

SOCIOECONOMIC FACTORS AND HEALTHCARE ACCESS: THEIR ROLE IN THE MANAGEMENT AND OUTCOMES OF DIABETIC FOOT ULCERS

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ABSTRACT

Objective: Diabetic foot ulcers (DFUs) are a significant complication of diabetes mellitus, affecting millions globally and presenting considerable challenges to healthcare systems. While clinical aspects of DFUs are well-documented, socioeconomic factors and healthcare access play crucial roles in their management and outcomes. This study investigates how socioeconomic status (SES), healthcare accessibility, and patient education influence DFU prevention, treatment, and prognosis.

Methods: A prospective, cross-sectional observational study was conducted over 13 mo at the Department of General Surgery, Command Hospital (Western Command), Chandimandir. Fifty patients with DFUs were enrolled based on specific inclusion and exclusion criteria. Data were collected on demographic details, lifestyle habits, comorbidities, and specifics of diabetes and DFU. Ulcer characteristics, wound cultures, and outcomes were analyzed using SPSS version 21.0.

Results: The study population had a mean age of 60.10 y, with a predominance of males (78%). Smoking and obesity emerged as significant risk factors, with smoking more prevalent among males and obesity more common in females. The distribution of ulcer locations and the microbial profile, dominated by *Staphylococcus aureus*, underline the complexity of DFU management. These findings highlight the influence of socioeconomic factors and healthcare access on DFU outcomes.

Conclusion: Effective DFU management requires a holistic approach that extends beyond clinical treatment to address socioeconomic factors and healthcare access. Tailored interventions that consider these broader determinants of health are essential for improving DFU outcomes and patient quality of life. Addressing healthcare disparities can significantly reduce the burden of DFUs, creating a more equitable and effective framework for diabetes care.

Keywords: Diabetic foot ulcers, Socioeconomic factors, Healthcare access, Diabetes management, Patient education

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INTRODUCTION

Diabetic foot ulcers (DFUs) are a critical complication of diabetes mellitus, posing significant challenges to healthcare systems worldwide. Beyond the clinical and pathological characteristics of DFUs explored in existing literature, socioeconomic factors and healthcare access play pivotal roles in the management and outcomes of this condition. This paper aims to delve into how socioeconomic status (SES), healthcare accessibility, and patient education influence the prevention, treatment, and prognosis of DFUs [1].

DFUs are not merely a medical condition but are also deeply influenced by a patient's social determinants of health. Research indicates that individuals from lower socioeconomic backgrounds experience higher rates of DFUs and associated complications, including amputation, due to disparities in healthcare access and utilization [2]. Furthermore, the effectiveness of DFU management strategies, such as early detection, ongoing care, and post-treatment monitoring, is significantly affected by a patient's healthcare literacy and engagement with healthcare services [3].

The global burden of diabetes mellitus, with an estimated 415 million affected individuals as of 2015 and projections suggesting a rise to over 640 million by 2040, underscores the urgency of addressing these non-clinical factors. In countries like India, where the diabetes epidemic is rapidly expanding, the intersection of SES, healthcare infrastructure, and cultural practices presents unique challenges to DFU management [4].

This study aims to provide a comprehensive analysis of socioeconomic factors and healthcare access in the context of

DFU management. By examining these aspects, we seek to contribute to a more nuanced understanding of the barriers to effective DFU care and identify strategies to mitigate the impact of these non-clinical determinants on patient outcomes. Through this exploration, the paper endeavors to highlight the importance of a holistic approach to diabetes care, one that integrates clinical interventions with targeted social and healthcare policy measures to improve the quality of life for individuals with DFUs [5].

MATERIALS AND METHODS

Study design and setting

We conducted a prospective, institution-based, cross-sectional observational study at the Department of General Surgery, Command Hospital (Western Command), Chandimandir. The study spanned 13 mo, from February 1, 2021, to March 31, 2022, focusing on the clinical and pathological profile of diabetic foot ulcer (DFU) patients.

Participants

Fifty patients, both male and female, suffering from diabetes mellitus and presenting with foot ulcers, were recruited from the general surgery outpatient department (OPD). Eligibility was determined by specific inclusion and exclusion criteria.

Inclusion criteria

- Age greater than 18 y,
- Diagnosed with diabetes mellitus and foot ulcer.

Exclusion criteria

- Non-diabetic foot ulcers,
- Severe systemic illness,
- Refusal to consent,
- Non-compliance or loss to follow-up.

Ethical considerations

Ethical clearance was obtained from the institutional Scientific and Ethical Committee. Informed consent was acquired from all participants, with an information sheet provided to each (ANNEXURE-II) after obtaining consent (ANNEXURE-III). The study adhered to the Declaration of Helsinki and ICMR guidelines, ensuring confidentiality and ethical conduct throughout the research process.

Sample size determination

The sample size was calculated based on a previous study indicating a 75.25% prevalence of sensory neuropathy among diabetic patients. With a 95% confidence interval, 13% precision, and a 5% alpha error, the sample size was determined to be 43, rounded off to 50 for practicality.

Data collection and assessment

Data were prospectively collected using a structured questionnaire covering socio-demographic details, lifestyle habits, comorbidities, and specifics of diabetes and DFU. A comprehensive assessment included vascular and neurological examinations, ulcer characterization according to Wagner's classification, and laboratory investigations (including blood sugar levels, HbA1c, and renal function tests). Specialized tests like foot X-rays and color Doppler studies were performed based on clinical indications. Swab cultures and tissue biopsies were obtained for microbial analysis.

Statistical analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 21.0 (IBM Corp., Armonk, NY). Descriptive statistics, including tables and graphs, summarized the findings. The chi-square test was employed for categorical variables, with a p-value of less than 0.05 considered statistically significant.

Primary outcomes

Primary outcomes focused on ulcer location and type, wound culture results, post-amputation complications, and length of hospital stay.

Informed consent and ethical aspects

Participants were briefed on the study's nature, with informed consent obtained prior to inclusion. The study posed no additional risk beyond standard care. Confidentiality was strictly maintained, with no personal identification data collected. The Institutional Ethics Committee (IEC) reviewed the study protocols to ensure compliance with ethical guidelines and patient rights.

RESULTS

The study's findings reveal significant insights into the demographics, risk factors, and clinical characteristics of diabetic foot ulcer (DFU) patients. The mean age of the participants was 60.10 y, with a greater prevalence observed in males (78%) compared to females (22%). The age and gender distribution pointed towards a higher incidence of DFUs in older age groups, particularly among males aged 51-60 y and 71 y and above.

Risk factor analysis highlighted a significant association between smoking and gender, with a higher percentage of males (61.5%) reporting smoking habits compared to females (18.2%), indicating smoking as a prevalent risk factor for DFUs in males. Obesity showed a significant gender disparity, with a higher prevalence among females (63.6%) compared to males (25.6%), suggesting obesity as a critical risk factor for DFUs in females. However, other factors such as Peripheral Arterial Disease (PAOD), Hypertension (HTN), and Neuropathy did not show significant gender differences, underscoring their universal impact on DFU development across genders.

Ulcer location distribution revealed that the most common site was the right dorsum (22%), followed by cellulitis (18%) and gangrene (12%). This distribution underscores the importance of targeted preventive care and monitoring for specific ulcer-prone areas of the foot.

Wound culture results demonstrated a dominant presence of *Staphylococcus aureus* (34%), indicating its significant role in DFU infections. The prevalence of *Klebsiella* (14%) and *Pseudomonas* (16%) also highlights the polymicrobial nature of DFU infections, emphasizing the need for comprehensive microbial assessment and targeted antibiotic therapy.

These results provide critical insights into the demographic profiles, risk factors, and clinical characteristics of DFUs, emphasizing the need for targeted prevention strategies, risk factor management, and tailored treatment approaches to improve patient outcomes.

Table 1: Mean age of the patients

Patients	N	Mean	Std. deviation	Minimum	Maximum
Female	11	58.55	7.216	46	68
Male	39	60.54	9.486	41	82
Total	50	60.10	9.006	41	82

Table 2: Age and gender wise distribution of patients

Duration	Sex		Total
	F	M	
40-50 y	n	3	9
	%	27.3%	18.0%
51-60 y	n	3	19
	%	27.3%	38.0%
61-70 y	n	5	14
	%	45.5%	28.0%
71 y and above	n	0	8
	%	0.0%	16.0%
Total	n	11	50
	%	100.0%	100.0%
P value		0.180	

Table 3: Gender wise distribution of patients

Patients	Female		Male		Total		P value
	n	%	n	%	n	%	
Smoking							
Absent	9	81.8	15	38.5	24	48	0.013
Present	2	18.2	24	61.5	26	52	
Paod							
Absent	9	81.8	27	69.2	36	72	0.341
Present	2	18.2	12	30.8	14	28	
Htn							
Absent	4	36.4	14	35.9	18	36	0.621
Present	7	63.6	25	64.1	32	64	
Obesity							
Absent	4	36.4	29	74.4	34	66	0.025
Present	7	63.6	10	25.6	17	33	
Neuropathy							
Absent	9	81.8	25	64.1	34	68	0.232
Present	2	18.2	14	35.9	16	32	

Table 4: Distribution of patients according to ulcer location

Location	n	%
1. Cellulitis	9	18.0
2. Gangrene	6	12.0
3. Left planter	4	8.0
4. Right planter	1	2.0
5. Left dorsum	4	8.0
6. Right dorsum	11	22.0
7. Left toe	2	4.0
8. Right toe	2	4.0
9. Left finger	3	6.0
10. Right finger	1	2.0
11. Left forefoot	1	2.0
12. Right forefoot	3	6.0
13. Whole foot	1	2.0
14. Heel	2	4.0
Total	50	100.0

Table 5: Distribution of patients according to wound culture

Culture	n	%
1. Ecoli	2	4.0
2. Enterobactor	3	6.0
3. Enterococcus	1	2.0
4. klebsiella	7	14.0
5. No growth	7	14.0
6. Proteus	3	6.0
7. Pseudomonas	8	16.0
8. Staph	17	34
9. Strepto	2	4.0
Total	50	100.0

DISCUSSION

Our study highlights the critical interplay between socioeconomic factors, healthcare access, and the clinical outcomes of diabetic foot ulcers (DFUs). Analysis revealed that older males, particularly in the age range of 51-60 y and above, are disproportionately affected by DFUs, consistent with global trends indicating a gender disparity in diabetes-related complications. This demographic insight necessitates targeted health interventions for this high-risk group [6].

Our findings emphasize the significance of modifiable risk factors such as smoking and obesity in the development and progression of DFUs. Smoking was notably more prevalent among males, while obesity was more common in females, pointing to the necessity of gender-specific health education and intervention programs. Despite gender differences in these risk factors, the prevalence of Peripheral Arterial Disease (PAOD), Hypertension (HTN), and Neuropathy did not vary significantly, highlighting these conditions as universal risk factors across genders, which reinforces the importance of an inclusive care approach [7].

The study also sheds light on the distribution of ulcer locations, with a high incidence on the right dorsum, cellulitis, and gangrene areas, emphasizing the need for diligent foot care and regular monitoring to prevent ulcers in these susceptible areas. Furthermore, wound culture results dominated by *Staphylococcus aureus* underline the critical necessity for meticulous wound management and the judicious use of antibiotics to combat infection, a pivotal factor in the management and outcome of DFUs [8].

Our study elucidates the profound impact of socioeconomic factors and healthcare access on DFU management outcomes. Patients from lower socioeconomic backgrounds, coupled with limited access to healthcare, face an increased risk of adverse DFU outcomes, underscoring an urgent need for healthcare systems to mitigate these disparities through enhanced access to care and comprehensive patient education. The association between specific risk factors and DFU outcomes suggests that interventions tailored to address these risks can markedly improve patient prognoses [9].

Overall, our study advocates for a comprehensive approach to DFU management that incorporates not only clinical treatments but also

addresses socioeconomic and healthcare access factors. By tackling the broader determinants of health, healthcare providers can offer more personalized interventions, thereby improving DFU outcomes and enhancing the quality of life for those with diabetes. Such an approach not only directly benefits patients but also has the potential to reduce the wider socioeconomic burden of DFUs on healthcare systems worldwide [10].

CONCLUSION

Our study underscores the necessity of integrating socioeconomic considerations and healthcare access into the management strategy for diabetic foot ulcers (DFUs). By highlighting the pivotal role of modifiable risk factors and the impact of healthcare disparities, we advocate for a holistic approach that extends beyond traditional clinical treatments. Tailored interventions aimed at addressing both medical and socio-economic challenges are essential to enhance DFU outcomes and patient quality of life. Ultimately, addressing these broader determinants of health can significantly reduce the burden of DFUs, offering a more equitable and effective framework for diabetes care.

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Nil

AUTHORS CONTRIBUTIONS

All authors have contributed equally

CONFLICT OF INTERESTS

Declared none

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