IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 24, Issue 10 Ser.1 (October 2025), PP 123-131
www.iosrjournals.org

A Study to Identify the Causes of Delayed Surgical Wound Healing Among Patients with Diabetes at SMVMCH, Puducherry

[1]Mrs.S.Sandhya, [2]Mrs.Angelin preskella, [3]Mr.R.Akash & [4]G. Muthamilselvi
[1]Tutor in Nursing, Department of Child Nursing, SMVNC, Puducherry.
[2-3] P.B.B.Sc., Nursing II-Year, Sri Manakula Vinayagar Nursing College, Puducherry-605 107.
[4] Principal, Department of OBG, SMVNC, Puducherry
Corresponding Author- ***Mrs.S.Sandhya***

ABSTRACT
Introduction: *Diabetes Mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia due to impaired insulin production or action. One of the major complications of diabetes is delayed wound healing, particularly in surgical wounds, which can lead to infections, prolonged hospital stay, and even amputation.* ***Statement of the Problem:*** *"A study to identify the causes of delayed surgical wound healing among patients with diabetes at SMVMCH, Puducherry."* ***Objectives:1.*** *To assess the causes of delayed surgical wound healing among patients with diabetes. 2. To associate the causes of delayed surgical wound healing with selected demographic variables.* ***Methodology:*** *A quantitative, non-experimental descriptive research design was adopted. A total of 30 diabetic patients who underwent surgery were selected using purposive sampling technique. Data were collected using demographic variables and the HEALD assessment tool. Data were analyzed using descriptive and inferential statistics.* ***Results:*** *The study revealed that 50% of patients experienced delayed wound healing and 30% had poor healing progress, while only 3.33% showed complete healing. No statistically significant association was found between wound healing and most demographic variables ($p > 0.05$).* ***Conclusion:*** *The study concluded that delayed wound healing is highly prevalent among diabetic patients, and post-surgical duration plays a significant role in wound healing outcomes.*
Key Words: *Diabetes Mellitus, Wound Healing, Surgical Wounds, HEALD, Delayed Healing*

I. INTRODUCTION

Diabetes Mellitus (DM) is a group of metabolic disorders characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. It is a major global health problem affecting millions of individuals and is associated with several complications that impair quality of life and increase mortality. Among the complications, delayed wound healing is one of the most serious. Wound healing is a complex physiological process involving inflammation, proliferation, and remodeling. In diabetic patients, this process is disrupted due to prolonged inflammation, reduced angiogenesis, impaired immune response, and decreased growth factor activity. Diabetic patients have a 15–25% lifetime risk of developing foot ulcers, with many cases progressing to severe infections such as osteomyelitis. These complications often result in hospitalization, surgical interventions, and even limb amputations. Furthermore, recurrence rates exceed 50%, making it a persistent clinical challenge. In India, chronic wounds affect approximately 4.5 per 1,000 population, and diabetic foot infections account for nearly 10% of hospital admissions. Effective management includes infection control, debridement, proper wound care, glycemic control, and use of advanced dressings. Despite these interventions, delayed wound healing remains a major concern, highlighting the need to identify contributing factors.

STATEMENT OF THE PROBLEM

"A study to identify the causes of delayed surgical wound healing among patients with diabetes at SMVMCH, Puducherry."

OBJECTIVE

1. To assess the causes of delayed surgical wound healing among patients with diabetes.
2. To associate the causes of delayed surgical wound healing with selected demographic variables.

NEED FOR THE STUDY

Worldwide

Diabetic patients have a high risk of developing foot ulcers (15–25%), with 40–80% progressing to severe infections. Recurrence rates exceed 50%, making wound management challenging.

India
Chronic wounds affect 4.5 per 1,000 population. Diabetic foot infections contribute significantly to hospital admissions and healthcare costs.
Tamil Nadu
Studies indicate neuropathy and infection as major causes of diabetic foot complications, often leading to surgical interventions such as amputations.

II. METHODOLOGY

Research Approach
Quantitative research approach.
Research Design
Descriptive research design.
Setting of the Study
Sri Manakula Vinayagar Medical College and Hospital (SMVMCH), Puducherry.
Population
All diabetic patients who underwent surgery.
Sample
Patients with diabetes who underwent surgery and met inclusion criteria.
Sample Size
30 patients.
Sampling Technique
Purposive sampling technique.

CRITERIA FOR SAMPLE SELECTION
Inclusion Criteria
- Patients with Diabetes Mellitus
- Age ≥ 18 years
- Post-surgical patients
- Patients with delayed wound healing
- Willing to participate

Exclusion Criteria
- Non-diabetic patients
- Non-surgical wounds
- Cancer patients
- Patients on immunosuppressive therapy

TOOLS FOR DATA COLLECTION
Section A: Demographic Variables
Includes age, gender, religion, occupation, residence, socioeconomic status, education, comorbidities, duration of diabetes, and HbA1c levels.
Section B: HEALD Assessment Tool
HEALD stands for:
- H – Hyperglycemia / metabolic
- E – Exudative wound
- A – Age and comorbidities
- L – Lifestyle and nutrition
- D – Drugs / surgical factors

SCORING INTERPRETATION (HEALD)

Score	Interpretation
0	Not present
1	Mild
2	Severe

Total Score:
- 0–3 → Minimal delay
- 4–7 → Moderate delay
- 8–10 → Severe delay

DATA COLLECTION PROCEDURE

Permission was obtained from the institution. Informed consent was taken. Data were collected from 30 patients using HEALD tool and demographic questionnaire.

ANALYSIS

Section I: Distribution of the patient with diabetes according to their selected demographic variables.

Table 1 : Frequency and percentage wise distribution of the patient with diabetes according to their selected demographic variables.

N=30

	Demographic Variables	Categories	Frequency (n)	Percentage (%)
1.	**Age**	18 – 30 years	6	20%
		31 – 45 years	9	30%
		46 – 60 years	10	33.33%
		Above 60 years	5	16.67%
2.	**Gender**	Male	15	50%
		Female	15	50%
3.	**Religion**	Hindu	18	60%
		Muslim	8	26.67%
		Christian	4	13.33%

Table 1 presents the frequency and percentage-wise distribution of patients with diabetes according to selected demographic variables. Out of the 30 patients, the majority (33.33%) were in the age group of 46–60 years, followed by 30% in the 31–45 years group, 20% in the 18–30 years group, and the least (16.67%) were above 60 years of age. Regarding gender, an equal distribution was observed, with 50% males and 50% females. In terms of religion, the majority of the patients were Hindu (60%), followed by Muslims (26.67%), and Christians comprised the smallest group at 13.33%

Table 2: Frequency and percentage wise distribution of the patient with diabetes according to their selected demographic variables.

N=30

	Demographic Variables	Categories	Frequency (n)	Percentage (%)
1.	**Presence of Comorbidities**	No other conditions	12	40%
		Hypertension	10	33.33%
		Kidney disease	5	16.67%
		Neuropathy	3	10%
2.	**Post-Surgical Days**	1 – 5 days	7	23.33%
		6 – 10 days	9	30%
		11 – 15 days	8	26.67%
		More than 15 days	6	20%
3.	**Duration of Diabetes**	Less than 5 years	11	36.7%
		5–10 years	10	33.3%
		More than 10 years	9	30%
4.	**Blood Sugar Control (HbA1c)**	Less than 7%	8	26.7%
		7–8%	10	33.3%
		8.1–9%	7	23.3%
		More than 9%	5	16.7%

The table 2 shows the distribution of clinical variables among 30 samples. Regarding comorbidities, 12 (40%) had no other conditions, 10 (33.33%) had hypertension, 5 (16.67%) had kidney disease, and 3 (10%) had neuropathy. In terms of post-surgical days, 9 (30%) were in 6–10 days, 8 (26.67%) in 11–15 days, 7 (23.33%) in 1–5 days, and 6 (20%) had more than 15 days since surgery. Regarding duration of diabetes, 11 (36.7%) had

diabetes for less than 5 years, 10 (33.3%) for 5–10 years, and 9 (30%) for more than10 years. For blood sugar control (HbA1c), 10 (33.3%) had 7–8%, 8 (26.7%) had less than 7%, 7 (23.3%) had 8.1–9%, and 5 (16.7%) had more than 9%.

Section II: Assessment of the Causes of delayed surgical wound healing among the patient with diabetes.

Table 3 : Frequency and percentage wise distribution of the surgical wound healing among the patient with diabetes.

N=30

HEALED Score Categories	Frequency (n)	Percentage (%)
Completely Healed Ulcer	1	3.33%
Healing in Progress	5	16.67%
Delayed Healing	15	50%
Poor Healing Progress	9	30%

Table 3 shows the frequency and percentage-wise distribution of surgical wound healing among patients with diabetes based on the HEALED score categories. Only 3.33% of patients had a completely healed ulcer, while 16.67% showed healing in progress. Half of the patients (50%) experienced delayed healing, and 30% exhibited poor healing progress.

Section III: Association of the Causes of Delayed surgical wound healing among the patient with diabetes with selected demographic variables.

Table 4: Association of the Causes of Delayed surgical wound healing among the patient with diabetes with selected demographic variables.

N=30

S. No	Demographic Variables	Categories	Completely Healed Ulcer F(%)	Healing in Progress F(%)	Delayed Healing F(%)	Poor Healing Progress F (%)	χ^2 / df / p-value
1	Age	18–30 years	0 (0.0)	2 (6.7)	3 (10.0)	1 (3.3)	χ^2=8.015, df=9, p=0.53 3 (NS)
		31–45 years	1 (3.3)	2 (6.7)	5 (16.7)	1 (3.3)	
		46–60 years	0 (0.0)	1 (3.3)	5 (16.7)	4 (13.3)	
		Above 60 years	0 (0.0)	0 (0.0)	2 (6.7)	3 (10.0)	
2	Gender	Male	1 (3.3)	0 (0.0)	8 (26.7)	6 (20.0)	χ^2=7.067, df=3, p=0.07 0 (NS)
		Female	0 (0.0)	5 (16.7)	7 (23.3)	3 (10.0)	
3	Religion	Hindu	0 (0.0)	4 (13.3)	9 (30.0)	5 (16.7)	χ^2=4.796, df=6, p=0.57 0 (NS)
		Muslim	1 (3.3)	0 (0.0)	4 (13.3)	3 (10.0)	
		Christian	0 (0.0)	1 (3.3)	2 (6.7)	1 (3.3)	

***Significance at p <0.05**

Table 4 shows the association between surgical wound healing and demographic variables such as age, gender, and religion. Delayed healing was most common among patients aged 31–45 years and 46–60 years (16.7% each). Among gender, males showed a slightly higher proportion of delayed healing (26.7%) and poor healing (20.0%) compared to females. In terms of religion, delayed healing was highest among Hindus (30.0%). Only a very small percentage of patients in all groups achieved complete healing. Overall, there was **no statistically significant association** between age, gender, and religion with surgical wound healing ($p > 0.05$)

Table 5: Association of the Causes of Delayed surgical wound healing among the patient with diabetes with selected demographic variables.

N=30

S. No	Demographic Variables	Categories	Completely Healed Ulcer F (%)	Healing in Progress F (%)	Delayed Healing F (%)	Poor Healing Progress F (%)	χ^2 / df / p-value

1.	Occupation	Unemployed	1 (3.3)	2 (6.7)	2 (6.7)	0 (0.0)	χ^2=9.556, df=9, p=0. 388 (N)
		Self-employed	0 (0.0)	1 (3.3)	3 (10.0)	2 (6.7)	
		Private/Government Employee	0 (0.0)	2 (6.7)	7 (23.3)	5 (16.7)	
		Retired	0 (0.0)	0 (0.0)	3 (10.0)	2 (6.7)	
2.	Residence	Urban	1 (3.3)	3 (10.0)	9 (30.0)	4 (13.3)	χ^2=1.867 df= 3, p=0. 601 (NS)
		Rural	0 (0.0)	2 (6.7)	6 (20.0)	5 (16.7)	
3.	Socio-economic Status	Low	0 (0.0)	1 (3.3)	5 (16.7)	3 (10.0)	χ^2=2.947 df=6, p=0. 815 (NS)
		Middle	1 (3.3)	3 (10.0)	7 (23.3)	3 (10.0)	
		High	0 (0.0)	1 (3.3)	3 (10.0)	3 (10.0)	

Table 5 shows the association between surgical wound healing and variables such as occupation, residence, and socioeconomic status. Delayed healing was highest among private/government employees (23.3%) and urban residents (30.0%). Poor healing progress was slightly higher among rural patients (16.7%). Patients belonging to the middle socioeconomic group showed a higher proportion of delayed healing (23.3%). Only a very small percentage of patients in all categories achieved complete healing. Overall, there was **no statistically significant association** between these demographic variables and wound healing ($p > 0.05$).

N = 30

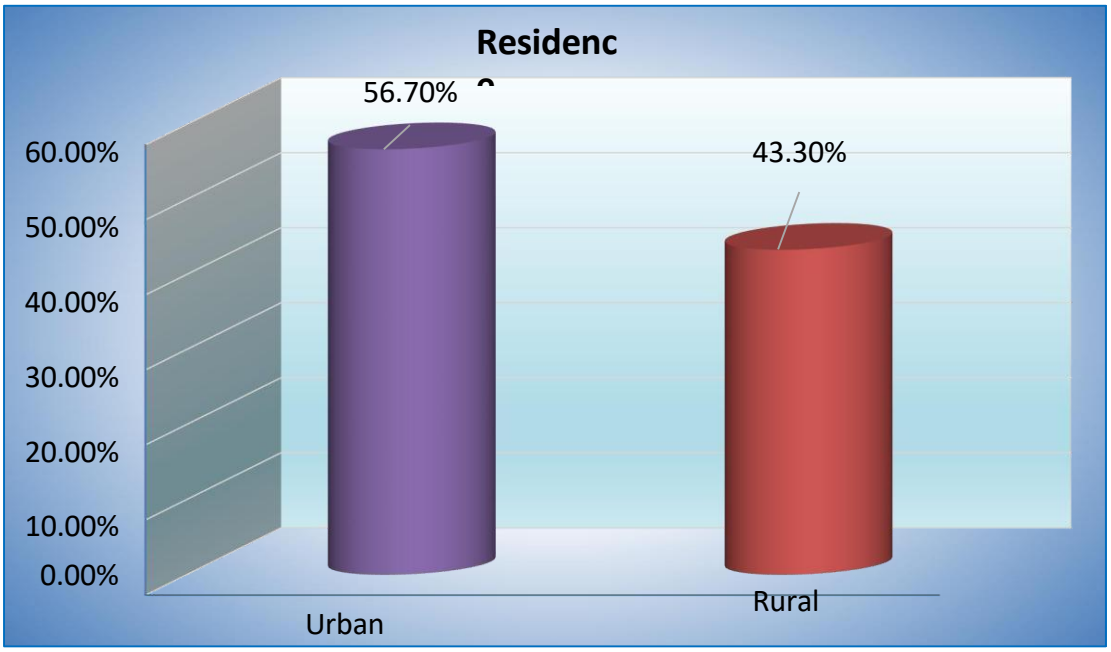

Figure: 1 Percentage wise distribution of the patient with diabetes according to the Residence Regarding residence, most of the respondents 17 (56.7%) lived in urban areas, whereas 13 (43.3%) were from rural areas.

Table 6: Association of the Causes of Delayed surgical wound healing among the patient with diabetes with selected demographic variables.

N=30

S. No	Demographic Variables	Categories	Completely Healed Ulcer	Healing Progress	Delayed Healing	Poor Healing Progress	χ^2 / df / p-value
			F(%)	F(%)	F(%)	F (%)	
1.	Education Status	No formal education	0 (0.0)	1 (3.3)	0 (0.0)	2 (6.7)	χ^2=8.600,

		Primary education	0 (0.0)	0 (0.0)	2 (6.7)	2 (6.7)	df=9, p=0.47 5 (NS)
		Secondary education	0 (0.0)	2 (6.7)	3 (10.0)	3 (10.0)	
		Higher education	1 (3.3)	2 (6.7)	10 (33.3)	2 (6.7)	
2.	Presence	No other conditions	0 (0.0)	3 (10.0)	6 (20.0)	3 (10.0)	χ^2=8.778, df=9, p=0.45 8 (NS)
		Hypertension	0 (0.0)	2 (6.7)	5 (16.7)	3 (10.0)	
		Kidney disease	1 (3.3)	0 (0.0)	3 (10.0)	1 (3.3)	
		Neuropathy	0 (0.0)	0 (0.0)	1 (3.3)	2 (6.7)	
3.	Post-Surgical Days	1–5 days	1 (3.3)	2 (6.7)	2 (6.7)	2 (6.7)	χ^2=8.466, df=9, p=0.48 8 (NS)
		6–10 days	0 (0.0)	1 (3.3)	6 (20.0)	2 (6.7)	
		11–15 days	0 (0.0)	0 (0.0)	5 (16.7)	3 (10.0)	
		More than 15 days	0 (0.0)	2 (6.7)	2 (6.7)	2 (6.7)	

***Significance at p <0.05**

Table 6: shows the association between surgical wound healing and variables such as education status, presence of comorbidities, and post-surgical days. Delayed healing was highest among patients with higher education (33.3%) and those without other conditions (20.0%). Patients with hypertension also showed notable delayed healing (16.7%). Regarding post-surgical days, delayed healing was more common during 6–10 days (20.0%) and 11–15 days (16.7%). Only a very small proportion of patients achieved complete healing across all categories. Overall, there was **no statistically significant association** between these variables and surgical wound healing (p > 0.05).

N = 30

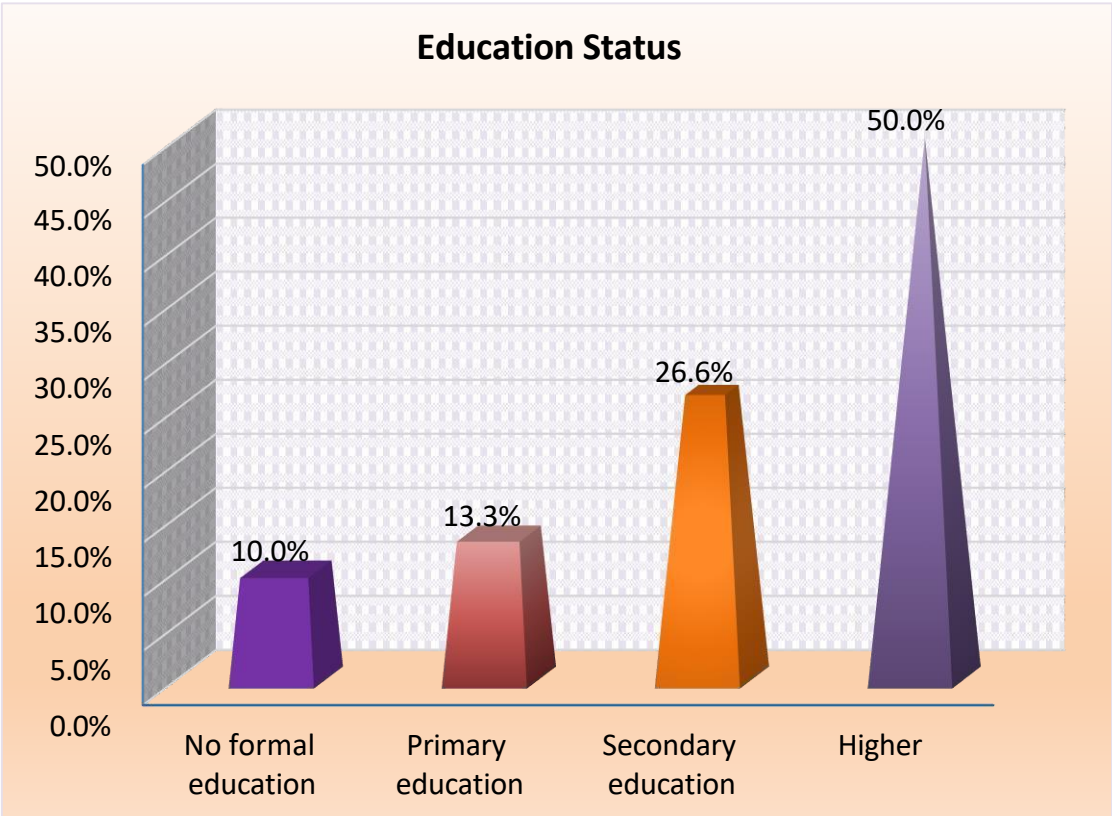

Figure: 2 Percentage wise distribution of the patient with diabetes according to the Education Status In terms of educational status, half of the participants 15 (50%) had higher education (graduate/postgraduate), 8 (26.67%) had secondary education, 4 (13.33%) had primary education, and 3 (10%) had no formal education.

Table 7: Association of the Causes of Delayed surgical wound healing among the patient with diabetes with selected demographic variables.

N=30

S. No	Demographic Variables	Categories	Completely Healed Ulcer F(%)	Healing in Progress F(%)	Delayed Healing F(%)	Poor Healing Progress F (%)	χ^2 / df / p-value
1.	Duration of Diabetes	Less than 5 years	1 (3.3)	2 (6.7)	6 (20.0)	2 (6.7)	χ^2=3.611, df=6, p=0.72 9 (NS)
		5–10 years	0 (0.0)	2 (6.7)	5 (16.7)	3 (10.0)	
		More than 10 years	0 (0.0)	1 (3.3)	4 (13.3)	4 (13.3)	
2.	Blood Sugar Control (HbA1c)	<7%	1 (3.3)	2 (6.7)	4 (13.3)	1 (3.3)	χ^2=4.284, df=9, p=0.89 1 (NS)
		7–8%	0 (0.0)	2 (6.7)	6 (20.0)	2 (6.7)	
		8.1–9%	0 (0.0)	1 (3.3)	3 (10.0)	3 (10.0)	
		>9%	0 (0.0)	0 (0.0)	2 (6.7)	3 (10.0)	

***Significance at p <0.05**

Table 7 presents the association between surgical wound healing and duration of diabetes and blood sugar control (HbA1c). Delayed healing was most common among patients with less than 5 years of diabetes (20.0%) and those with HbA1c levels of 7–8% (20.0%). Patients with longer duration (>10 years) showed equal proportions of delayed and poor healing (13.3%). Poor healing progress was higher among patients with HbA1c >9% (10.0%). Only a very small percentage of patients achieved complete healing across all categories. Overall, there was **no statistically significant association** between duration of diabetes, HbA1c levels, and surgical wound healing (p> 0.05).

N = 30

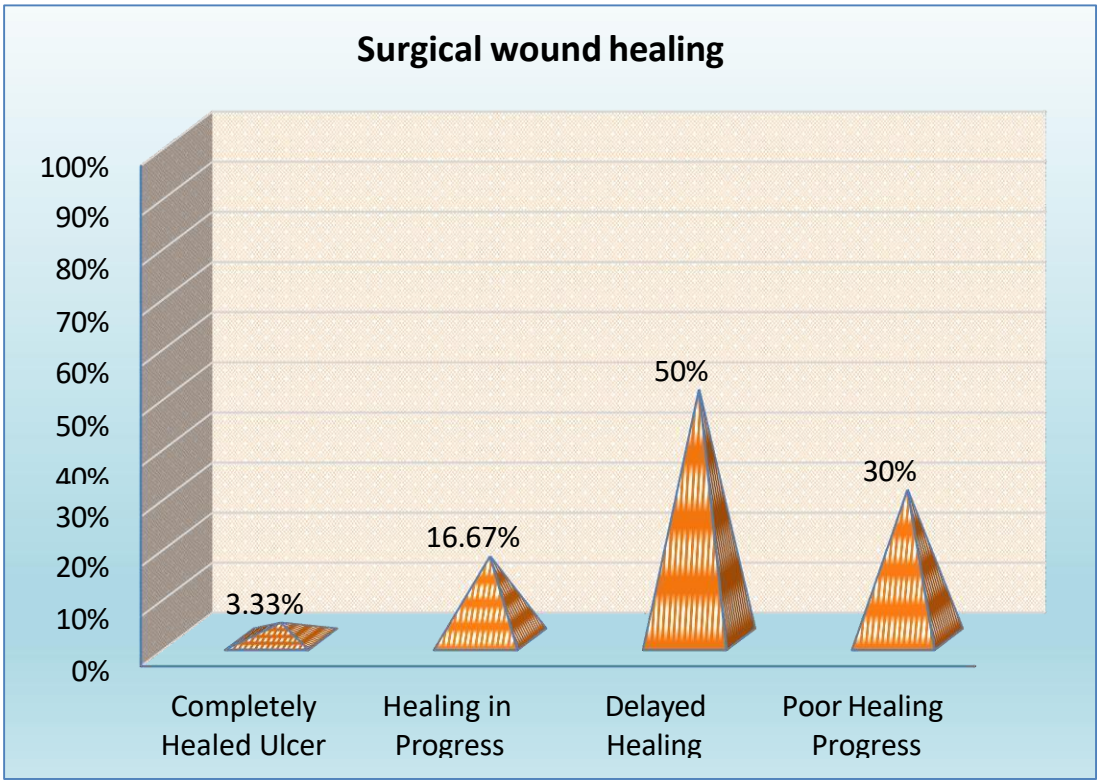

Figure 3: Percentage wise distribution of the surgical wound healing among the patient with diabetes.

Figure 3: Depicts the percentage distribution of surgical wound healing outcomes among patients with diabetes. The findings show that 50% of the patients experienced delayed healing, representing the largest proportion. Poor healing progress was observed in 30% of the patients, indicating a considerable number with unsatisfactory recovery. Meanwhile, 16.67% of the patients were in the stage of healing in progress, showing partial improvement. Only 3.33% of the patients achieved complete healing of ulcers, which is the smallest proportion. Overall, the figure indicates that a majority of diabetic patients had delayed or poor wound healing, emphasizing the impact of diabetes on the wound healing process.

III. RESULTS

- Majority (33.33%) were aged 46–60 years
- Equal gender distribution (50% male, 50% female)
- 60% were Hindu
- 46.67% were employed

Wound Healing Status

- Complete healing: 3.33%
- Healing in progress: 16.67%
- Delayed healing: 50%
- Poor healing: 30%

Association Findings

- No significant association with demographic variables ($p > 0.05$)
- Post-surgical days showed better healing progression

IV. DISCUSSION

The findings indicate that diabetes significantly delays wound healing due to impaired circulation, neuropathy, and immune dysfunction. Most patients experienced delayed or poor healing, consistent with existing literature.

The lack of significant association with demographic variables suggests that biological and clinical factors play a greater role than demographic characteristics.

V. CONCLUSION

The study concludes that delayed surgical wound healing is highly prevalent among diabetic patients. Post-surgical duration plays a significant role in healing, emphasizing the need for timely intervention and proper wound care.

NURSING IMPLICATIONS

Nursing Practice

- Early identification of delayed healing
- Proper wound care and glycemic control

Nursing Education

- Training in wound assessment tools (HEALD)

Nursing Administration

- Ensure availability of wound care resources

Nursing Research

- Promote further studies on wound healing interventions

RECOMMENDATIONS

- Conduct studies with larger samples
- Long-term follow-up studies
- Patient education programs
- Develop standardized wound care protocols

REFERENCES:

[1]. Abraham S, Mathew A. Risk factors associated with delayed wound healing in diabetics: A nursing perspective. Asian J Nurs Educ Res. 2020;10(1):56–61.
[2]. Bhat RG, Upadhyay P. Evaluation of surgical site infections in diabetics. Indian J Surg. 2012;74(6):479–483.
[3]. Chatterjee S, Mallik S. Surgical wound infections in diabetes: Prevention strategies. Int J Community Med Public Health. 2018;5(9):4004–4009.
[4]. Das A. Chronic wound healing: A review of current management and treatment options. J Clin Diagn Res. 2012;6(8):1441–1444.
[5]. Gopalan H, Fernandes J. Correlation between blood glucose levels and wound healing. Indian J Clin Nurs. 2015;6(4):22–27.
[6]. Kiran M, George S. Impact of glycemic control on surgical wound healing in diabetes. Kerala J Med Sci. 2014;17(2):45–50.
[7]. Mahajan A, Kaur S. An observational study of surgical wound healing in diabetic patients. Int J Nurs Educ Res. 2016;4(2):187–190.
[8]. Muthamilselvi G. Prevalence of malnutrition among hospitalized children. Int J Nurs Educ Res. 2014;2(3):189–191.
[9]. Muthamilselvi G, Sathyavathy G, et al. A study to assess the effectiveness of comprehensive nursing strategies on level of thirst distress among chronic kidney disease clients during hemodialysis. Int J Novel Res Dev. 2023;9.
[10]. Patel AV, Thakkar D. Evaluation of factors influencing delayed healing in diabetic
[11]. Sharma P, Gupta R. Role of infection in wound healing in diabetic patients. Indian J Clin Pract. 2014;25(5):450–455.
[12]. Singh N, Armstrong DG, Lipsky BA. Preventing foot ulcers in patients with diabetes. JAMA. 2005;293(2):217–228.

[13]. Singh V, Patil R. Study of surgical wound healing and infection in diabetes mellitus patients. Int Surg J. 2015;2(3):395–398.
[14]. Sathyavathy G. A study to assess the severity of gastro esophageal reflux disease by using FSSG among patients admitted at SMVMCH, Puducherry. Int Quest J Res Pharm Sci. 2024;10(6):29–34.
[15]. Sathyavathy G. Effectiveness of deep breathing exercises on reducing cancer pain and stress. Int J Renewable Energy Exchange. 2024;10(6):85–92.
[16]. Thomas J, Sebastian J. A study to identify wound healing complications among diabetics. Nurs J India. 2013;104(1):19–22.