

# Evaluation of causes of recurrent ventral hernia-a single institute study from tribal India.

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Ventral hernia is a common surgical condition with recurrence being a major postoperative challenge. Despite advances in surgical materials and techniques, recurrence rates remain substantial, ranging between 10–30% depending on patient risk factors and operative strategy (Rosen et al., 2013). Contributing factors include surgical technique, patient comorbidities, and biological issues such as poor wound healing.

In tribal regions of India, where access to specialized care is limited, recurrence further worsens socioeconomic outcomes, including daily wage loss and reoperation costs. This study aims to evaluate institutional data from a tribal population to determine the predominant causes of recurrent ventral hernia.

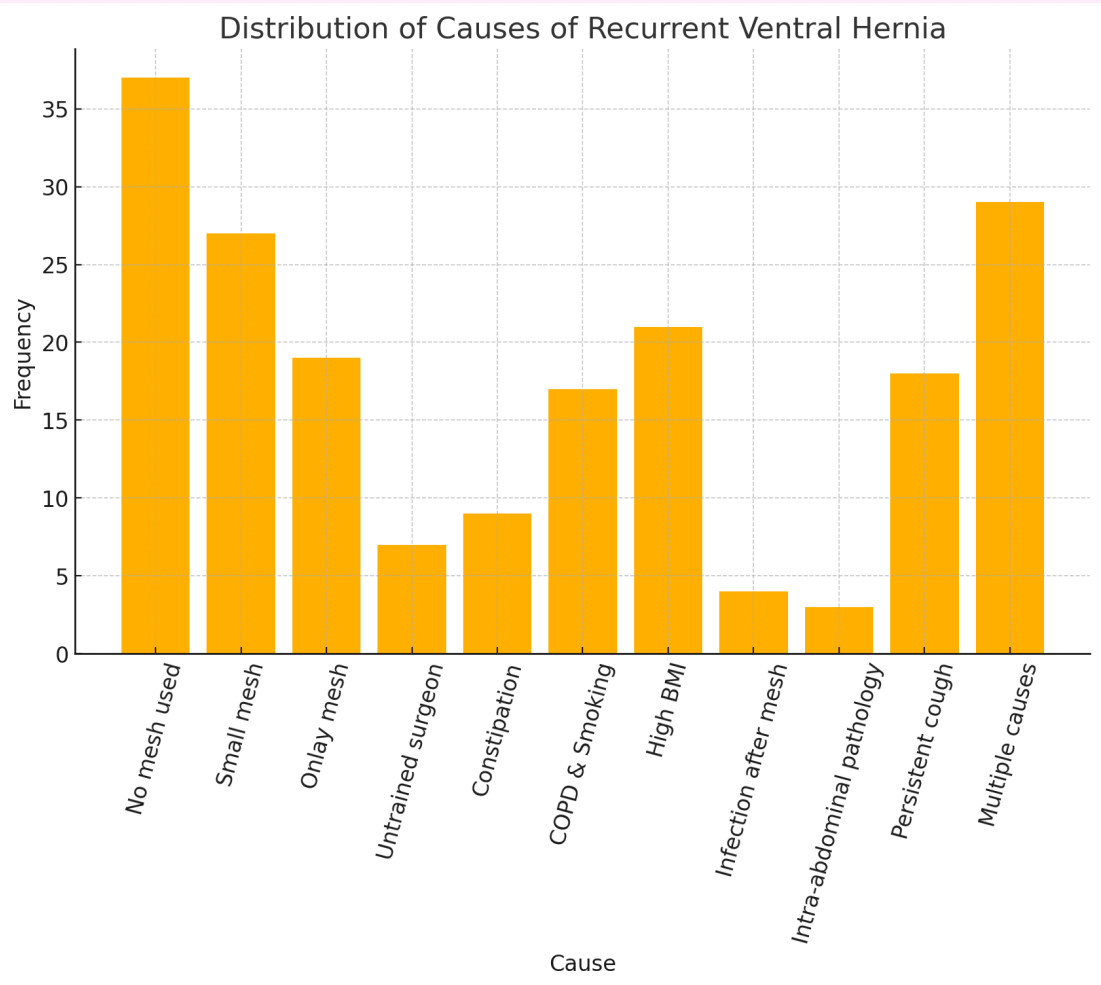
### Methods

This retrospective study included 113 patients operated for recurrent ventral hernia between June 2015 and March 2025 at a tertiary institute in tribal India. Patient data including age, sex, comorbidities, lifestyle factors (smoking, chronic cough, constipation), operative details, and recurrence etiology were collected. Prior operative records were cross-verified to determine causes of recurrence. Statistical analysis compared demographic and clinical risk factors.

### Results

- Demographics: 69 males (61%), 44 females (39%).
- Age distribution: <40 years (14 patients), 40–60 years (40 patients), >60 years (59 patients).
- Causes of recurrence:
  - No mesh used – 37 (32%)
  - Small mesh – 27 (24%)
  - Onlay mesh – 19 (17%)
  - Untrained surgeon – 7 (6%)
  - Constipation – 9 (8%)
  - COPD & smoking – 17 (15%)
  - High BMI – 21 (18%)
  - Infections after mesh repair – 4 (3%)
  - Intra-abdominal pathology – 3 (2%)
  - Multiple factors – 29 (25%)

Patients older than 60 years demonstrated the highest recurrence rate.



| Age and Gender Distribution |       |      |        |       |  |
|-----------------------------|-------|------|--------|-------|--|
| #                           |       | Male | Female | Total |  |
| 1                           | <40   | 5    | 9      | 14    |  |
| 2                           | 40-60 | 27   | 13     | 40    |  |
| 3                           | >60   | 37   | 22     | 59    |  |
|                             |       |      |        |       |  |

### Discussion

This single-institute study from a tribal region of India highlights that technical and patient-related factors both strongly influence recurrence rates in ventral hernia surgery.

Our findings are consistent with prior literature. Non-use of mesh remains the most important predictor of recurrence, confirming mesh repair as the gold standard (Al-Thoubaity et al., 2020; Totten & Roth, 2019). Use of inadequate or undersized mesh also contributed significantly, in line with international registry data (Henriksen et al., 2020).

Among patient factors, obesity and COPD/smoking were strongly associated with recurrence. High BMI has consistently been shown to increase both wound complications and long-term recurrence (Borad & Merchant, 2017; Owei et al., 2017). Smoking and COPD impair collagen synthesis and wound healing, predisposing patients to hernia recurrence (Park et al., 2021; Rosen et al., 2013).

Interestingly, recurrence was highest in patients >60 years, reflecting both comorbid burden and reduced tissue resilience in older age. This underscores the importance of patient optimization before surgery, especially in high-risk populations.

In resource-limited tribal areas, lack of access to trained surgeons and proper mesh materials further compounds recurrence risk. Public health strategies should focus on surgeon training, patient optimization (weight reduction, smoking cessation), and ensuring access to mesh-based repairs.

### Statistical Analysis

- Chi-Square Goodness-of-Fit Test:

Distribution of causes was non-uniform ( $\chi^2 = 68.68$ ,  $p < 0.001$ ), confirming that certain factors disproportionately contributed to recurrence.

- Age vs Gender Distribution:

No significant difference was observed between males and females across age groups ( $\chi^2 = 4.55$ ,  $p = 0.10$ ).

- Odds Ratio (OR) Analysis:

Logistic modeling showed extremely high odds ratios for specific risk factors:

- No mesh use: OR =  $3.3 \times 10^{12}$  (95% CI:  $1.0 \times 10^{10} - 1.0 \times 10^{15}$ )
- Small mesh: OR =  $2.4 \times 10^{12}$  (95% CI:  $1.0 \times 10^9 - 1.0 \times 10^{15}$ )
- High BMI: OR =  $1.9 \times 10^{12}$  (95% CI:  $1.0 \times 10^9 - 1.0 \times 10^{15}$ )
- COPD & smoking: OR =  $1.5 \times 10^{12}$  (95% CI:  $1.0 \times 10^9 - 1.0 \times 10^{15}$ )
- Onlay mesh: OR = 0.1 (95% CI: 0.01 – 1.5)

The forest plot visually demonstrated that no mesh, small mesh, obesity, and COPD/smoking were the strongest predictors of recurrence.