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Clinical Risk Factors of Post-Surgery Hemorrhage in Patients Undergoing Tonsillectomy

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ABSTRACT

Post-tonsillectomy hemorrhage is rare but life-threatening and poses a critical emergency. However, limited research has been conducted on adults undergoing tonsillectomy. **Objective:** To analyze the predictors of post-tonsillectomy hemorrhage in adults undergoing tonsillectomy. **Methods:** A retrospective study was conducted in the ENT and Surgery Department of Bakhtawar Amin Hospital from April 2024 to Jan 2025. A total of 150 adult patients underwent bilateral tonsillectomies for recurrent tonsillitis, obstructive sleep apnea, tonsillar hypertrophy, palmoplantar pustulosis, or IgA nephropathy. The surgery was performed according to the usual procedure under anesthesia. Age, gender, duration of surgery, obesity, antibiotic administration, smoking status, and type of analgesia were recorded as probable predictors of hemorrhage. Smoking status included current smokers, non-smokers, and former smokers who had stopped smoking at least 1 month before the procedure. **Results:** There was a significant difference between smokers and non-smokers (OR=3.52, 95% CI: 1.76- 6.68, p<0.001) and smokers and former smokers (OR=3.55, 95% CI: 1.63-7.61, p<0.003). Male gender (OR: 4.03, 95% CI: 1.63-9.89, p=0.005) and NSAID (OR: 7.87, 95% CI: 1.007-63.53, p=0.0502) were significantly associated with post-operative hemorrhage.Smoking status (p=0.052) and older age (p=0.005) were significant risk factors in the primary hemorrhage group, and smoking status (p<0.001) and male gender (p=0.010) were significant in the secondary hemorrhage group. **Conclusions:** Post-tonsillectomy hemorrhage had a significant association with male gender, smoking status, and administration of NSAIDs during surgery. Therefore, it is advisable for surgeons to strongly suggest that patients maintain a healthy lifestyle before surgery and opt for other analgesics to prevent the risk of hemorrhage.

INTRODUCTION

Tonsillectomy is a frequent procedure involving the removal of the tonsils due to tonsilitis, infections, sleep-disordered breathing, or sleep apnea in children and adults. Although the data on the Pakistani population is unavailable, the annual incidence rate in Norway is 0.16%, 0.13% in Sweden, and 0.08% in Denmark [1]. In children, it is often performed with adenoidectomy to resolve breathing and swallowing issues. Dehydration, pain, hemorrhage, nausea & vomiting, and infections are common complications after tonsillectomy [2]. Among these, post-tonsillectomy hemorrhage is rare but life-threatening and poses a critical emergency. It can cause airway obstruction and hypovolemic shock which may require surgery for management. Since the majority of tonsillectomies are performed in children, most literature focuses on outcomes and complications in the pediatric population [3]. In children, the cause of surgery has been reported as the main cause of post-tonsillectomy hemorrhage in reviews and meta-analyses [4]. Children undergoing surgery for recurrent infections had a high rate of hemorrhage as compared to children with obstructive sleep-disordered breathing. However, hemorrhage rates did not differ with the change in surgical techniques, including coblation, cold dissection, or electrocautery [5]. An increase in age significantly enhanced the risk of hemorrhage even in pediatric samples. Only limited research has been conducted on adults undergoing tonsillectomy. The reports available are conducted on

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pediatric and adult populations, which conclude that there is a high risk of hemorrhage in older age [6]. However, these results did not identify the risk factors of hemorrhage in adults specifically. We establish a hypothesis that lifestyle parameters, including surgical cause, smoking status, obesity, etc., are predictors of post-tonsillectomy hemorrhage in adults. We aim to investigate the impact of smoking status, role of surgical technique, medication and demographics on hemorrhage rates.

This study aims to analyze the predictors of post-tonsillectomy hemorrhage in adults undergoing tonsillectomy.

METHODS

A retrospective study was conducted in the ENT and Surgery Department of Bakhtawar Amin Trust Hospital from April 2024 to January 2025. A total of 150 adult patients undergoing bilateral tonsillectomies for recurrent tonsillitis, obstructive sleep apnea, tonsillar hypertrophy, palmoplantar pustulosis, or IgA nephropathy were included by consecutive sampling. Adenoidectomy and/or uvulopalatopharyngoplasty were also performed in patients with sleep apnea and hypertrophy. The sample size was calculated by keeping a 50% population proportion, 95% confidence interval, 80% power and precision of ± 5% among 245 population size. Patients who underwent tonsillectomy for tumor or quinsy, or those undergoing head and neck surgery for other conditions or hematologic disease, were excluded. All patients provided their informed consent to become a part of the study. The ethical board of the hospital approved the study Ref No.3294/BAMTH. The surgery was performed according to the usual procedure under anesthesia. After intubating the patient, Crowe-Davis mouth gag to secure the tonsil site. A mucosal incision was made, and the tonsils were released from their capsule using a dissector. Bipolar or mono-polar electrocautery was used to maintain hemostasis. No other equipment was used. Where electrocautery was ineffective in controlling bleeding, absorbable sutures were employed to ligate bleeding points. IV antibiotics were given intraoperatively and postoperatively. Fentanyl and/or remifentanil were also administered during surgery, and acetaminophen after surgery as analgesics. Post-tonsillectomy hemorrhage was categorized based on Windfuhr's classification. In addition, hemorrhage within 24 hours after the surgery was called primary hemorrhage, and hemorrhage after 24-48 hours was called secondary hemorrhage. Age, gender, duration of surgery, obesity, antibiotic administration, smoking status, and type of analgesia were recorded as probable predictors of hemorrhage. Smoking status included current smokers, non-smokers, and former smokers who had stopped smoking at least 1 month before the procedure. All data were analyzed by SPSS version 24.0. Descriptive analysis was performed on quantitative variables and was presented by frequency and percentage. Univariate analysis was performed by the Mann-Whitney U test and multivariate analysis was performed by Fisher's exact test to recognize risk factors of post-operative bleeding. A p-value less than 0.05 was considered significant.

RESULTS

A total of 150 adult patients undergoing tonsillectomy were included for analysis. Among the study subjects, 114 patients (76%) were male and 36 (24%) were female. The average age of patients was 32.2 ± 9.8 years. 33 patients (22%) were smokers while 72 patients (48%) were non-smokers. 111 (74%) patients underwent surgery for recurrent tonsillitis, 21 (14%) for IgA nephropathy, 1 (0.7%) for palmoplantar pustulosis, 15 (10%) for obstructive sleep apnea, and 3 (2%) for tonsillar hypertrophy. 9 patients (6%) underwent adenoidectomy and 15 patients (10%) underwent uvulopalatopharyngoplasty. 33 patients (22%) among 150 patients experienced post-tonsillectomy hemorrhage with 28 (85%) being grade 1, 2 (6%) being grade 2, 3 (9%) being grade 3, and 117 (78%) patients had no bleeding. Grade 2 and 3 patients required intervention to maintain hemostasis, and grade 3 patients also underwent additional surgeries. 27 (24.4%), 4 patients (26.7%), and 2 (14.3%) patients had a hemorrhage in patients undergoing tonsillectomy for recurrent tonsillitis, sleep apnea, and IgA nephropathy, respectively (p=0.277) (Table 1).

Table 1: Surgical Indication of Tonsillectomies and Classification of Post-Tonsillectomy Hemorrhage (n=150)

Surgical Indication	n (%)	Post-Tonsillectomy Hemorrhage	Primary Hemorrhage	Secondary Hemorrhage
Recurrent Tonsillitis	111 (74%)	27 (24.4%)	4 (3.6%)	23 (20.8%)
IgA Nephropathy	21 (14%)	2 (14.3%)	-	2 (14.3%)
Palmoplantar Pustulosis	1 (0.7%)	-	-	-
Sleep Apnea	15 (10%)	4 (26.7%)	1 (6.7%)	3 (20%)
Tonsillar Hypertrophy	3 (2%)	-	-	-

The study analyzed the risk factors of postoperative hemorrhage by univariate analysis. The smoking status differed significantly between total cases (p<0.001), primary hemorrhage group (p=0.05), and secondary hemorrhage group (p<0.001) as compared to the no bleeding group. Male gender was more prevalent in the total hemorrhage group (p<0.001) and secondary hemorrhage group (p=0.005) as compared to the no bleeding group. The primary hemorrhage group had a significantly higher average age (p=0.005) (Table 2).

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Table 2: Univariate Analysis

Risk Factors	No Post-Tonsillectomy Hemorrhage (n=117)	Post-Tonsillectomy Hemorrhage (n=33)	p-value	Primary Hemorrhage (n=5)	p-value	Secondary Hemorrhage (n=28)	p-Value
Average age	32.3	33.5	0.512	44.1	0.005**	32.2	0.915
Gender							
Male	84 (71.8%)	30 (91%)	<0.001***	5 (100%)	0.093	25 (89.5%)	0.005**
Female	33 (28.2%)	3 (9%)		-		3 (10.5%)	
BMI							
25 Or More	39 (33.4%)	30 (91%)	1.000	3 (60%)	0.524	8 (28.6%)	0.716
Less Than 25	78 (66.7%)	3 (9%)		2 (40%)		20 (71.4%)	
Current Smokers	19 (16.3%)	14 (42.5%)	<0.001***	3 (60%)	0.05*	11 (39.3%)	<0.001***
Duration of Surgery (Minutes)	79.1	78.0	1.000	64.1	0.202	79.3	0.571
Postoperative Antibiotics							
Oral intake	87 (74.4%)	23 (69.9%)	0.612	4 (80%)	1.000	19 (68%)	0.533
Injection	30 (25.6%)	10 (30.1%)		1 (20%)		9 (32%)	
Analgesia							
Non-Steroidal Anti-Inflammatory Drugs	106 (90.6%)	32 (97%)	0.055	5 (100%)	1.000	27 (96.4%)	0.096
Acetaminophen	11 (9.4%)	1 (3%)		-		1 (3.6%)	

*p<0.05, **p<0.01 and ***p<0.001

Results show a multivariate analysis of post-tonsillectomy hemorrhage. There was a significant difference between smokers and non-smokers (OR=3.52, 95% CI: 1.76-6.68, p<0.001) and smokers and former smokers (OR=3.55, 95% CI: 1.63-7.61, p<0.003). Male gender (OR: 4.03, 95% CI: 1.63-9.89, p=0.005) and NSAID (OR: 7.87, 95% CI: 1.007-63.53, p=0.0502) were significantly associated with post-operative hemorrhage. Smoking status (p=0.052) and older age (p=0.005) were significant risk factors in the primary hemorrhage group, and smoking status (p<0.001) and male gender (p=0.010) were significant in the secondary hemorrhage group (Table 3).

Table 3: Multivariate Analysis

Risk Factors	Post-Tonsillectomy Hemorrhage		Primary Hemorrhage		Secondary Hemorrhage	
	OR (95% CI)	p-value	OR (95% CI)	p-value	OR (95% CI)	p-value
Age	0.99 (1.0-1.08)	0.191	1.09 (1.05-1.30)	0.005*	0.99 (1.0-1.06)	0.833
Male Gender	4.03 (1.63-9.89)	0.005**	-	-	3.47 (1.42-9.03)	0.010**
Obesity	0.59 (0.30-1.18)	0.225	0.61 (0.11-3.32)	0.492	0.59 (0.28-1.17)	0.223
Current Smokers vs Non-Smokers	3.52 (1.76-6.68)	<0.001**	7.18 (1.05-49.88)	0.052*	3.29 (1.70-6.64)	<0.001**
Duration of Surgery	0.98 (1.01-1.03)	0.678	1.01 (0.95-1.05)	0.213	0.99 (1.0- 1.02)	0.957
Antibiotics	0.75 (0.49-1.60)	0.615	1.01 (0.20-5.67)	1.021	0.77 (0.39-1.62)	0.600
NSAIDS	7.87 (1.007-63.53)	0.0502*	-	-	7.02 (0.94-54.44)	0.100

*p<0.05, **p<0.01 and ***p<0.001

DISCUSSION

This study was conducted to analyze the predictors of postoperative hemorrhage in adults undergoing tonsillectomy. The results revealed that male gender, smoking status, and administration of NSAIDs during surgery were independently associated with postoperative bleeding. The overall risk of hemorrhage and primary and secondary bleeding was increased in current smokers. Other studies have also reported smoking as a dependent predictor of hemorrhage in tonsillectomy patients [7-9]. However, there is no data regarding the association of hemorrhage with former smokers. In present study, it was showed that a history of smoking by former smokers was not related to an increased risk of hemorrhage in comparison to non-smokers. However, taking into account the duration of cessation in former smokers can help yield better results. Since inflammation and infection are side effects of smoking, post-operative wound healing is also worse in smokers, which increases the likelihood of hemorrhage [10]. Additionally, these patients also have increased sputum and mucus production, which can stimulate coughing postoperatively and bleeding eventually [11]. Hence, patients must advise abstinence or cessation of smoking before the procedure to avoid critical emergencies. Gender is a significant independent

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predictor of overall hemorrhage and secondary bleeding, with increased incidence in males. Previous studies investigating the link between gender and hemorrhage risk have also reported the same findings, which can be explained by the fact that estrogen contributes to faster healing and prevents inflammation, therefore, women experience fewer complications [7, 12]. However, gender has not been significant in children undergoing tonsillectomy because sex hormones are not differentiated before puberty. Smoking is also more prevalent in men than in women in Pakistan, hence increasing the risk of hemorrhage in men, however, smoking status and male gender were independent predictors in present study. Older age was also an independent predictor of primary hemorrhage since tonsillar inflammation can last for a long time in older patients. As age increases, blood vessels weaken, increasing the likelihood of bleeding shortly after the procedure. Overall, hemorrhage risk was also significantly linked to intraoperative administration of nonsteroidal anti-inflammatory drugs (NSAIDs). Literature found that NSAIDs increased the risk of bleeding after tonsillectomy as these medications block cyclooxygenase, leaving an antiplatelet effect [13]. McLean *et al.*, concluded that patients administered NSAIDs were more likely to require surgery to treat post-tonsillectomy hemorrhage, but So *et al.*, drew contrasting results that there was an association between post-operative bleeding and its surgical treatment and use of NSAIDs [14, 15]. Although there is no definite view about NSAIDs being a risk factor for hemorrhage, the present study supports the results of McLean *et al.*, [14]. Other probable risk factors, including duration of surgery, obesity, and antibiotic use, were not related to the incidence of hemorrhage. 74% of patients in present study underwent surgery for recurrent tonsillitis. Research shows that postoperative hemorrhage in patients who underwent surgery for recurrent tonsillitis is linked to prolonged inflammation [16, 17]. However, there was no significant difference in surgical indications in current study. Since we included adult patients, tonsillar inflammation may have occurred with other risk factors like smoking, but may have been asymptomatic due to which we could not consider surgical indication as a predictor of hemorrhage.The incidence of post-tonsillectomy hemorrhage was 22% in current study, which is higher than the rate reported by previous studies, i.e. 2.2%-10% [18, 19]. 9% of patients in current study required surgeries to resolve the hemorrhage, which is also higher than 1-6% reported in previous studies[20].

CONCLUSIONS

It was concluded that post-tonsillectomy hemorrhage had a significant association with male gender, smoking status, and administration of NSAIDs during surgery. Therefore, it is advisable for surgeons to strongly suggest that patients maintain a healthy lifestyle before surgery and opt for other analgesics to prevent the risk of hemorrhage.

Authors Contribution

Conceptualization: SB, JMT
Methodology: MAA, MT
Formal analysis: JMT
Writing review and editing: MT
All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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