two third of the studied sample were females and this mean average age were 50.9 ± 10.5 years. As regard to educational level the highest percentage (52%) was illiterate while the lowest percentage (0.6%) among the same group was university and most (76.0%) among the studied sample not had occupation. On the other hand result show that most (68%) of them were lived in rural area.

Table (2): Distribution of the studied sample according their medical data (n= 50).

Medical data	No.	%
Duration of type 2 diabetes		
5 – <10 years	32	64.0
>10 years	17	34.0
Don't known	1	2.0
Body mass index (BMI)		
Normal weight	14	28.0
Overweight	28	56.0
Obese	8	16.0
Accompanied medical illness with diabetes II		
Heart disease	3	6.0
Hypertension	18	36.0
Heart and hypertension	0	.0
Not present	29	58.0
Diabetes treatment		
Oral hypoglycemic agents	32	64.0
Insulin	17	34.0
Insulin and oral hypoglycemic agents	1	2.0
Family history of peripheral arterial disease		
Yes	17	34.0
No	33	66.0
Receive medical treatment for PAD		
Yes	3	6.0
No	47	94.0

NS= not significant

Table (2) founded that more than two-thirds among the studied sample have diabetes less than 10 years and they were had overweight constituted (56%). The result revealed that the highest percentage (58%) among them were hadn't any accompanied medical illness. As regard diabetes treatment more than two thirds were had taken oral hypoglycemic agents but (66%) among them they were hadn't family history about peripheral arterial disease. Finally most of the studied sample weren't received previously any medical treatment for PAD.

Table (3): Total ankle brachial index (ABI) degrees among the studied sample (n= 50).

Total Ankle brachial index (ABI) degrees	NO	%
Normal	0	0.0
Mild obstruction	30	60.0
Moderate obstruction	20	40.0

Table (3) showed that, two thirds of the studied sample have mild obstruction while the other third were had a moderate obstruction of peripheral vascular disease.

Table (3): relations between socio-demographic data of studied sample and their ankle brachial index degrees (ABI) (n= 50).

Socio-demographic data	ankle brachial index degrees			Fisher (*P* – value)
	Normal (n= 0)	Mild (n= 30)	Moderate (n=20)	
	No (%)	No (%)	No (%)	
Age				
20- <30	0 (0.0)	0 (0.0)	0 (0.0)	6.042 (.196) NS
30- <40	0 (0.0)	10 (83.3)	2 (16.7)	
40- <50	0 (0.0)	6 (66.7)	3 (33.3)	
50- <60	0 (0.0)	7 (46.7)	8 (53.3)	
60- <70	0 (0.0)	4 (40.0)	6 (60.0)	
>70	0.(0.0)	3 (75.0)	1 (25.0)	
Sex				
Male	(0.0)	13 (61.9)	8 (38.1)	.055 (.815) NS
Female	(0.0)	17 (58.6)	12 (41.4)	
Educational level				
Illiterate	0 (0.0)	16 (61.5)	10 (38.5)	.175 (.916) NS
Read and write	0 (0.0)	8 (61.5)	5 (38.5)	
Secondary	0 (0.0)	6 (54.5)	5 (45.5)	
University	0 (0.0)	0 (0.0)	0 (0.0)	
Occupation				
Not working	0 (0.0)	20 (58.8)	14 (41.2)	.210 (.900) NS
working	0 (0.0)	10 (62.5)	6 (37.8)	
Residence				
Rural	0 (0.0)	22 (59.5)	15 (40.5)	.017(.895) NS
Urban	0 (0.0)	5 (61.5)	8 (38.5)	

NS= not significant *** *p* = ≤.05** (statistical significance **** *p* = ≤.01** (highly statistical significance)

Table (4): presented that there were no statistical significance relation between all socio-demographic data of the studied sample and their ankle brachial index degrees.

Table (5): Relations between medical data of the studied sample and their ankle brachial index (ABI) degrees (no =50)

Medical data	Ankle brachial index (ABI) degrees			Fisher (P – value)
	Normal (n= 0)	Mild (n= 32)	Moderate (n=18)	
	No (%)	No (%)	No (%)	
Duration of type 2 diabetes				
5 – <10 years	0 (0.0)	23 (71.9)	9 (28.1)	6.870 (.03*)
>10 yrs.	0 (0.0)	6 (35.3)	11 (64.7)	
Don't known	0 (0.0)	1 (100.0)	0 (0.0)	
BMI				
Normal weight	0 (0.0)	6 (71.4)	2 (28.6)	
Overweight	0 (0.0)	16 (57.1)	12 (42.9)	7.589 (.669) NS
Obese	0 (0.0)	5 (62.5)	3 (37.5)	
Accompanied medical illness with diabetes II				
Heart disease	0 (0.0)	0 (0.0)	3 (100.0)	
Hypertension	0 (0.0)	9 (50.0)	9 (50.0)	7.662 (.02*)
Heart and hypertension	0 (0.0)	0 (0.0)	0 (0.0)	
Not present	0 (0.0)	21 (72.4)	8 (27.6)	
Diabetes treatment				
Oral hypoglycemic agents	0 (0.0)	17 (53.1)	15 (46.9)	4.052 (.132) NS
Insulin	0 (0.0)	13 (76.5)	4 (23.5)	
Insulin and oral hypoglycemic agents	0 (0.0)	0 (0.0)	1 (100.0)	
Family history of peripheral arterial disease				1.797 (.180) NS
Yes	0 (0.0)	8 (47.1)	9 (52.9)	
No	0 (0.0)	22 (66.7)	11 (33.3)	
Receive medical treatment for PAD				
Yes	0 (0.0)	2 (66.7)	1 (33.3)	.059 (.808) NS
No	0 (0.0)	28 (59.6)	19 (40.4)	

Table (5): showed that there were statistical significance relation between only two medical data as the duration of type 2 diabetes and accompanied medical illness with diabetes mellitus and their ankle brachial index degrees (p .03 & .02) respectively among the studied sample.

Discussion

The present study revealed that, the mean average age among the studied groups were (50.9 ± 10.5) years, this related to increase the risk of peripheral arterial disease among type II diabetes mellitus with aging process. Another interpretation it was observed that with increasing age, the prevalence of PVD in type 2DM showed an increasing. This result was in agreement with **John, J and Rathiga,A (2015)** who mentioned that, more than half of the study sample between age 51 to 60 years were having lower extremity perfusion among Type 2 Diabetes Mellitus with lower extremity perfusion in Chettinad Hospital and Research Institute, TamiNadu, India. This result was also in contradicted with **Bhuvaneshwari S & Tamilselvi S (2018)** revealed that more than one third of the diabetes patients were between the age group above 60 years among both groups in Saveetha Medical College and Hospital in Chennai.

The result of this present study illustrated that more than half of the studied sample were females ,this can be discussed as decline level of estrogen at menopause cause increased risk for diabetes mellitus (DM) because estrogen produce several anti-aging effects including anti oxidative properties as oxidative stress is considered the most important cause in micro vascular diseases. This result agreed with **Kumari1.A et al., (2019)** who illustrated that half of the diabetic patients in control group were females in selected hospital of Ambala, Haryana. In contrary to the current study findings **Shilshi, TL et al., (2017)** Illustrated that more than two third among patients with type 2 diabetes mellitus were males in Saveetha medical college and hospital, Chennai.

Our findings showed that more than half of the studied samples were illiterate. This may be rationalized as in the past there was no interest in education so, illiteracy was common among diabetic patients that lead to lack of health awareness about complication of diabetes and follow up. As well this finding is supported by **Bhuvaneshwari, S & Tamilselvi, S (2018)**[13] illustrated that more than one third of the control group among patients with type 2 diabetes mellitus were illiterate. On the other hand; **Priya, N (2016)** study was contradicted this finding, shows that more than one third among patients with selected non- communicable diseases (NCDs) admitted at Sri Narayani Hospital and Research Centre (SNHRC), Vellore were studied in Primary education.

As regard, current study sample's occupation showed that the majority of them were not occupied. This may be related to the lack of work makes diabetics patients less mobile, which lead to a slowing of lower peripheral blood circulation, thus being prone to peripheral vascular disease. This result supported by **baby, B (2015)** revealed that that one third of control group were unemployment among diabetes mellitus patients with lower extremity perfusion in selected hospital at Coimbatore.

The current study revealed that the majority of the studied sample was from the rural area because the lack of health awareness about care of diabetes mellitus which can be converted into complication leads to peripheral vascular disease as well as lack of health care services in rural area. This result supported by **Ram BD et al., (2017)** regarding area of residence, more than half among patients with type 2 diabetes mellitus at tertiary care hospital, Pakistan. the subjects were residing in the rural area.

Results of the current study showed that more than two-thirds of the studied sample's duration of diabetes from five (5) to less than ten (10) years. This can be discussed as the longer the duration of diabetes, the more susceptible to peripheral vascular disease. This result in agreement with **Abishal, A (2015)** stated that more than thirty of the control group was having duration of diabetes more than five years

among diabetes mellitus patients in selected hospitals of Kanyakumari district. On the other hand, **Ram BD et al., (2017)** study was contradicted this finding, illustrated that more than half among patients with type 2 diabetes mellitus at tertiary care hospital, Pakistan were have diabetes mellitus more than ten (10) years.

The present study revealed also that more than half of the studied samples were overweight, this due to lack of compliance with healthy diet for diabetic patients and exercise. As well this finding also in agreement with **Priya, N (2016)** represented that majority of patients with selected non- communicable diseases (NCDs) were overweight. In contrast to the current study results **Kumar, AVN (2018)** reported that, nearly half of among clients with type II diabetes mellitus in selected hospital at Maharashtra were in the normal range of body mass index

The current study found that there more than half of the studied samples were taking oral hypoglycemic agent. Because the studied sample have diabetes mellitus type II, so most of them were taking oral hypoglycemic agent, unless the condition was not responding, then the treatment will be changed to insulin injection. This result supported by **Vijayabarathi. M (2014)** regarding type of diabetic medication, majority of the control group was taking Oral Hypoglycemic agent among type 2 diabetes Mellitus with foot ulcer admitted in diabetic wards at Rajiv Gandhi Government General Hospital.

The present study revealed also that more than two-thirds of the participants were haven't family history of peripheral arterial disease. Because the diabetes will be caused either by getting old, obese, not exercising regularly and not eating healthy food. This result was further supported by **Hemalatha, K (2018)** who found that the majority of the control group wasn't have family history of peripheral arterial disease among diabetes mellitus patients with impaired lower extremity perfusion center from Morris Mathias hospital.

The Current study revealed that two thirds of the studied group have mild obstruction while the other third were had a moderate obstruction of peripheral vascular disease because more than two-thirds of the studied sample has diabetes less than ten years, so its effect on the peripheral blood vessels is less. This result supported by **Akhtar, KB et al., (2010)** who found that more than half of the Study patients of type-2 Diabetes Mellitus have mild ankle brachial index in diabetic clinic of PMRC Research Centre, Lahore. On the same line **Shilshi, TL et al., (2017)** illustrated that more than half in control group had PVD among patients with type 2 diabetes mellitus, Chennai. In contrary to the current study findings **Kumar, AVN (2018)** who found that the pre- test of ankle brachial index (ABI) scores regarding the peripheral vascular tissue perfusion among clients with type II diabetes mellitus shows that majority (72%) of clients had moderate reduction in peripheral vascular tissue perfusion.

The current study illustrated that there were statistically significant relation among duration of type 2 diabetes and their ankle brachial index (ABI) levels because the greater the number of years of diabetes and the lack of attention to follow-up, all of this will lead to the impact of peripheral blood vessels. Another rational most of the sample age was more than forty years with no awareness and follow-up will lead to affected peripheral vessels. This finding is compatible with **Goel S, et al., (2018)** who said that there was significant association between duration of diabetes with peripheral arterial disease in type 2diabetes mellitus at MGM Institute of Health Sciences, Navi Mumbai.

Conclusion

There are two thirds of the studied sample had mild degree of peripheral arterial obstruction and there was statistical significant relation between the duration of type 2 diabetes and accompanied medical illness regarding their ankle brachial index degree and there no relation between their socio-demographic data with this degree of peripheral vascular disease.

Recommendations

- Frequent nursing assessment of peripheral vascular disease and consider important nurse's role when mange among type II diabetes mellitus by ankle brachial index.
- Planning a program that helps diabetic patients to self-care management of peripheral vascular disease

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