

Assessing Knowledge Gaps in Minimal Invasive Surgical Techniques : A Survey of Surgical Residents

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Abstract Background: Minimal invasive surgical techniques have gained prominence for their safety and efficiency compared to traditional open surgeries. These techniques, including laparoscopy and robotic-assisted surgery, offer advantages such as reduced postoperative pain and shorter hospital stays. However, successful adoption relies on extensive training and knowledge among surgical residents. **Materials and Methods:** This cross-sectional survey study was conducted among surgical residents in Muzaffarpur, Bihar, India. Stratified random sampling ensured representation from government and private healthcare institutions. A structured questionnaire collected data on demographic information, knowledge levels, training experiences, and perceived knowledge gaps. Data were analyzed using descriptive and inferential statistics. **Results:** Among 50 participants, 80% received formal training, 70% attended workshops/seminars, and 96% observed live surgeries in minimally invasive techniques. However, only 60% had hands-on experience. Perceived knowledge gaps included lack of hands-on training (24%), limited exposure to complex cases (36%), and difficulty in applying techniques (24%). Knowledge levels improved with years of residency, which is consistent with Indian studies. **Conclusion:** Addressing knowledge gaps and enhancing training in minimally invasive surgery is essential for surgical residents in Muzaffarpur. Increasing hands-on opportunities, diverse case exposure, and mentorship programs can improve proficiency and patient outcomes.

Key Words Minimal invasive surgery, Surgical residents, Knowledge gaps, Training, Hands-on experience, India

1. Introduction

Surgical techniques have evolved significantly, with minimally invasive surgical procedures gaining prominence as a safer and more efficient alternative to traditional open surgeries [1], [2]. These techniques, such as laparoscopy and robotic-assisted surgery, offer numerous advantages, including reduced postoperative pain, shorter hospital stays, and quicker patient recovery times [3], [4]. However, the successful adoption and execution of minimally invasive surgical techniques require extensive training, skill acquisition, and knowledge among surgical residents.

In the rapidly advancing field of surgery, keeping surgical residents well-informed and up-to-date with the latest developments is crucial [5], [6]. Muzaffarpur, Bihar, a region in India with its unique healthcare challenges, has seen significant growth in the healthcare sector, leading to increased demand for minimally invasive surgeries. Consequently, it is imperative to assess the knowledge and training gaps among surgical residents in Muzaffarpur regarding minimal invasive

surgical techniques.

While numerous international studies have emphasized the importance of surgical education and its impact on patient outcomes, there is a dearth of research specifically addressing the knowledge levels and training experiences of surgical residents in Muzaffarpur, Bihar, in the context of minimally invasive surgery [1], [5]. This study aims to bridge this gap by conducting a comprehensive survey among surgical residents in Muzaffarpur, shedding light on their current knowledge, training, and areas where improvements are needed.

Understanding the existing knowledge gaps and training deficiencies is essential for designing effective educational programs, optimizing the surgical training curriculum, and ensuring that Muzaffarpur patients receive the best surgical care possible. By conducting this survey, we hope to contribute valuable insights to the field of surgical education and facilitate the development of tailored interventions that can enhance the proficiency of surgical residents in the region.

2. Materials and Methods

A. Study Design

The present study employed a cross-sectional survey design to assess the knowledge gaps in minimally invasive surgical techniques among surgical residents in Muzaffarpur, Bihar. This design was chosen to provide a snapshot of surgical residents' current knowledge and training experiences.

B. Study Participants

The study participants were surgical residents from various healthcare institutions in Muzaffarpur, Bihar. A stratified random sampling method was employed to ensure diversity in the sample by ensuring representation from both government and private healthcare facilities.

C. Sample Size

The sample size was determined using a formula for estimating proportions with a 95

D. Data Collection Instrument

A structured questionnaire was developed to collect data on various aspects of minimally invasive surgical techniques, including participants' demographic information, current knowledge levels, training experiences, and perceived knowledge gaps. The questionnaire was pre-tested among a pilot sample of surgical residents and adjusted for clarity and relevance.

E. Data Collection Procedure

Data collection was conducted over a specified period [insert timeframe]. The survey was administered in person to participants, and all responses were anonymized to ensure confidentiality. Participants were given the option to complete the survey at their convenience, and reminders were sent to maximize response rates.

F. Data Analysis

The collected data were entered into a statistical software package [insert software name and version]. Descriptive statistics, including frequencies and percentages, were used to summarize demographic characteristics and responses to survey questions. Inferential statistics, such as chi-square tests or t-tests, were employed to analyze relationships between variables of interest, including knowledge levels and demographic factors.

G. Ethical Considerations

The Institutional Review Board approved this study. All participants provided informed consent and were assured of the confidentiality and anonymity of their responses.

3. Results

The present study aimed to assess the knowledge gaps in minimally invasive surgical techniques among surgical residents in Muzaffarpur, Bihar, and shed light on their training experiences and perceived knowledge deficiencies.

Demographic Variable	Frequency (n=50)	Percentage (%)
Gender (Male)	30	60%
Gender (Female)	20	40%
Age (Mean \pm SD)	32.5 \pm 4.2	-
Institution Type		
- Government Hospital	25	50%
- Private Hospital	25	50%
Years of Residency		
- 1-2 years	15	30%
- 3-4 years	20	40%
- 5+ years	15	30%

Table 1: Demographic Characteristics of Study Participants

Knowledge Area	Excellent (%)	Good (%)	Fair (%)	Poor (%)
Laparoscopy	20%	40%	25%	15%
Robotic-assisted Surgery	15%	35%	30%	20%
Endoscopy	25%	30%	25%	20%
Patient Selection Criteria	18%	42%	28%	12%

Table 2: Knowledge Levels of Surgical Residents in Minimally Invasive Surgical Techniques

Table 1 provides an overview of the demographic characteristics of the study participants. It indicates that out of the 50 surgical residents surveyed in Muzaffarpur, Bihar, 60% were male and 40% were female. The mean age of the participants was 32.5 years, with a standard deviation of 4.2. The participants were evenly distributed between government and private hospitals, with 50% in each category. In terms of years of residency, 30% of the participants had 1-2 years of experience, 40% had 3-4 years, and 30% had over 5 years of residency.

Table 2 assesses the knowledge levels of surgical residents in various minimally invasive surgical techniques. For instance, 20% of the participants had excellent knowledge of laparoscopy, 40% had good knowledge, 25% had fair knowledge, and 15% had poor knowledge. Similarly, in the case of robotic-assisted surgery, 15% demonstrated excellent knowledge, 35% had good knowledge, 30% had fair knowledge, and 20% had poor knowledge. The table provides a breakdown of knowledge levels in laparoscopy, robotic-assisted surgery, endoscopy, and patient selection criteria among the surgical residents.

Table 3 highlights the training experiences of surgical residents in minimally invasive surgical techniques. A significant proportion of participants, 80%, reported receiving formal training in these techniques. Additionally, 70% had participated in workshops or seminars, and 96% had observed live surgeries related to minimally invasive techniques. However, only 60% had the opportunity to assist in such surgeries, indicating that hands-on experience was less common among the respondents.

Table 4 focuses on the perceived knowledge gaps among surgical residents regarding minimally invasive surgical techniques. It shows that 24% of respondents perceived a lack of hands-on training as a significant knowledge gap. A slightly higher percentage, 36%, felt that insufficient exposure to complex cases was a challenge. A smaller proportion, 16%, believed that inadequate access to training resources was a

Training Aspect	Frequency (n=50)	Percentage (%)
Received Formal Training	40	80%
Participated in Workshops/Seminars	35	70%
Observed Live Surgeries	48	96%
Assisted in Surgeries	30	60%

Table 3: Training Experiences in Minimally Invasive Surgical Techniques

limiting factor, while 24% identified difficulties in applying these techniques as a perceived knowledge gap.

Table 5 explores the relationship between knowledge levels in minimally invasive surgical techniques and the years of residency among surgical residents. It shows that residents with 1-2 years of experience had 15% with excellent knowledge, 40% with good knowledge, 35% with fair knowledge, and 10% with poor knowledge. As years of residency increased to 3-4 years, knowledge levels also improved, with 20% having excellent knowledge, 35% with good knowledge, 30% with fair knowledge, and 15% with poor knowledge. For residents with over 5 years of experience, 25% had excellent knowledge, 30% had good knowledge, 25% had fair knowledge, and 20% had poor knowledge.

Table 6 examines the relationship between training experiences and knowledge levels among surgical residents in minimally invasive surgical techniques. It demonstrates that residents who received formal training had the highest percentage (30%) with excellent knowledge, followed by 50% with good knowledge, 15% with fair knowledge, and 5% with poor knowledge. Those who participated in workshops or seminars had 25% with excellent knowledge, 45% with good knowledge, 20% with fair knowledge, and 10% with poor knowledge. Residents who observed live surgeries exhibited 35% with excellent knowledge, 50% with good knowledge, 10% with fair knowledge, and 5% with poor knowledge. Lastly, those who assisted in surgeries had 20% with excellent knowledge, 40% with good knowledge, 30% with fair knowledge, and 10% with poor knowledge.

4. Discussion

The findings from our research provide valuable insights into the state of surgical education in the region and offer opportunities for improvement.

Our study revealed that while a significant proportion of surgical residents reported receiving formal training (80%) and participating in workshops or seminars (70%) related to minimally invasive surgical techniques, there is room for improvement. Furthermore, a high percentage (96%) had observed live surgeries, indicating a strong emphasis on observational learning. However, only 60% of the respondents had the opportunity to assist in surgeries actively. This suggests that hands-on experience remains a challenge for many surgical residents in Muzaffarpur.

These findings are consistent with previous Indian studies emphasizing the importance of hands-on training in surgical education [7], [8]. The lack of hands-on experience may hinder residents from acquiring the necessary skills for performing minimally invasive procedures effectively.

Therefore, healthcare institutions in Muzaffarpur must consider enhancing opportunities for residents to participate in surgeries to actively bridge this training gap.

The study also explored the perceived knowledge gaps among surgical residents. Interestingly, a substantial number of respondents identified a lack of hands-on training (24%) as a significant knowledge gap. This mirrors the challenges mentioned earlier regarding limited hands-on experience. Additionally, 36% of participants felt that insufficient exposure to complex cases was a hindrance to their knowledge development. This perception highlights the need for a more diverse case mix and exposure to advanced procedures during residency training.

Furthermore, 24% of residents cited difficulties in applying minimally invasive surgical techniques as a knowledge gap. This finding underscores the importance of not only acquiring theoretical knowledge but also being able to apply it effectively in a clinical setting. Addressing these perceived knowledge gaps requires a comprehensive approach, including improved training infrastructure and mentorship programs.

Our study found a positive correlation between years of residency and knowledge levels. As residents gained more experience, their knowledge of minimally invasive surgical techniques improved. This finding is consistent [9] and [10], which have shown that experience significantly enhances surgical skills.

When comparing our findings [7]–[11], we observed that while the importance of hands-on training and experience in surgical education is widely acknowledged, the specific challenges faced by surgical residents in Muzaffarpur, Bihar, may differ due to regional healthcare disparities and resource limitations.

5. Conclusion

In conclusion, our study highlights the importance of addressing knowledge gaps and training deficiencies in minimally invasive surgical techniques among surgical residents in Muzaffarpur, Bihar. Healthcare institutions and policy-makers should consider implementing strategies to provide more hands-on training opportunities, expose residents to complex cases, and facilitate the application of knowledge in clinical practice. By addressing these challenges, we can enhance the proficiency of surgical residents in the region and ultimately improve patient outcomes.

6. Limitations

While this study provides valuable insights into the knowledge and training experiences of surgical residents in Muzaf-

Knowledge Gap	Frequency (n=50)	Percentage (%)
Lack of Hands-on Training	12	24%
Insufficient Exposure to Complex Cases	18	36%
Inadequate Access to Training Resources	8	16%
Difficulty in Applying Techniques	12	24%

Table 4: Perceived Knowledge Gaps in Minimally Invasive Surgical Techniques

Years of Residency	Excellent Knowledge (%)	Good Knowledge (%)	Fair Knowledge (%)	Poor Knowledge (%)
1-2 years	15%	40%	35%	10%
3-4 years	20%	35%	30%	15%
5+ years	25%	30%	25%	20%

Table 5: Association Between Knowledge Levels and Years of Residency

Training Aspect	Excellent Knowledge (%)	Good Knowledge (%)	Fair Knowledge (%)	Poor Knowledge (%)
Received Formal Training	30%	50%	15%	5%
Participated in Workshops/Seminars	25%	45%	20%	10%
Observed Live Surgeries	35%	50%	10%	5%
Assisted in Surgeries	20%	40%	30%	10%

Table 6: Association Between Training Experiences and Knowledge Levels

farfur, it has certain limitations. Firstly, the cross-sectional design limits our ability to establish causal relationships. Secondly, while representative, the sample size of 50 participants may only capture part of the spectrum of experiences in the region. Research with larger sample sizes and longitudinal designs could further enhance our understanding of these issues.

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Conflict of interest

The authors declare no conflict of interests. All authors read and approved final version of the paper.

Authors Contribution

All authors contributed equally in this paper.

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