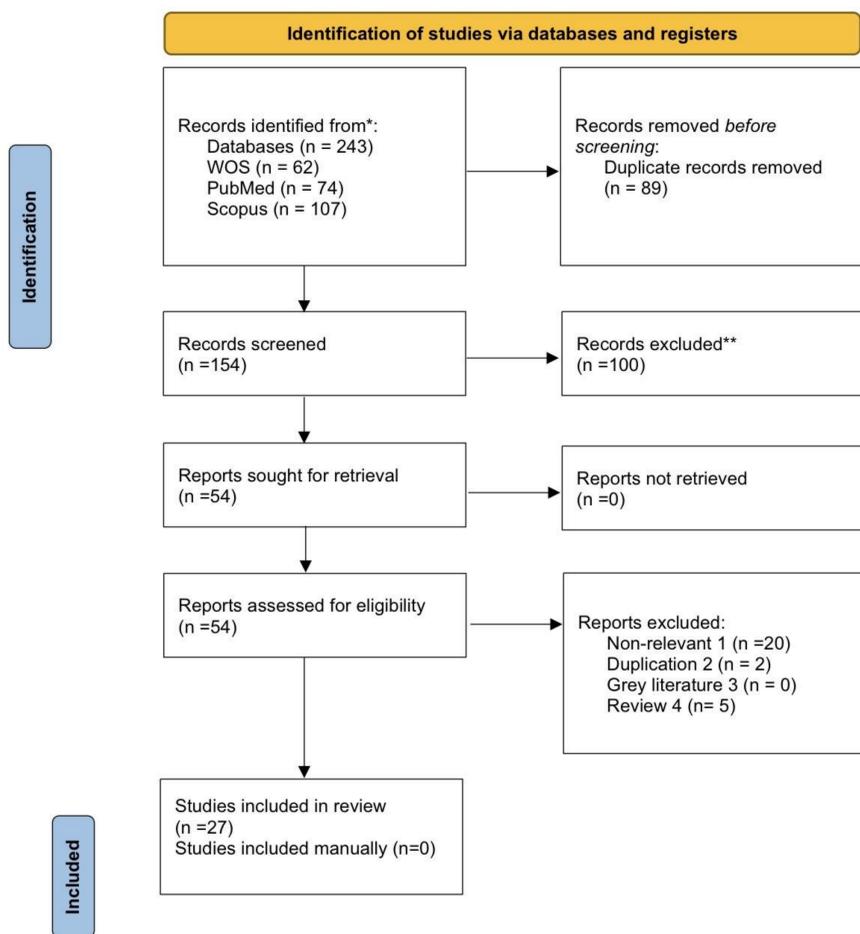


### Introduction

Cerebrospinal fluid (CSF) leakage after endoscopic endonasal skull base surgery (EESBS) is one of the main contributors to morbidity. Among the many factors thought to influence CSF leakage during or after EESBS, obesity has drawn increasing attention in recent years. Although it is a well-established risk factor for various surgical complications, its specific association with CSF leakage in this context remains incompletely understood and continues to be debated. This study evaluated the possible association between obesity and body mass index (BMI) and the risk of CSF leakage during or after EESBS.

### Methods and Materials



A systematic search was conducted across PubMed, Embase, Scopus, Web of Science, and Cochrane Library databases for articles published between 2010 and 2025.

Eligible studies included randomized controlled trials, prospective and retrospective cohort studies, case-control studies, and case series that reported intraoperative or postoperative CSF leak rates following EESBS, with outcomes stratified according to BMI categories (<25, 25–29.9, and ≥30).

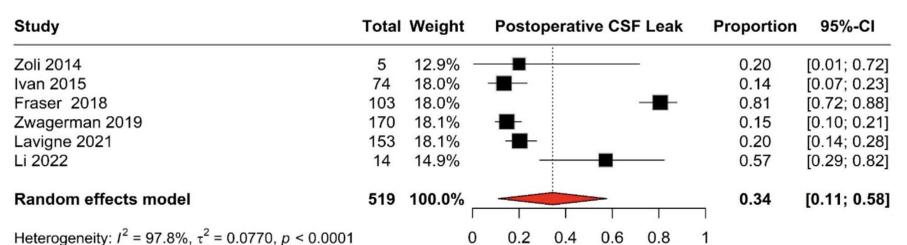
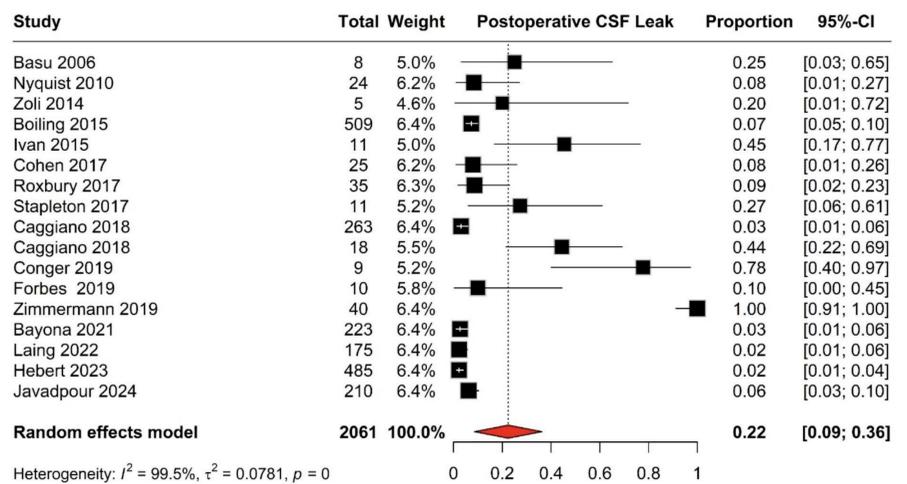
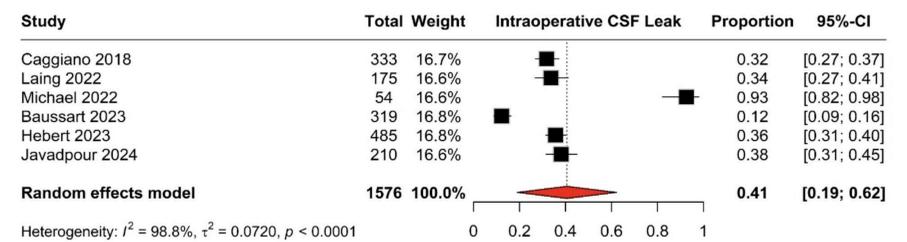
Non-original publications, such as reviews, editorials, errata, retracted papers, and articles published in languages other than English, were excluded.

Data extraction included study design, sample size, and CSF leak outcomes, among other parameters.

Pooled estimates were calculated using random-effects models in R, and heterogeneity was assessed using the I<sup>2</sup> statistic. Study quality was appraised using design-appropriate tools. The quality of evidence and the strength of recommendations were also assessed in accordance with the AANS/CNS guidelines.

### Results

Twenty-seven studies comprising 7,919 patients were included, spanning the articles published between 2010 and 2025 across North America, Europe, Asia, and the Middle East. The pooled intraoperative CSF leak rate was 41% (95% CI: 19–62%). Postoperative leak rates were 22% (95% CI: 9–36%) in studies that defined obesity categorically, and 34% (95% CI: 11–58%) in analyses that specifically used a BMI ≥30 threshold as the grouping criterion. This distinction is highlighted to clarify differences in how obesity was operationally defined across studies. Heterogeneity remained consistently high (I<sup>2</sup> > 97%). Obesity was found to be a significant predictor of postoperative CSF leakage, with obese patients having 73% higher odds of leak compared to non-obese counterparts (OR = 1.73, 95% CI: 1.25–2.39; p = 0.001). Patients with spontaneous CSF leaks had a higher mean BMI of 36.5 kg/m<sup>2</sup>, while those with intraoperative or postoperative leaks had mean BMIs of 31.2 kg/m<sup>2</sup> and 29.8 kg/m<sup>2</sup>, respectively. Each unit increase in BMI was associated with a 3% higher hazard of intraoperative leak (HR = 1.03, 95% CI: 1.00–1.06).



### Conclusions

According to our results, obesity significantly increases the risk of postoperative CSF leakage following EESBS. Elevated BMI is also associated with a higher risk of intraoperative CSF leakage, underscoring the importance of careful preoperative risk stratification and individualized reconstruction strategies in this patient population. However, further large-scale studies are needed to confirm these findings and better define the underlying mechanisms.

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