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Study for predominant factor of diabetic foot ulcer among Indians - Vusculopathy/Neuropathy

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Abstract
Lower extremity complications in persons with diabetes have become an increasingly significant public health concern in both the developed and developing world. These complications, beginning with neuropathy and subsequent diabetic foot wounds frequently lead to infection and lower extremity amputation even in the absence of critical limb ischemia. In order to diminish the detrimental consequences associated with diabetic foot ulcers, a com-mon-sense-based treatment approach must be implemented. Many of the etiological factors contributing to the formation of diabetic foot ulceration may be identified using simple, inexpensive equipment in a clinical setting. Prevention of diabetic foot ulcers can be accomplished in a primary care setting with a brief history and screening for loss of protective sensation via the Semmes-Weinstein monofilament.

Keywords: Diabetes, Patients, Infection

1. Introduction

- The causative agents for Diabetic Foot ulcers are neurological factor, Ischemic factor due to peripheral vasculopathy and infection.
- The purpose of my research is to determine which factors (among neurological and peripheral vasculopathy) is predominant for developing Diabetic foot ulcer in case of Indians.
- In a life span of a diabetes patient, there is almost 25% chance for developing foot ulcer and a timely intervention can safe foot amputation upto 40 %.
- Treatment approach for the diabetic foot ulcer greatly depends upon the predisposing and causative factor. If it is neurological factor, the treatment approach would be mainly off loading, if it is vusculopathy then it would be peripheral vascular reconstructive surgery.

2. Objective of the study

Objective of my study is to determine the main causative factor for developing foot ulcer among Indians. For this I am going to evaluate each component (i.e. Neurological, vascular) for the comparative study and to determine their contributing role for diabetic foot ulcer formation among Indians.

2.1 Hypothesis

2.1.1 My proposed Null hypothesis is

- Main contributing role for developing diabetic foot ulcer among Indians is Neurological components rather than vascular components.

2.1.2 Alternative Hypothesis

- If Null hypothesis is rejected (by application of Chi square test, Z score, standard error of Mean, F score, Anova Model)

2.1.3 To Consider

i) Type I error: (error in accepting Null hypothesis)
ii) Type II error: (error in rejecting Null Hypothesis)
iii) Power of Type II error:- β
iv) Probabilistic factor of β (1 - β).

2.1.4 Materials and Methods

Description of the study area:
Samples were collected from Diabetes OPD of Ramkrishna Seva Pratisthan, Kolkata. The description of the sampling (study) area is given below. The Hospital is situated in South Kolkata and the patients are primarily from urban background, Hindu by religion, Middle class in economic status wise.

2.1.5 Recent advances related to the topic

- A recombinant platelet-derived growth factor is now used to treat for diabetic wound healing.
- Hyperbaric oxygen therapy (HBOT): effective modality for the treatment of Diabetic foot ulcer.
- G-CSF is a new adjunctive therapy under investigation G-CSF has been found to enhance the activity of Neutrophils in Diabetic patients.

3. Conclusion

- Every Diabetes patients have increased risk of Diabetic foot ulcer.
- Neuropathy, peripheral vusculopathy and infections play a crucial role.
- Regular feet inspection (atleast once annually) should be carried out.
- Treatment plans must be based on the examination findings.
- If ulcer is present, then the affected region of the foot must be offloaded. Debridement and appropriate dressing must be applied.
- Antibiotics to be administered on the basis of culture and sensitivity of the wound.
- If Ischemia is present then revulcularisation surgery may be indicated.
- A recombinant platelet-derived growth factor is now used to treat for diabetic wound healing.

- Hyperbaric oxygen therapy (HBOT): effective modality for the treatment of Diabetic foot ulcer.
- G-CSF is a new adjunctive therapy under investigation G-CSF has been found to enhance the activity of Neutrophils in Diabetic patients.

3.1 Collection of Samples

The samples were collected essentially during the Diabetic foot clinic while conducting Biothesiometry, Hot and Cold perception study and peripheral sound Doppler study among twenty-five patients during OPD of Ramkrishna Seva Pratisthan.
My sample size (X) is twenty five.
The sample structure: Male: Female- 1:1
Age group: Between 40 – 50 years.
Diabetes control: Uncontrolled Diabetes Status.
HbA1c: Ranges from 8.5 % to 9.5%

4. Results

Table 1

S. no.	Age year	Sex	HbA1c level	Test for large fibre neuropathy test by Biothesiometry (avg. score on both feet)	Test for small fibre neuropathy test by hot and cold perception study (quantitative analysis)		Test for vusculopathy by sound Doppler study (ABI index)	Additional information about diabetic neuropathy by Spoturine Albumin Creatinine Ratio(ACR) mg/g creatitine
					Hot Erception (avg. score)	Cold Perception (avg. score)		
1.	40	M	9%	28	40	10	1.0	233
2.	45	M	8.9%	32	35	18	1.2	259
3.	50	M	8.6%	26	38	22	0.9	300
4.	46	M	9.4%	25	38	20	1.0	325
5.	42	M	9.0%	35	42	21	1.1	326
6.	44	M	8.9%	30	48	15	0.9	288
7.	47	M	9.3%	28	50(Max)	18	1.2	169
8.	50	M	9.4%	29	44	21	1.3	180
9.	46	M	8.7%	25	32	22	1.4	280
10.	43	M	8.8%	27	28	18	1.0	201
11.	42	M	8.5%	26	32	23	0.9	306
12.	41	M	8.8%	35	31	19	1.1	138
13.	46	M	8.6%	42	38	22	1.4	205
14.	47	F	8.8%	40	32	15	1.2	232
15.	49	F	8.9%	32	35	28	1.3	288
16.	50	F	8.7%	28	36	22	0.9	287
17.	49	F	8.9%	32	38	24	1.1	188
18.	50	F	9.0%	38	37	22	1.0	158
19.	44	F	9.2%	30	36	24	1.2	206
20.	45	F	9.5%	26	38	18	1.3	236
21.	47	F	9.4%	29	28	16	1.0	306
22.	48	F	9.0%	30	32	18	0.9	292
23.	49	F	9.1%	31	35	22	0.9	201
24.	44	F	9.4%	34	28	19	0.9	203
25.	43	F	8.8%	38	30	22	1.0	196

5. Discussion

5.1 Among 25 patients the following facts are observed

i) 98.2% (P< 0.05) patiensts have features of Large fibre neuropathy
ii) 94.3% (P >0.05) patients have "hot perception impairment study" as small fibre neuropathy.
iii) 64.2% (P >0.05) patients have "cold perception impairment study" as small fibre neuropathy.
iv) 99.99 % patients do not exhibit any features of Peripheral vusculopathy as ABI index is on and above 0.9 (P < > 0.05)
v) 2.3 % patients might have developed peripheral arterial sclerosis as ABI for them is above 1.3
vi) Another interesting finding in my study is that 99.99 % patients have developed microalbuminurea and about 33.33 patients have developed macroalbuminurea.

So from the above findings it is quite evident that majority of the diabetic foot ulcer patients have diabetic peripheral neuropathy rather the features of peripheral vascular disease.
It should be further added that Large fibre neuropathy and hot perception impairment study as small fibre neuropathy plays a predominant role in the neurological component part of Diabetic foot ulcer among the observed group ' cold perception impairment' among the study group is lesser than ' hot perception impairment'.

6. Summary

6.1 In my research works the following are observed:

i) 98.2 % patients have features of large fibre neuropathy.
ii) 94.3 % patients have "hot perception Impairment study" as small fibre neuropathy.
iii) Relatively lesser percent of "cold perception impairment" as small fibre neropathy

iv) 99.99 % patients do not develop any features of peripheral vascular disease as ABI is Between 0.9 to 1.3.
v) Average Biothesiometry score from both feet are calculated while determining large fibre neuropathy.
vi) Average hot & cold perception (quantitative score) from both feet are considered while calculating small fibre neuropathy.
vii) 99.99% patients have already developed Microalbuminurea.
viii) 33.33% patients have developed Macroalbuminurea.

This study has been conducted for a period of one year (from Jan'14 to Dec'14.)

7. Conclusion

i) After considering of the following factors, I am going to accept my null hypothesis (i.e. the main causative factor of Diabetic foot ulcer among Indian is peripheral Neuropathy rather than peripheral vusculapathy)
a. Z score falls within the confidence limit of my null hypothesis.
b. Chi square value (χ) (calculated from observed and expected value)
ii) Therefore, there is now no scope for propagating an "alternate hypothesis".
iii) My findings have been substantiated by the following conclusive observations:
a. 99.99% patients have developed large fibre neuropathy.
b. 96% patients have "not perceptions study impairment' as small fibre neuropathy.
c. 99% patients have not exhibited any features of peripheral vascular disease.

8. Contribution to Knowledge

- On the contrary of the existing knowledge, my research has thrown some light about the main causative factor of Diabetic Foot ulcer among Indians.
- Though my research findings are based on a small sample of 25, but it has conclusively demonstrated that peripheral neuropathy plays a predominant role in diabetic foot ulcer than vusculopathy.
- Therefore, for the treatment modality, more emphasis must be laid down in offloading and to prevent the prolonged cold and hot exposure of the soles of feet.
- In this connection, regular foot inspection, wearing of proper shoes must be emphasized.

8.1 Suggestion for Future Research

As I have conducted my research on a small sample of 25, in future a larger sample may be conducted to verify my Research findings in a larger prospective involving more variable factor. Instead of Sound Doppler study peripheral vascular status of inferior extremely may be ascertained by "Real Arterial Doppler Study.

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