International Journal Dental and Medical Sciences Research
Volume 7, Issue 6, Nov – Dec 2025 pp 232-239 www.ijdmsrjournal.com ISSN: 2582-6018

Extensive Study on Incidence and Risk Factors of Deep Vein Thrombosis in Asymptomatic Patients after Prolonged Surgery in Different age groups

1 Dr Asutosh Dhal, 2 Dr Pravat Kumar Majumdar, 3 Dr Durga Prasad Sahu
1. Post graduate resident Department of General Surgery, HI tech medical college and hospital, Bhubaneswar.
2. Associate professor Department of General Surgery, HI tech medical college and hospital, Bhubaneswar.
3. Post graduate resident Department of General Surgery, HI tech medical college and hospital, Bhubaneswar.

Date of Submission: 15-12-2025 Date of Acceptance: 25-12-2025

ABSTRACT
Introduction: Deep vein thrombosis is a significant postoperative complication associated with increased morbidity and mortality. Identifying risk factors and implementing preventive measures are crucial in surgical patients to reduce complications.
Objective: To determine the incidence of DVT among surgical patients and analyse the demographic and risk factors contributing to its occurrence.
Methodology: Data was collected from 100 patients undergoing surgical procedures. Patients were evaluated using duplex scanning for DVT diagnosis, and relevant demographic, clinical, and procedural data were collected. Factors such as age, type of surgery, duration of surgery, postoperative mobilization time were analysed.
Results: The incidence of asymptomatic DVT was 6%,throughduplex scanning. The majority of patients were middle-aged (40–59 years). Elective surgeries accounted for 77% of cases. Prolonged surgical durations (>420 minutes) were observed in 13% of cases, and delayed mobilization beyond nine days was seen in 15% of patients, both contributing to increased DVT risk.
Conclusion: Although the incidence of DVT was relatively low, the study highlights the importance of early screening, thromboprophylaxis, and timely postoperative mobilization. Patients with prolonged operative times require targeted preventive strategies.
Keywords: Deep vein thrombosis, surgical complications, thromboprophylaxis, duplex scan, risk factors, postoperative mobilization.

I. INTRODUCTION

Deep vein thrombosis (DVT) is a serious postoperative complication that significantly contributes to patient morbidity and mortality. It occurs when blood clots form in the deep veins, typically in the lower extremities, and can lead to life-threatening conditions such as pulmonary embolism (PE) (1,2). DVT is a central component of venous thromboembolism (VTE), the third leading cause of cardiovascular death after myocardial infarction and stroke(2).The pathogenesis of DVT is best explained by Virchow's Triad—venous stasis, endothelial injury, and hypercoagulability—which collectively promote thrombus formation (1,3,4). Thrombi typically develop in areas of reduced blood flow near venous valves, where hypoxia triggers prothrombotic responses including the expression of P-selectin, which recruits immune cells bearing tissue factor(4,5). Structurally, a venous thrombus consists of an inner white thrombus rich in platelets and an outer red thrombus composed primarily of fibrin and red blood cells, with extracellular DNA and fibrin forming a scaffold that influences thrombolytic response (6,7). Risk factors for DVT include prolonged immobility, surgical trauma, obesity, cancer, oral contraceptive use, and aging—all of which increase blood viscosity or activate clotting pathways (1,4,8). Notably, major surgeries such as orthopedic or abdominal procedures significantly increase DVT risk, with knee and hip replacements among the highest contributors (13–16). Studies report a DVT incidence of 15–40% in major surgeries, with autopsy findings showing that up to 50% of hospitalized deaths are associated with DVT, and PE occurs in 10–30% of cases with proximalDVT (9–12). Although historically believed to be less prevalent among Asians and Indians, emerging data report incidences ranging from 1.3% after spinal surgery to 41.7% after colon surgery, suggesting underestimation due to frequent asymptomatic presentation and limited studies in these populations (13–18). Men, older adults, smokers, and obese individuals are particularly at risk, with recurrence being more common in males (1,19). The clinical challenge is compounded by the high rate of silent DVTs, especially in postoperative cardiac patients, which often go

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undiagnosed until complications arise (19,20). Despite the availability of effective thromboprophylaxis—including early mobilization, anticoagulants, and mechanical devices—DVT remains under-recognized, with public awareness far lower than that for heart attacks or strokes (21,22). This highlights the urgent need for comprehensive, region-specific research to better understand DVT risk and outcomes in Indian populations. This study aims to fill this gap by investigating the incidence, risk factors, and effectiveness of current prophylactic strategies for postoperative DVT in Indian surgical patients, thereby contributing to evidence-based guidelines and improved patient outcomes.

II. MATERIALS AND METHOD

This prospective observational study, conducted in the Department of General Surgery, evaluates the incidence of deep vein thrombosis (DVT)in a symptomatic patients following prolonged surgical procedures over a 12-month period. The study includes all patients aged 18 and above who underwent elective or emergency surgeries lasting more than two hours, with a final sample size of 100 patients. Exclusion criteria include patients with pre-existing DVT, those on anticoagulant therapy, or those who underwent cardiac or vascular surgeries. Data collection involved handheld Doppler ultrasonography on postoperative days 2, 5, and 7 to detect early thrombotic changes. Additional data were gathered through patient history, surgical details, haematological investigations, lipid profile analysis, and intraoperative blood loss assessments. Statistical analysis was performed using Excel, with categorical variables presented as frequency and percentage.

III. RESULTS

This study analysed 100 patients to determine the incidence and risk factors of deep vein thrombosis (DVT). It examines demographic, surgical related factors, and key clinical outcomes, including Doppler and duplex scan findings. Results highlight DVT occurrence patterns, associated risk factors, and treatment interventions. Data is presented in tables and graphs for clear interpretation.

Table1: Distribution Of Study Population According To Age

AGE	N	%
<20	1	1
20-39	30	30
40-59	55	55
>60	14	14
TOTAL	100	100

Table no. 1 shows that the majority of patients fall within the 40–59 age group, comprising 55% of the total sample. This is followed by the 20–39age group, which accounts for 30% while participants aged 60 and above make up 14% .The least signified group is those under 20 years old, constituting only 1% .The distribution shows that the condition under study is more prevalent in middle aged individuals, with fewer cases observed in younger and older populations.

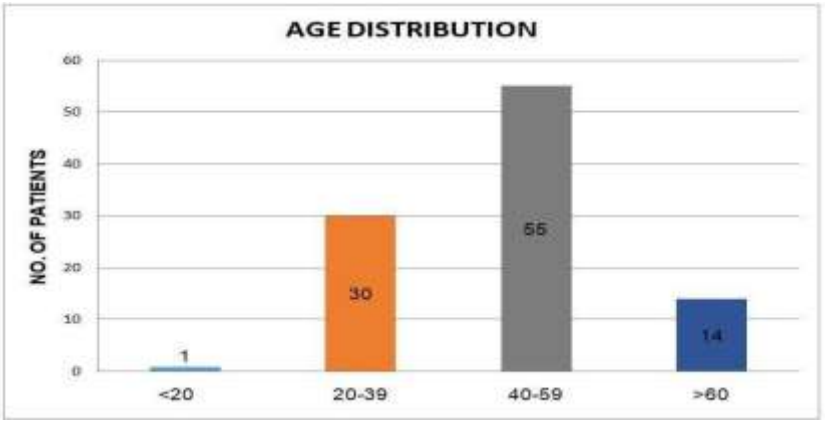

Figure 1-Age Distribution Of The Patients

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Table 2: Distribution Of Study Population According To Nature Of Surgeries

SURGERYTYPE	N	%
ELECTIVE	77	77
EMERGENCY	23	23
TOTAL	100	100

Table no. 2 reveals that the majority of procedures were elective, accounting for 77% of the total cases. In contrast, emergency surgeries comprised 23% of the cases. This indicates that most patients underwent planned surgical interventions, while a smaller proportion required urgent or unplanned procedures. The higher percentage of elective surgeries shows better preoperative preparation and management, whereas emergency surgeries likely involved critical or unforeseen medical conditions requiring immediate attention.

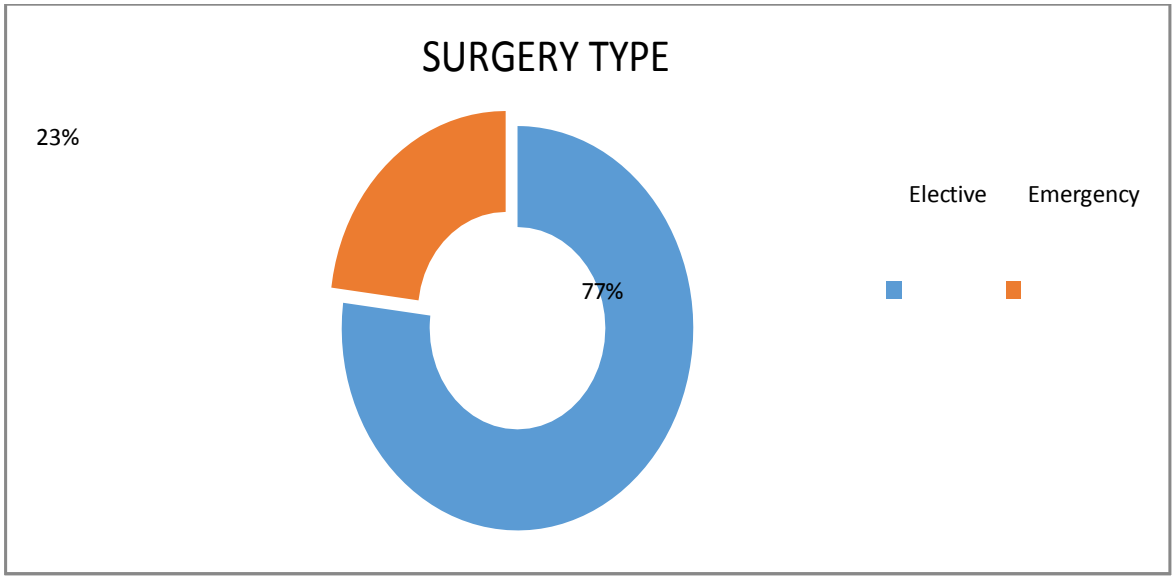

Figure 2-Percentage Of Nature Of Surgeries

Table 3: Distribution Of Study Population According To Time Duration Of Surgeries

TIMEDURATION(Minutes)	NO. OFPATIENTS	%
120-180	22	22
181-240	14	14
241-300	16	16
301-360	19	19
361-420	16	16
>420	13	13
Total	100	100

Table no. 3 shows the distribution of patients based on the duration of time spent, with data categorized into specific time intervals. The majority of patients, 22in total, spent between 120 to 180 minutes, showing that this range is the most common duration for patient visits. A slightly lower number of patients (14) spent between 181 to 240 minutes, indicating a decrease in visit durations as the time increases. For patients spending 241 to 300 minutes, the number is 16, showing a moderate frequency in this category. The 301 to 360-minute range follows closely with 19 patients, while the 361 to 420-minute group saw a similar count of 16 patients. The smallest number of patients, 13, were in the >420minute category, indicating that fewer patients required extended visits beyond 7 hours. Overall, the distribution shows a concentration of patients with shorter visit durations, with a gradual decline as time increases, and a noticeable drop-off in visits longer than 7 hours.

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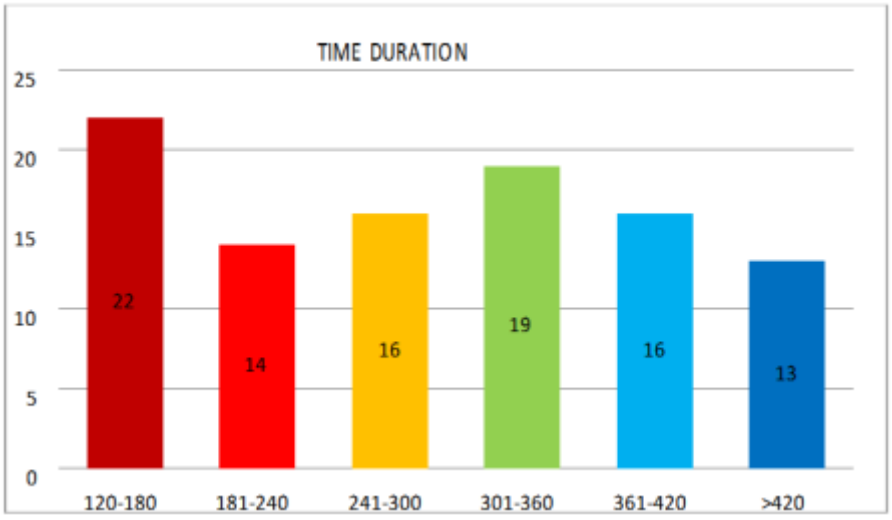

Figure 3-Time Duration Distribution

Table 4: Distribution Of Study Population According To Mobilization Time

NO.OFDAYS	NO. OFPATIENTS	%
1-3	31	31
4-6	28	28
6-9	26	26
>9	15	15
TOTAL	100	100

The table no. 4provides a breakdown of the number of patients across different day intervals. The largest group, with 31 patients, fallsintothe1-3dayrange, indicating that the majority of patients required care for this period. The second highest number of patients, 28, were in the 4-6 day range, showing a significant portion of patients needing relatively short-term care. There were 26 patients in the 6-9 day category, showing a moderate demand for care over this duration. The smallest group, with 15 patients, falls into the >9 day category, indicating that fewer patients required extended care beyond 9 days. Overall, the data shows that most patients required care for up to 9 days, with a smaller number needing longer stays.

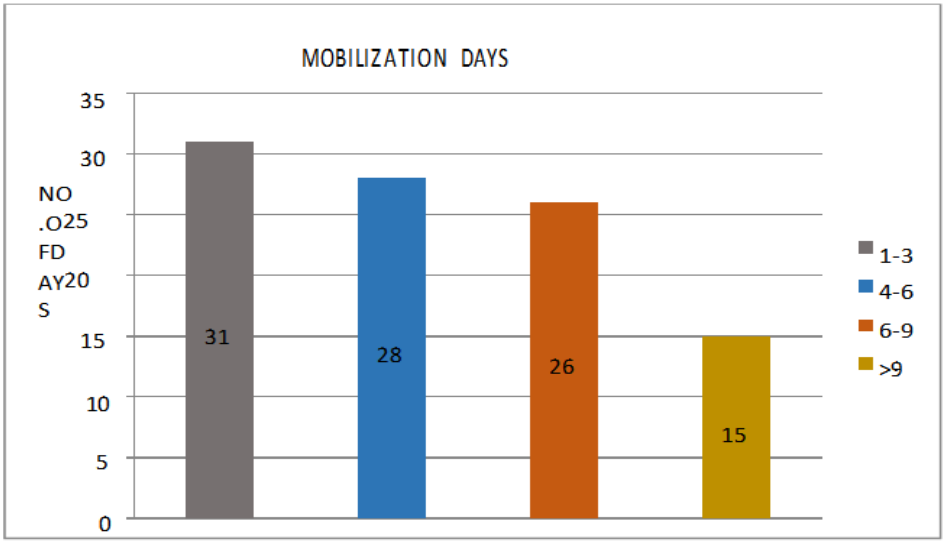

Figure4-Distribution Of Study Population According To Mobilization Time

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Table 5: Distribution Of Study Population According To Doppler Findings

DOPPLERTYPE	ABNORMAL	NORMAL
POD2	0	100
POD5	2	98
POD7	6	94

In table no. 5 the Doppler findings over different postoperative days (POD) indicate a gradual improvement in vascular status. On POD 2, none of patients showed abnormal Doppler findings. By POD 5, the percentage of abnormal findings increased to 2%, with higher number of (98%) patients having normal Doppler readings. By POD 7, the trend continued, with abnormal findings minimally increasing further to 6% and normal findings decreasing to 94%. This shows a progressive recovery in vascular flow post-surgery, possibly due to healing processes and improved circulation over time.

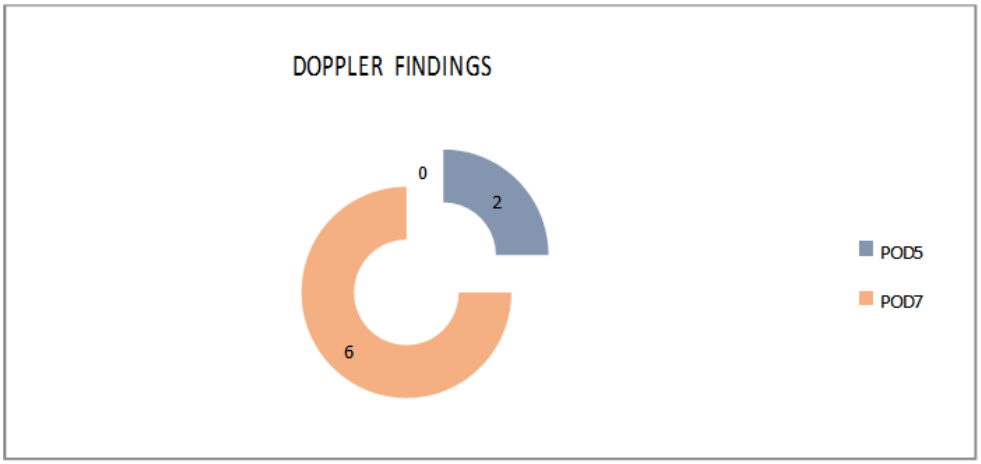

Figure 5-Doppler Findings

Table 6:Diagnosis of Dvt From Duplex Scan

DVT	NO. OFPATIENTS	%
YES	6	6
NO	94	94
TOTAL	100	100

The table no. 6 shows the incidence of deep vein thrombosis (DVT) among patients. It shows that6%ofpatients tested positive for DVT, while 94% did not have DVT.

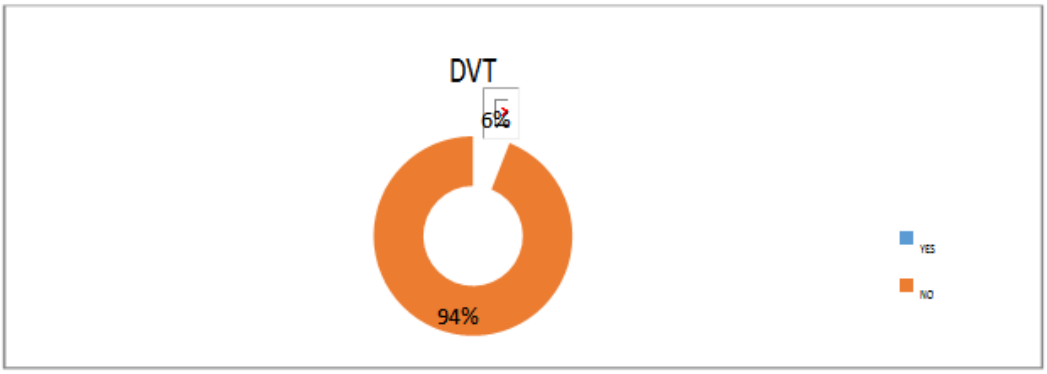

Figure 6-Incidence Of Deep Vein Thrombosis

IV. DISCUSSION

Deepveinthrombosis (DVT) remains a significant clinical concern, particularly among patients undergoing surgery or those with predisposing risk factors. Understanding the role of age, surgical category, length of hospital stay, postoperative vascular recovery in the incidence of DVT can provide valuable insights for improving patient care. The study found that most DVT patients were between40–59 years old (55%), followed by those aged 20–39(30%). Seniors (60+) made up 14%, while those under 20werejust1%. These findings align with several previous studies, which consistently show that age is a major risk factor for DVT, especially in hospitalized or critically ill patients.

Research by Harris et al. (1997) and Zhang et al. (2022) supports this, indicating that DVT risk increases with age (23, 24). Lorchaivej et al. (2022) and Li et al. (2022) also identified older adults—especially those post-surgery or critically ill—as high-risk groups needing targeted prevention (25, 26). Additionally, Glise Sandblad et al. (2022) found that older DVT patients are more prone to complications like pulmonary embolism (PE), while Tsai et al. (2002) confirmed that age is a strong predictor of DVT in the general population (27, 28). Pawar et al. (2020) reported a similar peak in DVT cases among 41–60-year-olds, reinforcing current findings. The evidence strongly, suggests that middle-aged and older adults face a higher risk of DVT, emphasizing the need for age-focused screening and preventive care, especially in surgical and critical care settings (29).

Our study shows that most surgeries were elective (77%),with emergency surgeries making up 23%, which is consistent with existing research. Ross etal. (2020) found that emergency procedures carry a higher risk of thrombosis due to limited pre-op preparation. This supports the need for individualized risk assessment in urgent cases. However, even elective surgeries are not without risk (30). Regarding patient length of stay, our data shows that the majority of patients (31) required hospitalization for 6-9 days, followed by 28 patients staying for 1-3 days (Table 4).The need for extended care beyond 9 days was observed in a smaller subset (15 patients).These findings indicate that while most surgical cases require a moderate duration of care, a fraction of patients necessitate prolonged hospitalization, potentially due to post operative complications such as DVT or infections. The gradual decline in patient numbers as the length of stay increases further highlights the efficiency of post operative management in elective procedures. The Doppler findings from Table 6 indicate a progressive improvement in vascular circulation after surgery. On post operative day(POD) 2, 52% of patients showed normal results, and none had abnormal findings. By POD 5, normal results increased to 98%, with only 2% abnormalities. Interestingly, POD 7 findings (Table 5) showed 94% normal and 6% abnormal, indicating ongoing vascular recovery as healing and mobilization progressed. These trends support previous research. Salahudheen etal. (2023) found a2% incidence of asymptomatic DVT on PODs 2, 5, and7, confirming Doppler's role in early detection(31). Borde etal. (2017) also reported a 12.08% DVT rate using biweekly Doppler scans in neurosurgical patients, linking risks to prolonged surgery, motor deficits, and delayed ambulation (32). Muleledhu et al.(2013) identified a 5% DVT prevalence in major abdominal surgery cases, highlighting cancer as a key risk factor (33). Collectively, these findings demonstrate that Doppler ultrasonography is a valuable tool for postoperative vascular assessment, enabling early DVT detection and improving outcomes through timely intervention.

The results of this study reveal a 6% incidence of deep vein thrombosis (DVT) detected by duplex ultrasound, as shown in Table 6. This finding aligns closely with Basindwah et al. (2023), who reported a 6.1% prevalence of asymptomatic DVT, particularly among patients with lumbar stenosis and spondylolisthesis. Their study underscores the potential benefit of routine preoperative DVT screening, especially in high-risk individuals (20). Similarly, Lorchaivej et al. (2022) observed a 5.4% incidence of postoperative DVT in patients undergoing gynecologic surgery (25), while Harris et al. (1997)reported a 7.5%incidence of major DVT in surgical ICU patients, particularly those with elevated APACHE II scores (23). Collectively, these findings underscore the clinical burden of DVT and highlight the importance of early detection, risk stratification, and tailored thromboprophylaxis in surgical and critically ill patient populations. Additional contributors included advanced age and perioperative blood transfusion, reinforcing the importance of individualized thromboprophylaxis strategies for high-risk populations (25).

Schwann et al. (2007) highlighted the broader impact of DVT by reporting a 13% incidence, with risk factors such as prolonged mechanical ventilation, blood transfusions, and reintubation linked to increased in-hospital mortality, longer hospital stays, and higher

readmission rates (19). This emphasizes the need for targeted prevention approaches that combine both pharmacological and mechanical methods.

V. CONCLUSION

The study found that 6% of patients developed asymptomatic deep vein thrombosis (DVT), detected through duplex scanning. Most affected individuals were middle-aged, with a higher number of male patients, suggesting possible gender and age-related risk factors. Delayed postoperative mobilization, especially beyond 9 days, appeared to contribute to DVT development. Doppler scans showed a gradual increase in abnormal findings, with 6% of cases identified by the seventh postoperative day. The results emphasize the importance of early screening, timely mobilization, and preventive measures for DVT, especially in high-risk surgical patients.

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