Chapter 5

Results

The chapter 5 presents the findings of the randomized controlled trial comparing the feasibility and safety of pneumoperitoneum creation using the Veress needle at three different anatomical points—supraumbilical, Palmer's, and Jain's points—in laparoscopic surgeries at a tertiary care center. The results are analyzed based on key parameters, including ease of needle insertion, time taken for insufflations, rate of successful entry, complications encountered, and overall safety profile. Statistical comparisons highlight the efficacy of each technique, providing insights into the most optimal approach for safe and efficient pneumoperitoneum establishment in laparoscopic procedures.

5.1.Demographic Analysis

The demographic distribution of participants in Table 5.1 reveals that the majority belong to the 31-45 years age group, accounting for 44.1% at Supraumbilical points, 45.6% at Palmer's points, and 48.5% at Jain's points. The youngest group (18-30 years) constitutes the smallest proportion, ranging from 16.2% to 19.1%, while the older group (46-60 years) shows a decreasing trend with 39.7% at Supraumbilical points, 35.3% at Palmer's points, and 32.4% at Jain's points. In terms of gender, females outnumber males across all study points, representing 55.9% at Supraumbilical and Palmer's points, and 63.2% at Jain's points, while males range between 36.8% and 44.1%.

Regarding BMI classification, most participants fall within the normal BMI range (18.5-24.9), constituting 44.1% at all study points, followed by overweight individuals (29.4%) and obese individuals (19.1%). A small proportion (7.4%) is underweight, showing consistency across all study points. Socioeconomic status distribution varies, with the low socioeconomic group being most prevalent at Supraumbilical points (36.8%) compared to Palmer's (33.8%) and Jain's points (29.4%), while the middle class shows a fluctuating trend, and the high socioeconomic group is highest at Palmer's points (39.7%).

Among comorbidities, hypertension is the most prevalent condition, affecting 47.1% at Supraumbilical points, 44.1% at Palmer's points, and 45.6% at Jain's points. Diabetes is also significantly present, highest at Palmer's points (52.9%) compared to Supraumbilical (45.6%) and Jain's points (42.6%). Other comorbid conditions show a similar prevalence of 48.5% at Supraumbilical and Palmer's points, but a markedly higher prevalence of 63.2% at Jain's points. These results indicate a predominantly middle-aged, female-dominant sample, with most individuals falling within a normal BMI range and exhibiting a significant burden of comorbidities, particularly hypertension and diabetes. Socioeconomic differences suggest potential variations in health conditions and access to care across different study points (Figure 5.1-5.12).

Table 5.1: Demographic Distribution of Participant

Parameters	**Supraumbilical points N (%)**	**Palmer's points N (%)**	**Jain's points N (%)**
Age Group (Years)			
18-30	11 (16.2%)	13 (19.1%)	13 (19.1%)
31-45	30 (44.1%)	31 (45.6%)	33 (48.5%)
46-60	27 (39.7%)	24 (35.3%)	22 (32.4%)
Gender			
Male	30 (44.1%)	30 (44.1%)	25 (36.8%)

Female	38 (55.9%)	38 (55.9%)	43 (63.2%)
BMI			
<18.5 (Underweight)	5 (7.4%)	5 (7.4%)	5 (7.4%)
18.5-24.9 (Normal)	30 (44.1%)	30 (44.1%)	30 (44.1%)
25-29.9 (Overweight)	20 (29.4%)	20 (29.4%)	20 (29.4%)
>30 (Obese)	13 (19.1%)	13 (19.1%)	13 (19.1%)
Socioeconomic Status			
Low	25 (36.8%)	23 (33.8%)	20 (29.4%)
Middle	22 (32.4%)	18 (26.5%)	23 (33.8%)
High	21 (30.9%)	27 (39.7%)	25 (36.8%)
Comorbidities			

Hypertension	32 (47.1%)	30 (44.1%)	31 (45.6%)
Diabetes	31 (45.6%)	36 (52.9%)	29 (42.6%)
Other	33 (48.5%)	33 (48.5%)	43 (63.2%)

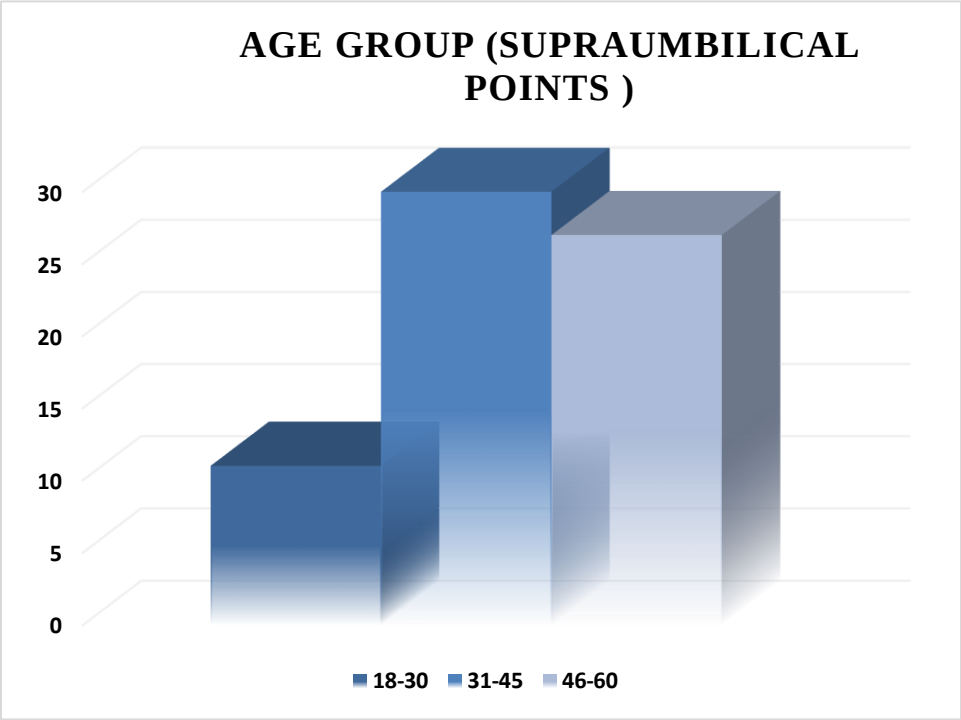

Figure 5.1:Comparison of Participant among the category of Age Group (Supraumbilical points)

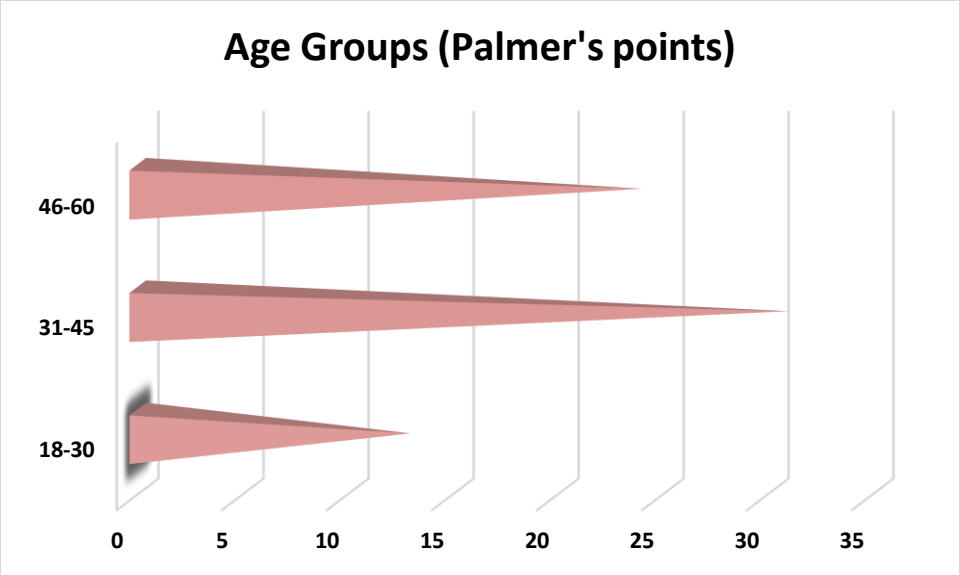

Figure 5.2:Comparison of Participant among the category of Age Group (Palmer'spoints)

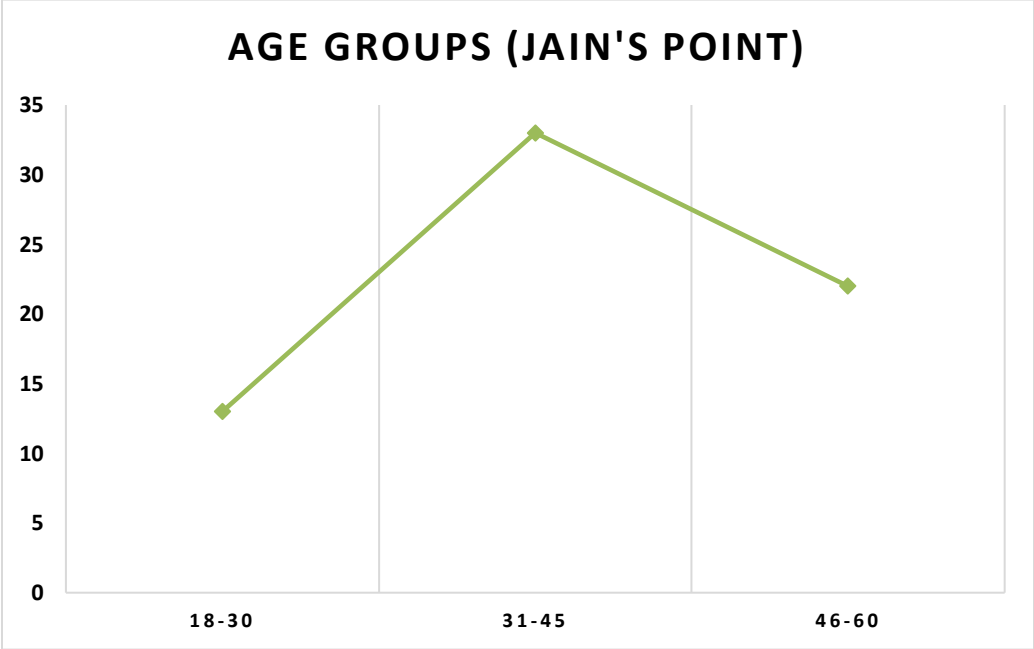

Figure 5.3:Comparison of Participant among the category of Age Group (Jain's points)

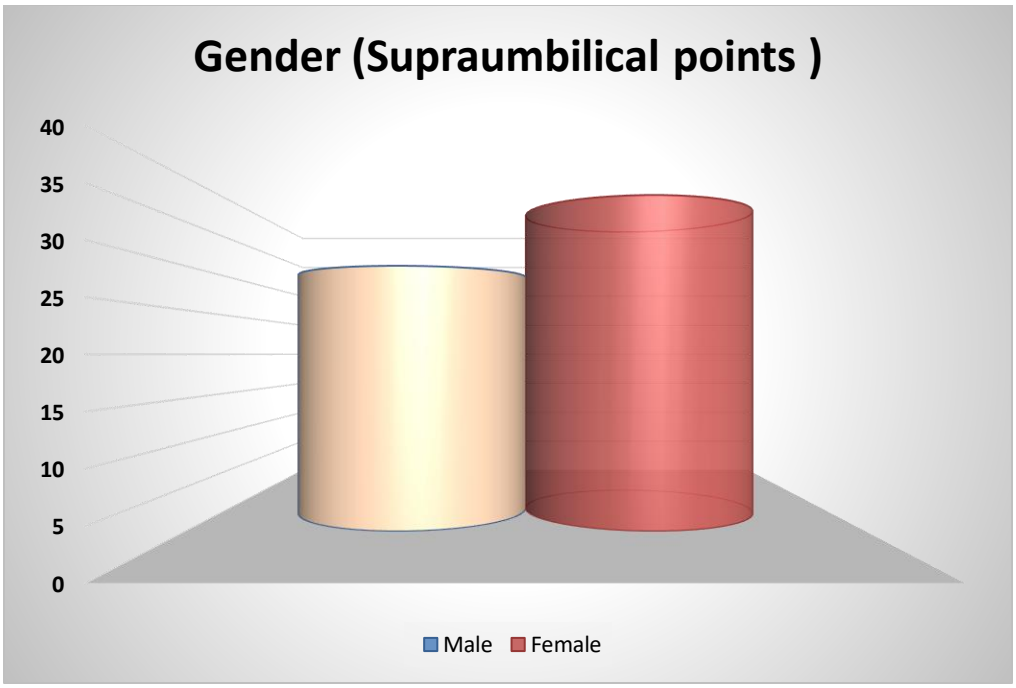

Figure 5.4: Comparison of Participant among the category of Gender Group (Supraumbilical points)

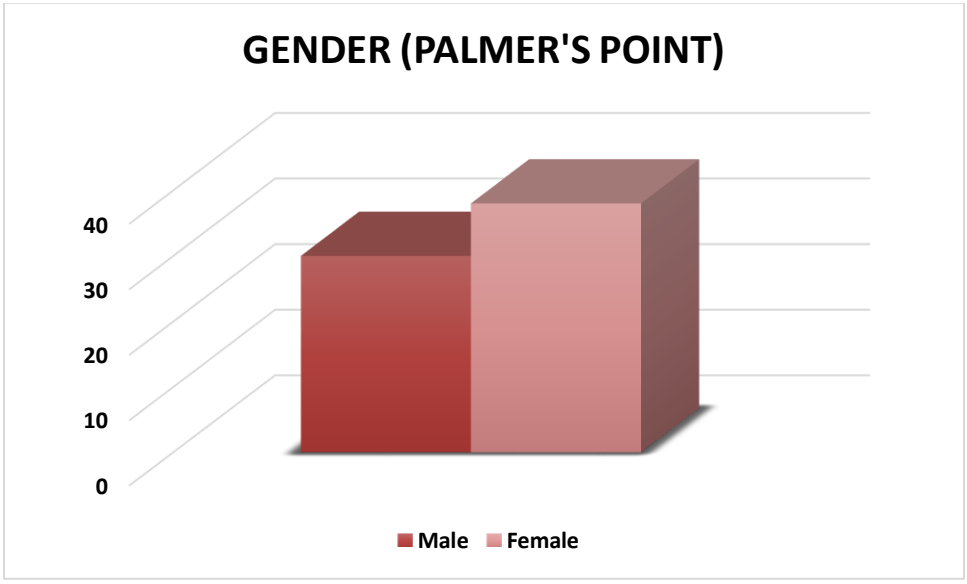

Figure 5.5: Comparison of Participant among the category of GenderGroup (Palmer's points)

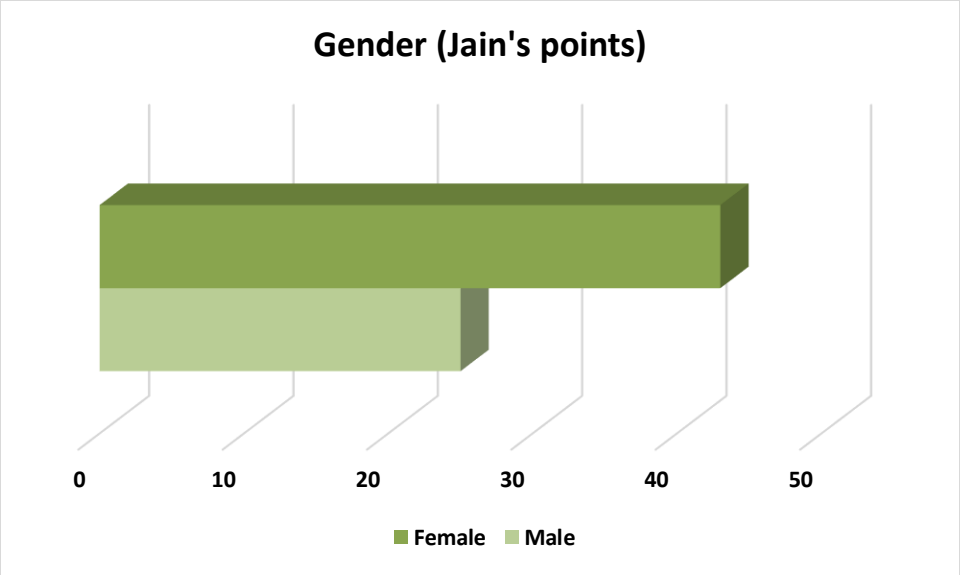

Figure 5.6: Comparison of Participant among the category of Gender Group (Jain's points)

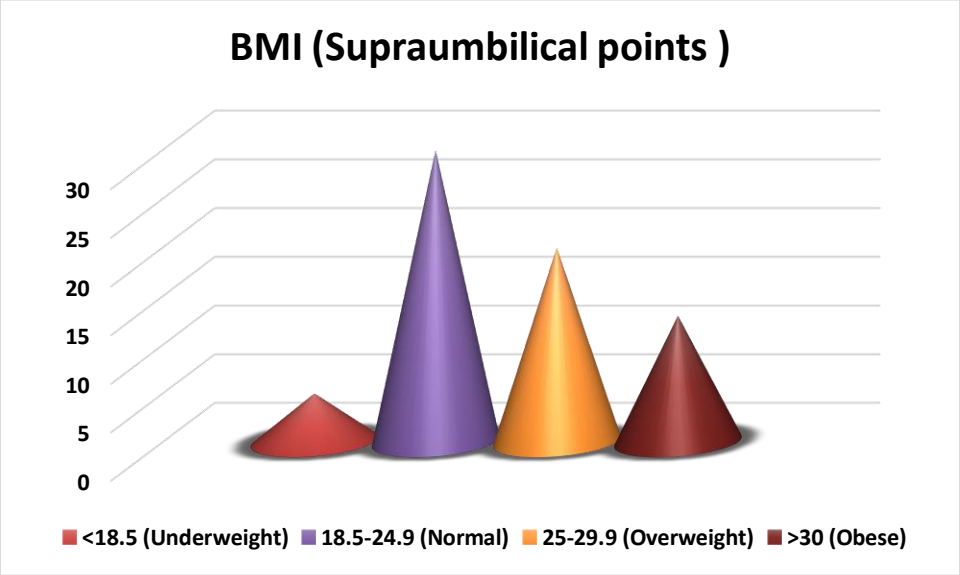

Figure 5.7: Comparison of Participant among the category of BMI (Supraumbilical points)

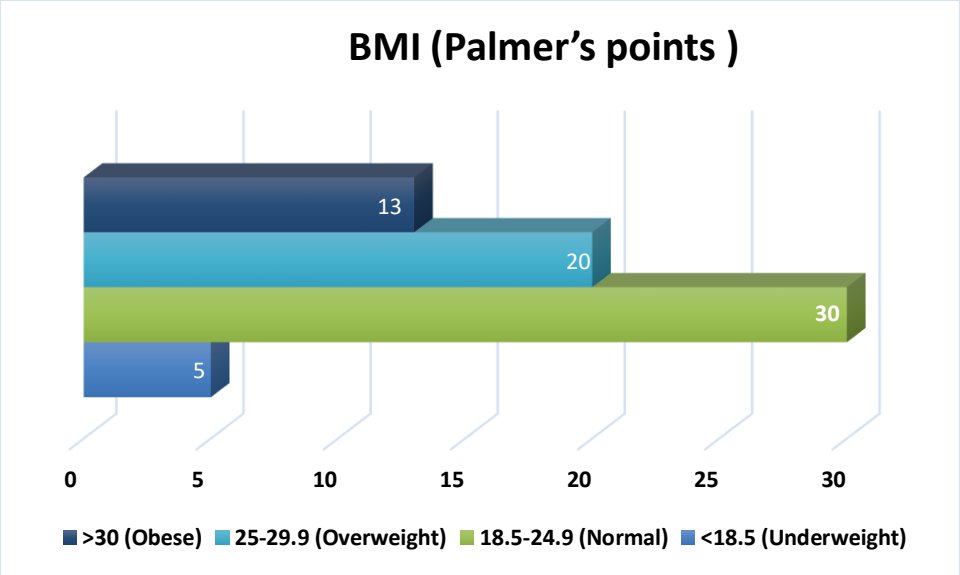

Figure 5.8: Comparison of Participant among the category of BMI (Palmer's points)

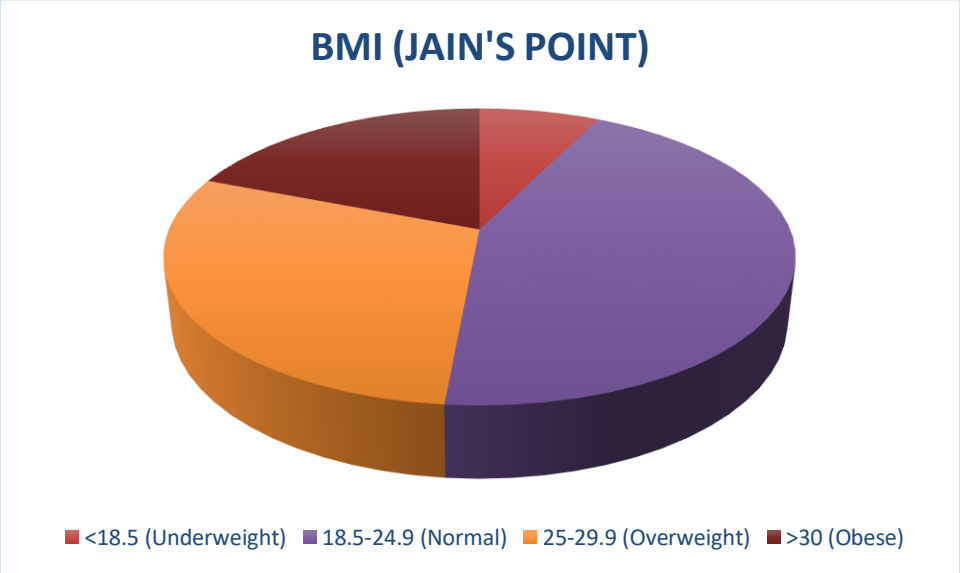

Figure 5.9: Comparison of Participant among the category of BMI (Jain's points)

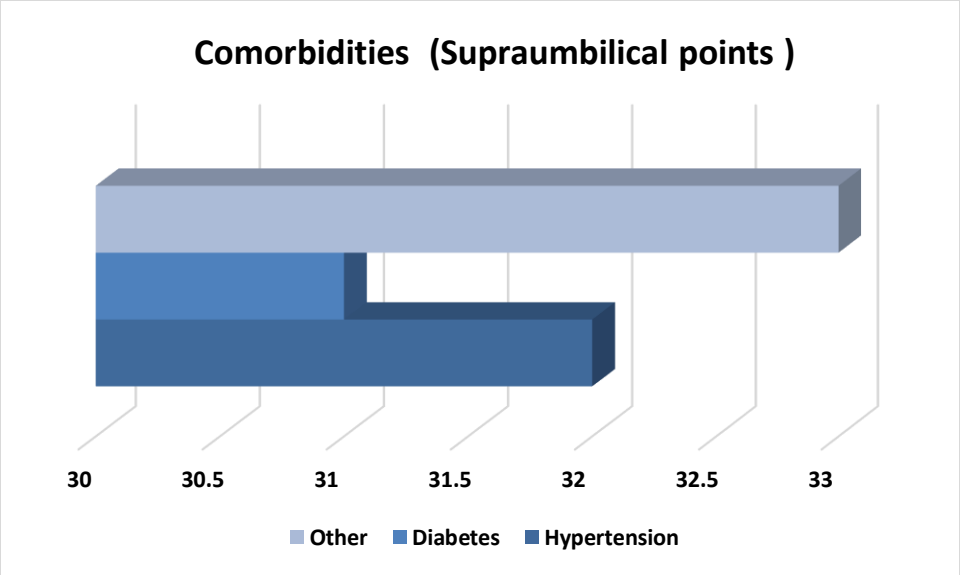

Figure 5.10: Comparison of Participant among the category of Co morbidities (Supraumbilical points)

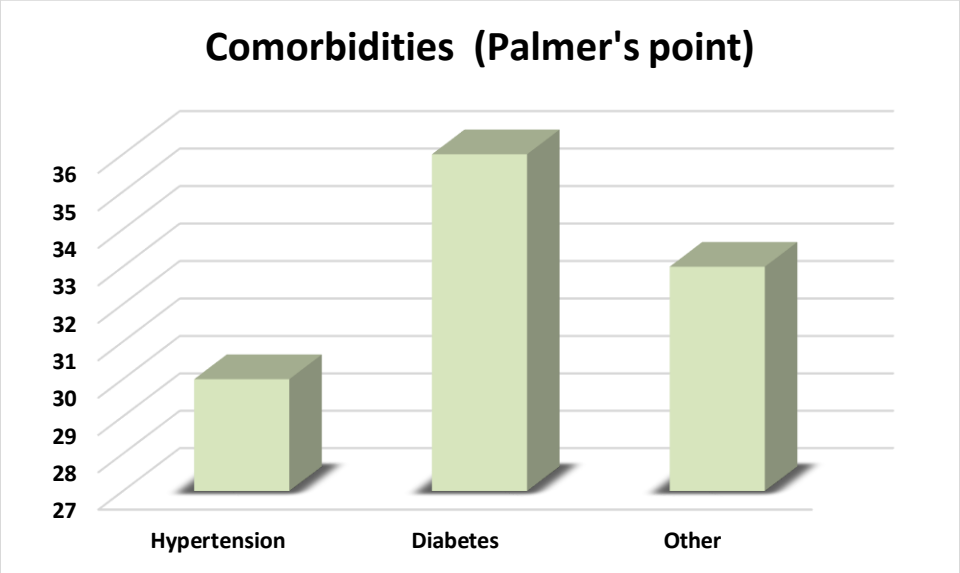

Figure 5.11:Comparison of Participant among the category of Comorbidities (Palmer's points)

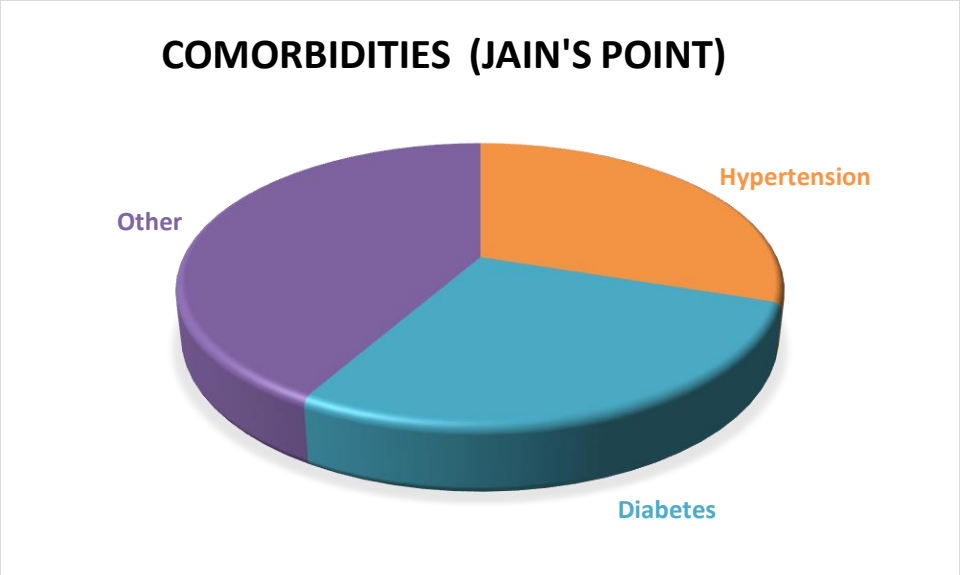

Figure 5.12:Comparison of Participant among the category of Comorbidities (Jain's points)

5.2.Preoperative Assessment

- **Clinical Parameters**

The preoperative abdominal examination results in Table 5.2 indicate that the majority of participants had a normal abdominal finding, with the highest percentage at Palmer's points (86.8%), followed by Jain's points (83.8%) and Supraumbilical points (75.0%), suggesting that most individuals did not exhibit any abnormalities. Adhesions were observed in a smaller subset, with the highest occurrence at Supraumbilical points (14.7%), followed by Jain's points (11.8%), while Palmer's points had the lowest incidence (5.9%), indicating a lower prevalence of adhesions at Palmer's points compared to the other two. Anatomical variations were the least frequent finding, with the highest prevalence at Supraumbilical points (10.3%), followed by Palmer's points (7.4%), and the lowest at Jain's points (4.4%). These results highlight that normal findings were predominant across all study points, while adhesions and anatomical variations were relatively uncommon, with a slightly higher incidence at Supraumbilical points (Figure 5.13-5.15).

Table 5.2: Preoperative Abdominal Examination

Abdominal Finding	Supraumbilical points N (%)	Palmer's points N (%)	Jain's points N (%)

Normal	51 (75.0%)	59 (86.8%)	57 (83.8%)
Adhesions	10 (14.7%)	4 (5.9%)	8 (11.8%)
Anatomical Variations	7 (10.3%)	5 (7.4%)	3 (4.4%)

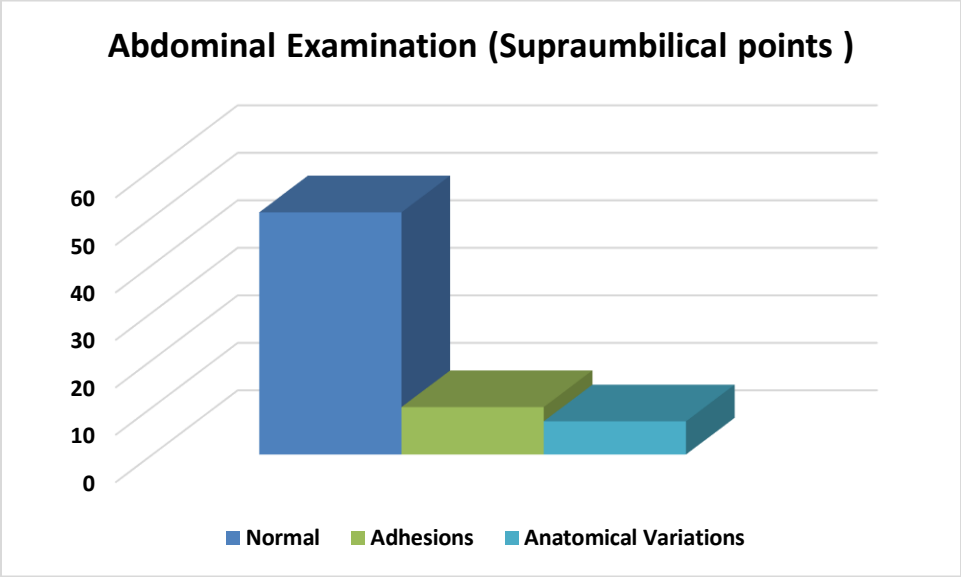

Figure 5.13: Distribution of Preoperative Abdominal Examination Findings Across Supraumbilical points

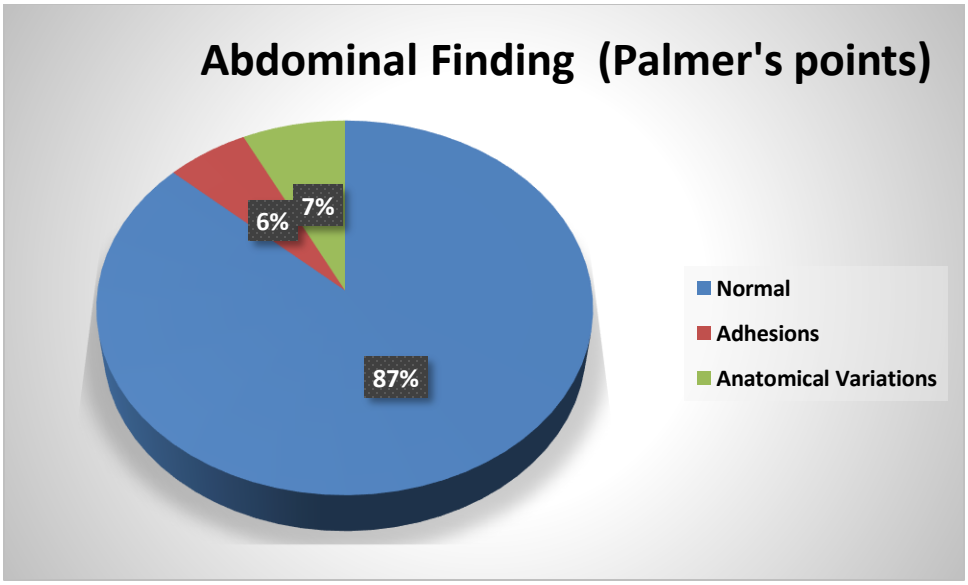

Figure 5.14:Distribution of Preoperative Abdominal Examination Findings Across Palmer's Points

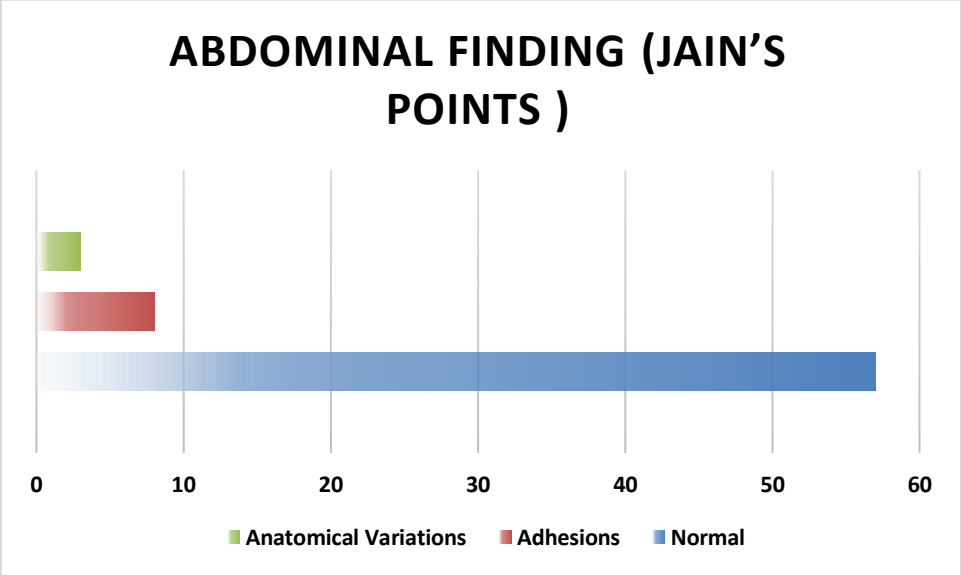

Figure 5.15:Distribution of Preoperative Abdominal Examination Findings Across Jain's Points

5.3.Intraoperative Assessment

- **Time Taken for Pneumoperitoneum Creation**

The findings from Table 5.3 highlight a statistically significant difference in the time required for pneumoperitoneum creation across different entry sites, with an F-value of 169.13 and a highly significant P-value of 0.001*. Among the three sites, Palmer's point demonstrated the shortest mean time (84 ± 8 seconds), followed by the supraumbilical point

(111 ± 9 seconds), while Jain's point took the longest (124 ± 10 seconds). The considerable variation in time suggests that Palmer's point may offer a more efficient and rapid approach for pneumoperitoneum establishment, potentially reducing procedural duration and improving operative efficiency. Conversely, the longer time required at Jain's point may indicate technical challenges or anatomical considerations that could slow down the process. These findings emphasize the importance of selecting the most optimal site for entry, particularly in time-sensitive surgical scenarios, where minimizing procedural delays can enhance patient outcomes and surgical workflow (Figure 5.16).

Table 5.3: Comparison of Time Taken for Pneumoperitoneum Creation Across Different Entry Sites

Site of Pneumo	**Mean ± SD (Times in Second)**	**F-Value**	**P-Value**
Supraumbilical points	111 ± 9 sec (1 min 51 sec)	169.13	0.001*
Palmer's points	84 ± 8 sec (1 min 24 sec)		
Jain's points	124 ± 10 sec (2 min 04 sec)		

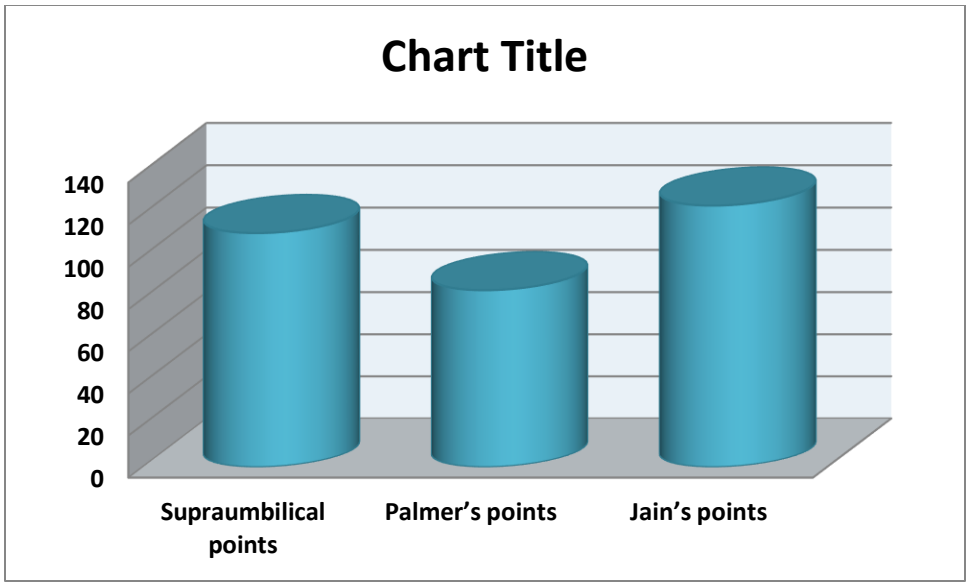

Figure 5.16: Mean Time Taken for Pneumoperitoneum Creation at Different Entry Sites

- **Number of Attempts for Successful Entry**

The results from Table 5.4 indicate a significant difference in the number of attempts required for successful entry across the three pneumoperitoneum sites. Palmer's point had the highest success rate on the first attempt, with 97.1% (66 out of 68 cases) requiring only a single attempt, followed by Jain's point with 91.2% (62 out of 68 cases), and the supraumbilical point with the lowest first-attempt success rate at 88.2% (60 out of 68 cases). Multiple attempts were required most frequently at the supraumbilical site (11.8%), followed by Jain's point (8.8%), and least at Palmer's point (2.9%). The chi-square value of 3.8 and a significant p-value of 0.001 suggest a meaningful difference in entry success rates among these sites. These findings highlight Palmer's point as the most reliable entry site, demonstrating the highest first-attempt success rate and the lowest need for multiple attempts, which could contribute to increased procedural efficiency and reduced complications (Figure 5.17-5.19).

Table 5.4: Comparison of Number of Attempts Required for Successful Entry Across Different Sites

Group	Single Attempt (n, %)	Multiple Attempts (n, %)	Chi-square	*p*-value

Supraumbilical	60 (88.2%)	8 (11.8%)	3.8	0.001
Palmer's Point	66 (97.1%)	2 (2.9%)		
Jain's Point	62 (91.2%)	6 (8.8%)		

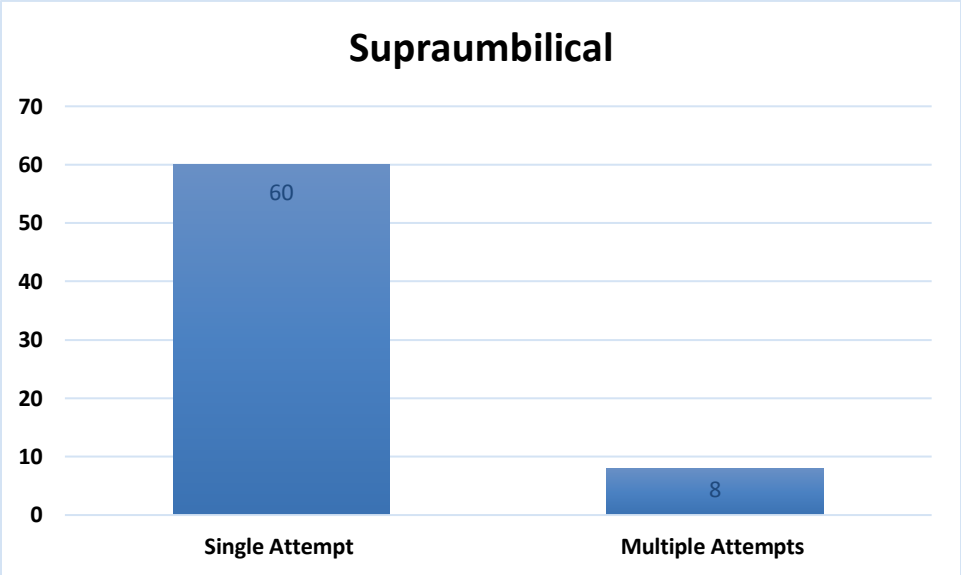

Figure 5.17: Success Rate of Single vs. Multiple Attempts for Pneumoperitoneum Supraumbilical Entry Point

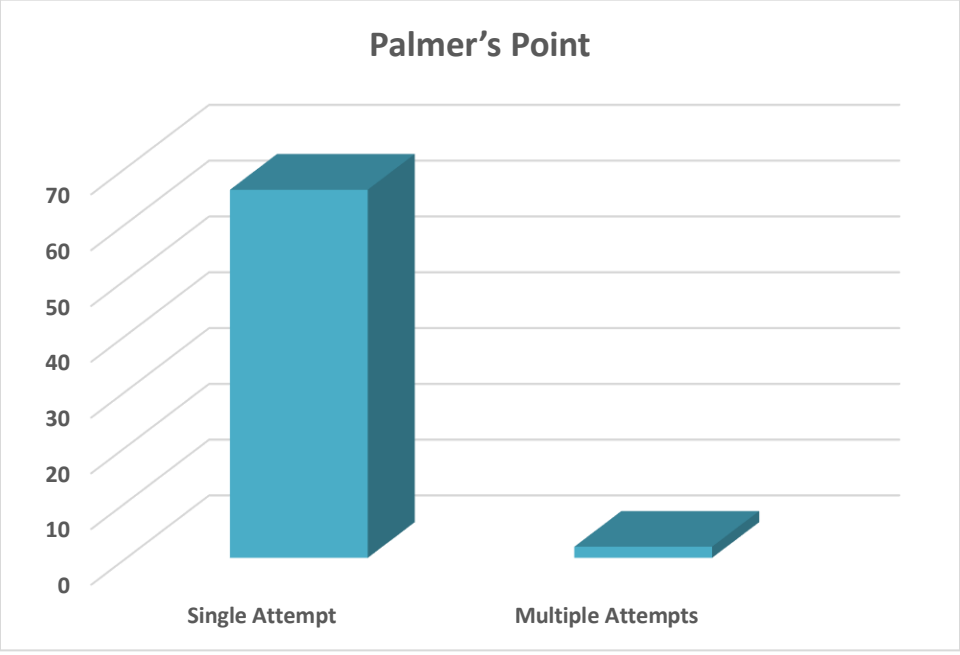

Figure 5.18: Success Rate of Single vs. Multiple Attempts for Pneumoperitoneum Palmer's Entry Point

Figure 5.19: Success Rate of Single vs. Multiple Attempts for Pneumoperitoneum Jain's Entry Point

❖ **Reinsertion Rates**

The results from Table 5.5 indicate a notable difference in reinsertion rates across different pneumoperitoneum entry sites. Palmer's point had the lowest reinsertion rate, with only 2 cases (2.9%) requiring a single reinsertion and no cases needing a second reinsertion. The supraumbilical site had a slightly higher reinsertion rate, with 5 cases (7.4%) requiring one reinsertion and 2 cases (2.9%) requiring a second reinsertion. In contrast, Jain's point had the highest reinsertion rates, with 8 cases (11.8%) needing one reinsertion and 5 cases (7.4%) requiring two reinsertions, indicating potential technical difficulties or anatomical constraints at this site. These findings suggest that Palmer's point provides the most reliable access with minimal reinsertion requirements, while Jain's point appears to pose more challenges, potentially leading to increased procedural time and complications (Figure 5.20-5.22).

Table 5.5: Comparison of Reinsertion Rates Across Different Pneumoperitoneum Entry Sites

Insertion Site	1 Reinsertion	2 Reinsertions
Supraumbilical	5 (7.4%)	2 (2.9%)
Palmer's Point	2 (2.9%)	0 (0%)
Jain's Point	8 (11.8%)	5 (7.4%)

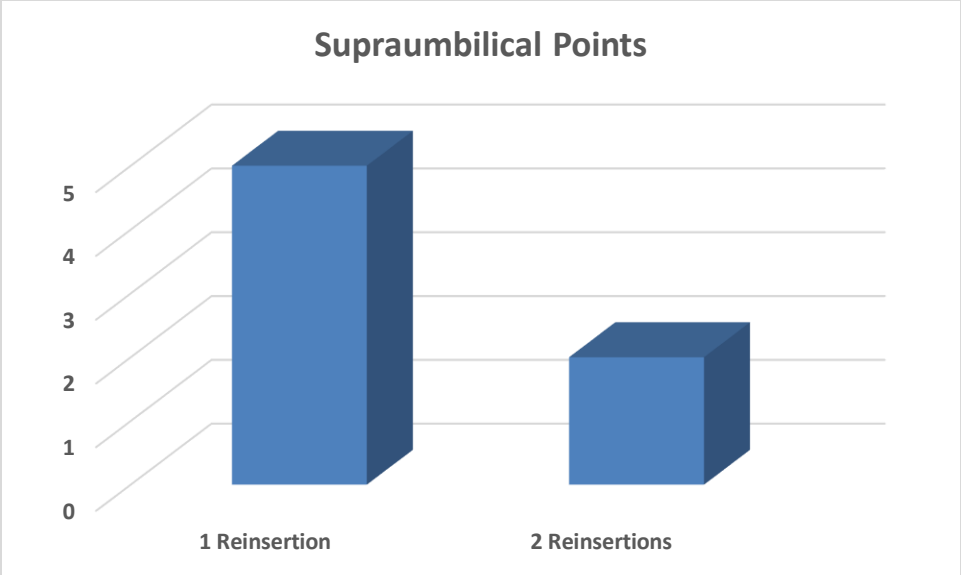

Figure 5.20: Reinsertion Frequency for Supraumbilical Pneumoperitoneum Entry Sites

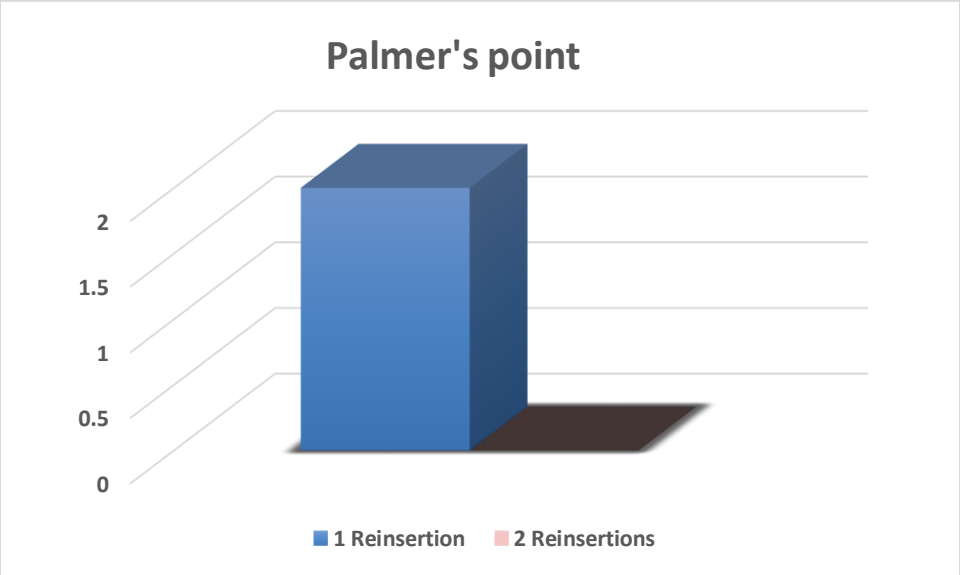

Figure 5.21: Reinsertion Frequency for Palmer's Pneumoperitoneum Entry Sites

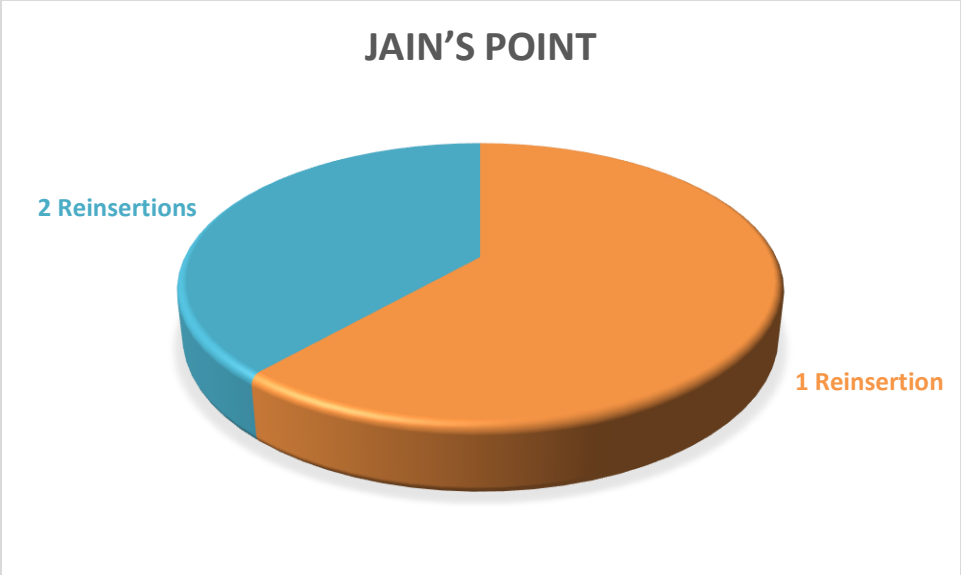

Figure 5.22:Reinsertion Frequency for Jain's Pneumoperitoneum Entry Sites

❖ **Intraoperative Complications**

The results from Table 5.6 highlight the incidence of intraoperative complications across different pneumoperitoneum entry sites, with statistically significant differences (p-values ranging from 0.01 to 0.03). Jain's point exhibited the highest complication rates, including vascular injury (4.4%), visceral injury (2.9%), and failed entry (7.4%), suggesting a greater risk associated with this site. The supraumbilical site showed moderate complication rates, with 2.9% vascular injuries, 1.5% visceral injuries, and a 4.4% failed entry rate. In contrast, Palmer's point demonstrated the lowest complication rates, with only 1.5% vascular injuries, no visceral injuries, and the lowest failed entry rate at 1.5%. The significant differences in complications suggest that Palmer's point may be the safest option for pneumoperitoneum creation, minimizing the risk of intraoperative injuries and failed entries, while Jain's point appears to be the most challenging and risk-prone site (Figure 5.23-5.25).

Table 5.6: Comparison of Intraoperative Complications Across Different Pneumoperitoneum Entry Sites

Complication	Supraumbilical (n=68)	Palmer's Point (n=68)	Jain's Point (n=68)	*p*-value
Vascular Injury (n, %)	2 (2.9%)	1 (1.5%)	3 (4.4%)	0.02

Visceral Injury (n, %)	1 (1.5%)	0 (0%)	2 (2.9%)	0.03
Failed Entry (n, %)	3 (4.4%)	1 (1.5%)	5 (7.4%)	0.01

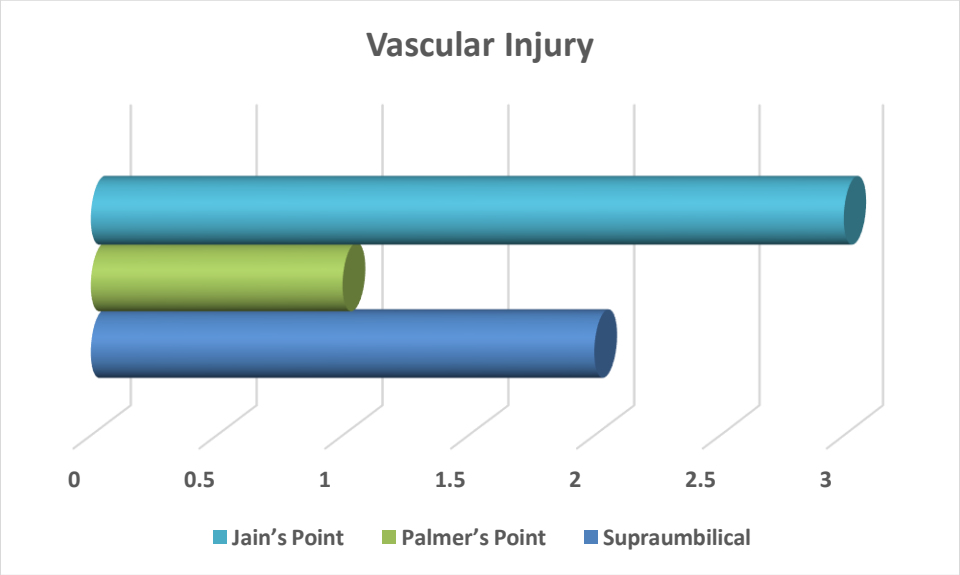

Figure 5.23:Incidence of Intraoperative Complications (Vascular Injury)atDifferent Pneumoperitoneum Entry Sites

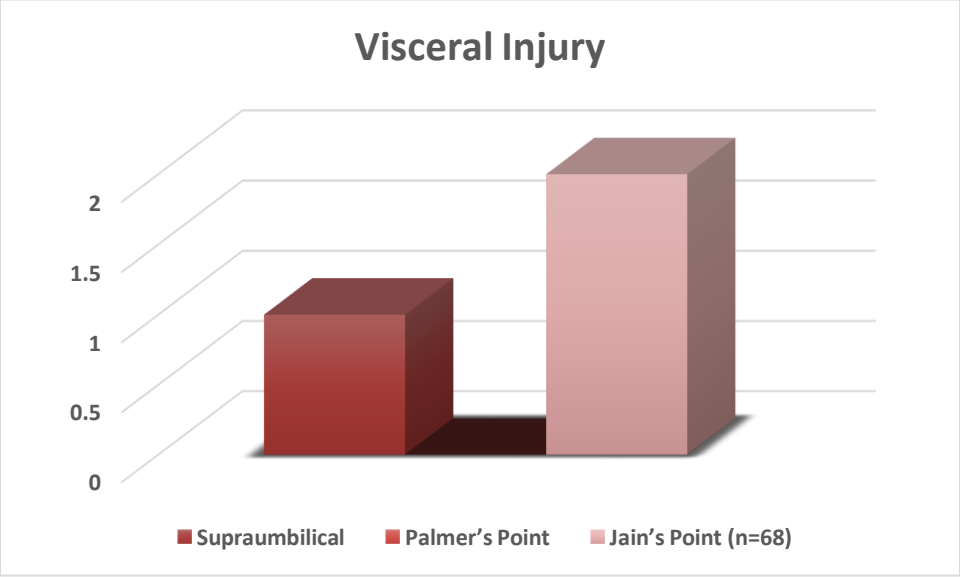

Figure 5.24:Incidence of Intraoperative Complications (Visceral Injury) at Different Pneumoperitoneum Entry Sites

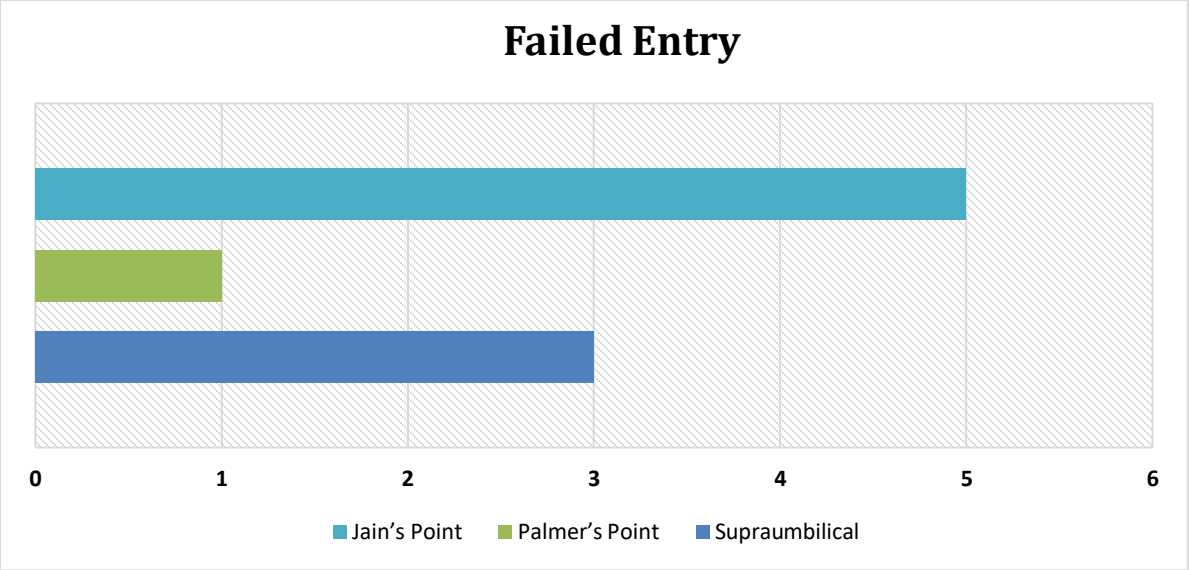

Figure 5.25:Incidence of Intraoperative Complications at (Failed Entry)Different Pneumoperitoneum Entry Sites

❖ **Conversion to Open Surgery**

The results from Table 5.7 show the conversion rates to open surgery across different pneumoperitoneum entry sites. Both the supraumbilical and Jain's point had a conversion rate of 1.5% (1 case each), while Palmer's point had no conversions (0%). Although the overall conversion rates were low, the absence of conversions at Palmer's point further supports its reliability as a preferred entry site. The need for conversion to open surgery at the supraumbilical and Jain's points may be attributed to anatomical challenges, failed entry, or intraoperative complications. These findings suggest that Palmer's point provides the most stable and predictable access, potentially minimizing the need for conversion to open surgery (Figure 5.26).

Table 5.7:Comparison of Conversion Rates to Open Surgery Across Different Pneumoperitoneum Entry Sites

Insertion Site	Conversion Cases (%)
Supraumbilical	1 (1.5%)
Palmer's Point	0 (0%)
Jain's Point	1 (1.5%)

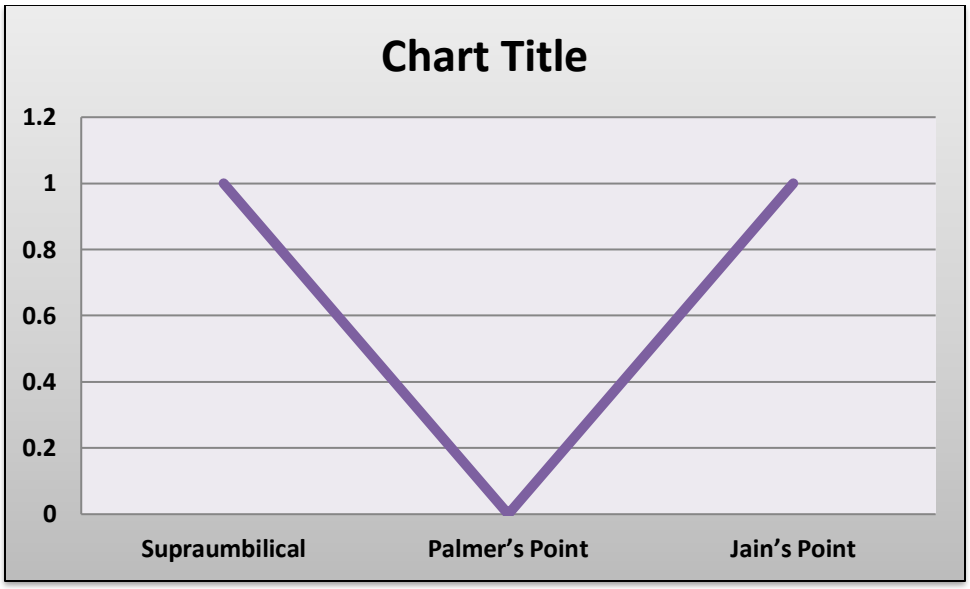

Figure 5.26: Frequency of Conversion to Open Surgery for Different Pneumoperitoneum Entry Sites

5.4.Postoperative Assessment

The results from Table 5.8 highlight significant differences in postoperative outcomes across the three pneumoperitoneum entry sites. Pain scores, based on the Visual Analog Scale (VAS), were highest at Jain's point, where 55.9% of patients reported pain, followed by the supraumbilical site at 44.1%, while Palmer's point had the lowest pain incidence at 26.5% (p=0.02). Entry site infection rates were also lowest at Palmer's point (1.5%) compared to the supraumbilical site (4.4%) and Jain's point (5.9%), indicating better postoperative healing at Palmer's point (p=0.04). Similarly, the duration of hospital stay was significantly shorter for Palmer's point (41.2%) compared to the supraumbilical site (58.8%) and Jain's point (67.6%) (p=0.01), suggesting that patients undergoing surgery through Palmer's point had faster recovery and potentially fewer complications. These findings reinforce that Palmer's point may be the most favorable site for pneumoperitoneum creation, offering better postoperative outcomes with less pain, lower infection rates, and shorter hospital stays (Figure 5.27-5.29).

Table 5.8: Comparison of Postoperative Outcomes Across Different Pneumoperitoneum Entry Sites

Outcome	Supraumbilical	Palmer's Point	Jain's Point	*p*-value

	(n=68)	(n=68)	(n=68)	
Pain Score (VAS 0-10)	30 (44.1%)	18 (26.5%)	38 (55.9%)	0.02
Entry Site Infection (n, %)	3 (4.4%)	1 (1.5%)	4 (5.9%)	0.04
Hospital Stay (days, Mean ± SD)	40 (58.8%)	28 (41.2%)	46 (67.6%)	0.01

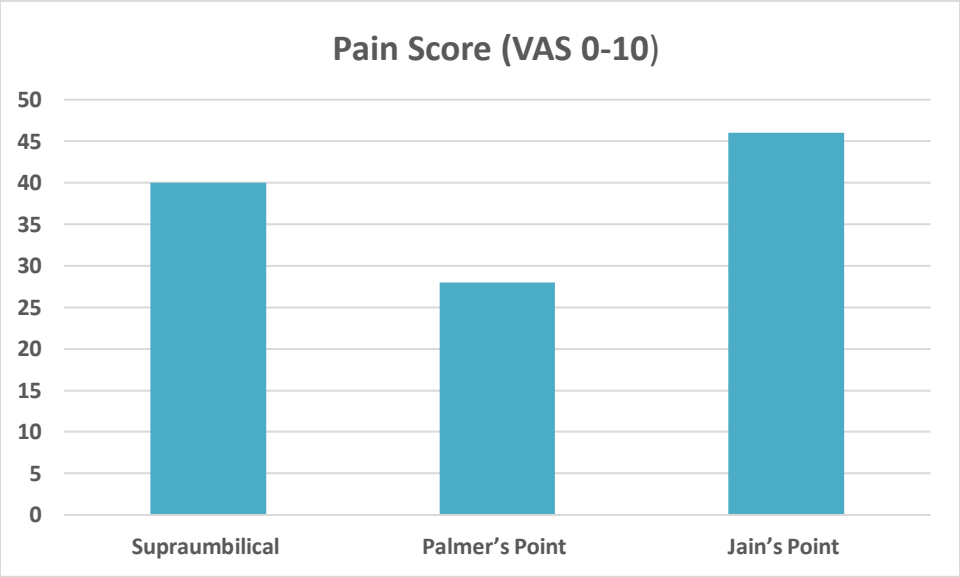

Figure 5.27: Postoperative Pain Scores for Different Pneumoperitoneum Entry Sites

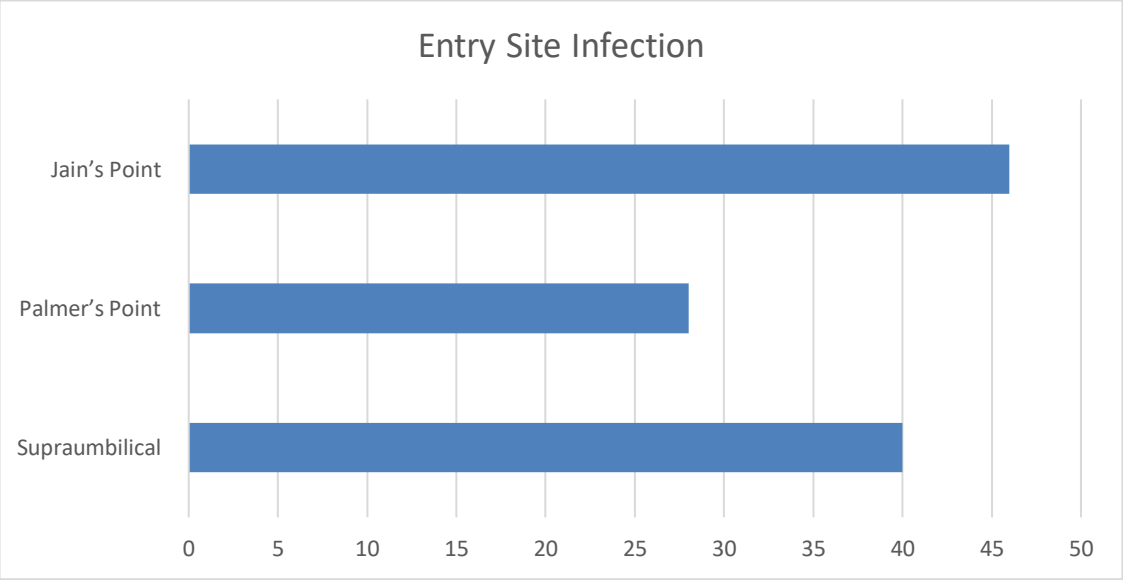

Figure 5.28: Infection Rates for Different Pneumoperitoneum Entry Sites

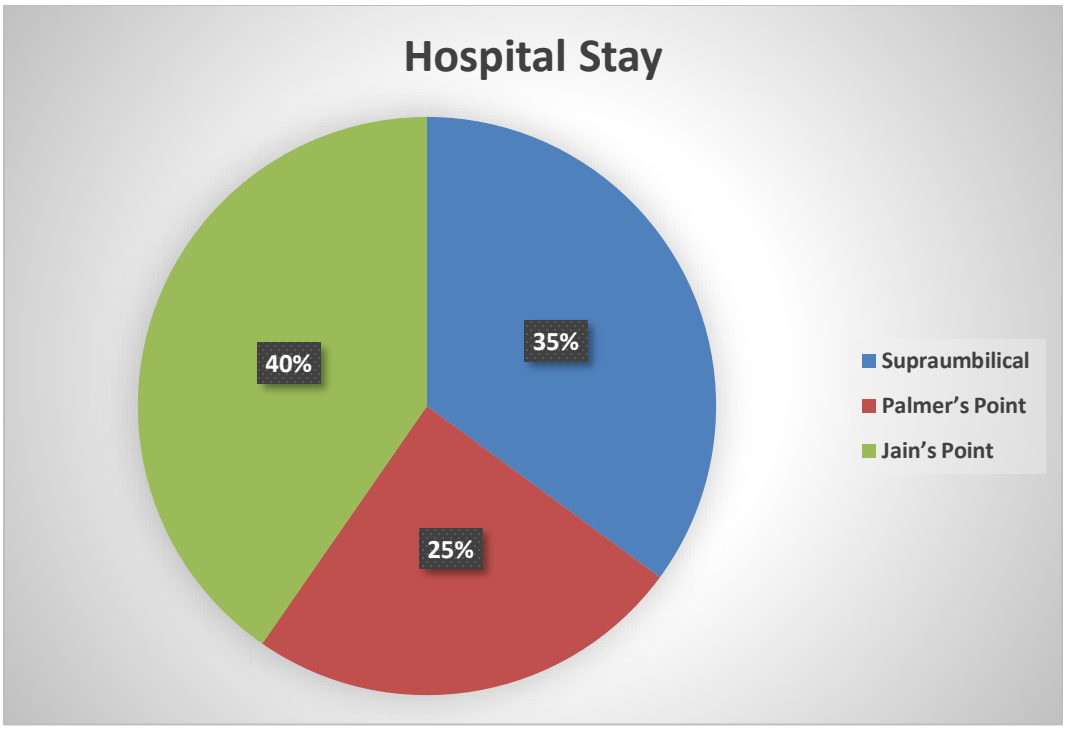

Figure 5.29:Hospital Stay Duration for Different Pneumoperitoneum Entry Sites

5.5.Follow –up Assessment

The results from Table 5.9 present the follow-up assessment of surgical outcomes across different pneumoperitoneum entry sites over a one-month period. Palmer's point demonstrated the highest improvement in surgical outcomes, with an increase from a baseline mean of 0.55 ± 0.50 to 0.68 ± 0.52, showing a 23.6% improvement. The supraumbilical point followed closely with a 24.0% improvement, increasing from 0.50 ± 0.48 to 0.62 ± 0.50. Jain's point had the lowest improvement, increasing from 0.52 ± 0.49 to 0.60 ± 0.51, reflecting only a 15.4% improvement. These findings suggest that while all sites showed progress postoperatively, Palmer's and supraumbilical points exhibited better overall improvement compared to Jain's point. This could indicate more favorable healing and recovery patterns associated with Palmer's and supraumbilical points, reinforcing their potential as more effective entry sites for laparoscopic surgeries.

Table 5.9: Follow-up Assessment of Surgical Outcomes at Different Pneumoperitoneum Entry Sites

LAPAROSCOPIC SURGERIES	Baseline Mean ± SD	Follow-up (1 Month)	Change	Improvement (%)

		Mean ± SD		
Supraumbilical Point	0.50 ± 0.48	0.62 ± 0.50	0.12	24.00%
Palmer's Point	0.55 ± 0.50	0.68 ± 0.52	+0.13	23.6%
Jain's Point	0.52 ± 0.49	0.60 ± 0.51	0.08	15.40%