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Predictors of Dehydration Following Adenotonsillectomy in Jordanian Pediatric Cases

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Abstract

Background: Dehydration is a well-established complication of adenotonsillectomy. This study aims to measure the prevalence of dehydration among pediatric adenotonsillectomy patients in a tertiary hospital in Amman and to identify the risk factors that could be associated with it.

Methods: This is an observational single-center study. Data were collected by reviewing the health records of patients who underwent adenotonsillectomy between January 2015 and June 2020 at Ibn Al-Haytham Hospital. Inclusion criteria were any patient between 1 and 12 years old that has undergone routine adenotonsillectomy. Exclusion criteria were any adenotonsillectomy for neoplasm purposes, patients with reported developmental delay, and patients who underwent adenoidectomy or tonsillectomy alone. Collected data included patients' demographics, indication for adenotonsillectomy, type of surgical technique, and history of dehydration in the following two weeks post adenotonsillectomy. The data were then imported into an SPSS statistical spreadsheet and analyzed. Descriptive statistics analysis of the demographic characteristics of the cases was prepared. Numerical data were expressed as percentages or means ± standard deviation (SD).

Results: Three hundred and eighty-four patients met the inclusion criteria of this study. 234 patients (62.2%) were male, and the majority of the cases (223 patients) were between 5 and 6 years old, accounting for 58.8% of the population. The prevalence of post-adenotonsillectomy dehydration was 5.7%. Point estimation with a 95% confidence interval falls between 5.17 and 5.63. Dehydration was more prevalent in children aged under three years old. Dependence-type Multivariate analysis revealed that age and gender remained significantly associated with dehydration with *P* values > 0.001 and 0.004, respectively, after adjusting for the other variables.

Conclusion: Dehydration is a serious yet rare complication post adenotonsillectomy. Screening for dehydration pre- and post-discharge is highly recommended. There is a need for further multi-center and population-based studies to examine the full extent of dehydration complications. It is in the best interest of surgeons and all caregivers to provide the best quality of care for adenotonsillectomy cases. Avoiding dehydration and all other surgical complications would be part of the standards of high-quality health care.

Keywords: Adenotonsillectomy, Dehydration, Complication, Pediatric

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Introduction

Tonsillectomy is one of the most common major pediatric otorhinolaryngology surgeries world wide (1, 2). It is

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↑What is "already known" in this topic:
The complications following adenotonsillectomy are well known in the literature. A lot of papers describe and review the commonest of them.

→What this article adds:
The literature is full of articles that focus on bleeding and ignore other common complications of adenotonsillectomy. In this article, we will focus on dehydration following adenotonsillectomy and its predictors as it is the most preventable complication.

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estimated that more than half a million tonsillectomy procedures are performed in the USA annually (3). It is sometimes combined with adenoidectomy, and this joint procedure is referred to as 'adenotonsillectomy' (4, 5). Although tonsillectomy and adenoidectomy are both considered very safe procedures, combining these two procedures could increase the risk of complications (6).The main indications for tonsillectomy could be grouped into two categories: infectious and obstructive indications (7). Nowadays, especially in developed countries, non-infectious indications are becoming more common than infectious (8).

Current evidence supports performing adenotonsillectomy as a day case for pediatric cases between three and seventeen years old (9). Surgeons worldwide are currently using several techniques to perform adenotonsillectomy (10, 11). The choice of the technique generally depends on the surgeon's familiarity and experience with the selected technique (8). The literature is full of articles that compare the complications of each technique, and the complication rates are relatively close to each other (12-14).

The mortality rate post-tonsillectomy ranges from 1 every 10,000 to 1 every 35,000 procedures, and the morbidity rate ranges from 2–14% (1, 6). Adenotonsillectomy complications are well documented in the literature (15, 16). Several studies indicated that the most common complications of adenotonsillectomy are pain, hemorrhage, dehydration, airway obstruction and other respiratory complications (2, 3). However, most articles focus on bleeding and ignore other common complications (3, 16).

Dehydration is one of the easily preventable complications of adenotonsillectomy, yet it could be fatal, especially in young patients with low body weight and low volume reserve (6, 17). There is a scarcity of studies that describe dehydration post-adenotonsillectomy and almost all available studies were conducted in Western or developed countries (17, 18).

Although prevention of dehydration post adenotonsillectomy is the primary concern of the surgeon, it is a multidisciplinary task that involves the parents, nurses, and medical doctors (19). Dehydration prevention includes the implementation of pain management protocols, preoperative and postoperative education, proper hydration, observation during and after hospital care, and other measures (5, 15, 20).

The objective of this observational single-center study is to measure the prevalence of dehydration among pediatric adenotonsillectomy patients in a tertiary hospital in Amman and to identify the risk factors that could be associated with it.

Methods

Data of this retrospective study was collected by health records review of patients who underwent adenotonsillectomy between January 2015 and June 2020 at Ibn Al-Haytham Hospital. Ibn Al-Haytham Hospital is a 200-bed hospital, and it is considered one of the leading tertiary private hospitals in Amman, Jordan (21).

Inclusion criteria were any patient between 1 and 12 years old that has undergone routine adenotonsillectomy as a day-case or inpatient case. Exclusion criteria were any adenotonsillectomy for neoplasm purposes, patients with reported developmental delay, and patients who underwent adenoidectomy alone (without tonsillectomy) or tonsillectomy alone (without adenoidectomy).

Collected data were patients' demographics, insurance data, indication for adenotonsillectomy, type of surgical technique, and history of dehydration in the following two weeks post adenotonsillectomy. The intracapsular Tonsillectomy technique was done on all of the patients. Also, cold and hot techniques were performed. The device used for the hot technique was monopolar electrocautery. The devices used for the cold technique were cold steel dissection and guillotine. A positive history of dehydration was considered when medical personnel indicated in a patient's record that the case had dehydration within two weeks post adenotonsillectomy or when there is a history of nausea or vomiting with intravenous (IV) fluids or oral rehydration therapy at an emergency room (ER) or clinic visit after being discharged from the hospital and within two weeks post adenotonsillectomy.

Data were collected on paper forms, then anonymous data were numerically coded and entered into Excel (Microsoft Corp., Redmond, WA, USA), where it was cleaned by running variables frequencies to explore all the variables. Missing data and anomalies, typos, and other data entry errors were corrected by conducting a cross-check against the originally filled paper forms and medical records. The data were then imported into an SPSS statistical spreadsheet (statistical data analysis software, SPSS version 23.0) and analyzed. Descriptive statistics analysis of the demographic characteristics of the cases was prepared. Numerical data were expressed as percentage or means ± standard deviation (SD), as appropriate. Data were interpreted as statistically significant when p-value < 0.05.

The ethical committee at Ibn Al-Haytham Hospital approved this descriptive, retrospective, cross-sectional study. This study was carried out in accordance with the Helsinki Declaration regulations to protect human research participants.

Results

Three-hundred and eighty-four patients met the inclusion criteria of this study. 234 (62.2%) of the patients were male, and the majority of the cases (223 patients) were between 5 and 6 years old, accounting for 58.8% of the population, with a mean age of 5.4±2.3 years. The characteristics of included cases are described in Table 1.

The main reported indication for adenotonsillectomy was for obstructive reasons with a number of 171 cases, presenting (45.7%) of the population. 260 patients that present 68.8%of the population had adenotonsillectomy by a cold technique and the other one-third,118 patients which present 31.2% of the patients, had it by a hot technique (Table 1).

The overall prevalence of post-adenotonsillectomy dehydration in included cases was 5.7%. with Point estimation with 95% confidence interval falls between 5.17 and 5.63. It was more common in males than in females and dehydration was more prevalent in the youngest age group

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Table 1. Characteristics of included adenotonsillectomy cases (n=384)

Variable	Number	Percent
Age (years) (n=379) (mean ± SD = 5.4 ± 2.3)		
<3 years	18	4.7
3 – 4	138	36.4
5+ years	223	58.8
Gender (n=376)		
Male	234	62.2
Female	142	37.8
Insurance status (n=367)		
Out-of-pocket payment	106	28.9
Insured	261	71.1
Adenotonsillectomy indication (n=374)		
Obstructive indication	171	45.7
Infectious indication	160	42.8
Both	43	11.5
Surgical technique (n=378)		
Cold technique	260	68.8
Hot technique	118	31.2

(< 3 years old) (Table 2). Dependence-type Multivariate logistic regression analysis, that predicts a dependent data variable by analyzing the relationship between one or more existing independent variables, was used to identify the adjusted effect of study variables on postoperative dehydration (Table 3). The analysis by a stepwise forward binary logistic regression model revealed that age and gender remained significantly associated with dehydration with odds ratio of 11.8 and 4.7, respectively, after adjusting for the other variables. Cases under three years old had an odds ratio of 11.8 and 95% confidence interval between 10 and 11.76. They were 11.8 times more likely to have dehydration compared to the 5+ age group (p<0.001). Similarly, male cases with odds ratio of 4.7 with 95% confidence interval between 4.03 and 4.67 were 4.7 times more likely to have dehydration compared to females (p=0.044). Insurance status, type of surgical technique, and the indication of adenotonsillectomy were all not statistically significant associated with pediatric post adenotonsillectomy dehydration and they were excluded from this stepwise regression model.

Discussion

The current study is the first study in the Middle East Region that explored the predictors of dehydration following adenotonsillectomy in pediatric cases. Dehydration can cause much distress to the child, their parents, the surgeon and other care providers and sometimes it requires a visit to the ER or readmission to the hospital (2, 22)

Two leading causes of dehydration post adenotonsillectomy were documented in the literature. The first cause is oropharyngeal pain, which could become an obstacle for oral feeding. Moreover, dehydration also increases the oropharyngeal pain and therefore the child might enter a dangerous cycle of dehydration and oropharyngeal pain post adenotonsillectomy. The second cause is nausea and vomiting. Opioid painkillers, swallowed blood and anesthesia often cause nausea and vomiting (17, 20, 23).

It is hard to compare the prevalence of dehydration between the current study and previous ones because most of the previous studies did not focus on a single adenotonsillectomy complication other than hemorrhage. However, other studies reported a prevalence ranging between 2.3% and 7.6% (3, 16). For example, in a large retrospective study, Dyer et al. reported a dehydration prevalence rate of 7.1% post adenotonsillectomy, while in another recent study (19), reported that 4.8% of adenotonsillectomy pe-

Table 2. Characteristics of patients that did and did not present with dehydration

	Dehydration Status		*p*-value
	No (%)	Yes (%)	
Gender			0.004*
Male	214 (91.5)	20 (8.5)	
Female	140 (98.6)	2 (1.4)	
Age			<0.001*
<3 years	12 (66.7)	6 (33.3)	
3 – 4	128 (92.8)	10 (7.2)	
5+ years	217 (97.3)	6 (2.7)	
Adenotonsillectomy indication			0.453
Obstructive indication	161 (94.2)	10 (5.8)	
Infectious indication	153 (95.6)	7 (4.4)	
Both	39 (90.7)	4 (9.3)	
Surgical technique			0.056
Cold technique	250 (96.2)	10 (3.8)	
Hot technique	107 (90.7)	11(9.3)	
Insurance status			0.337
Out-of-pocket payment	98 (92.5)	8 (7.5)	
Insured	248 (95.0)	13 (5.0)	

* Significant at α<0.05 level

Table 3. Associated factors with dehydration post adenotonsillectomy in logistic regression analysis

Variable		Odds Ratio	95% confidence interval	*p*-value
Age	< 3 years	11.8	10.1, 11.76	0.001*
	3 – 4 years	3.3	2.96, 3.22	0.035*
	5 + years	Reference	Reference	
Gender	Male	4.7	4.03, 4.67	0.044*
	Female	Reference	Reference	

* Significant at α<0.05 level

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diatric cases visited the ER to manage dehydration complication after their procedure (19, 24). The differences in dehydration prevalence between these studies could be explained by differences in the exclusion and inclusion criteria and differences in study settings.

According to the current study findings, the youngest age group (< 3 years) was a risk factor for dehydration. This is in line with Duval et al. findings where younger children had more dehydration encounters when compared with other age groups (3). Also, Lindquist et al. reported higher dehydration in young children (19). Similarly, in studies that were concerned with dehydration induced by diarrhea, young age was also a predictor for dehydration (25, 26).

Younger age is less cooperative with resuming oral feeding post adenotonsillectomy and with their low body fluid volume reserve, it is not surprising to find the risk of dehydration higher at this age group (27).

In addition, based on the current study results male gender was another significant predictor for dehydration post-adenotonsillectomy after controlling for other factors. To the best of our knowledge, no previous studies identified male gender as a risk factor for dehydration. However, a Swedish and an American study identified male gender as a predictor for another complication (hemorrhage) post-tonsillectomy with or without adenoidectomy (2, 28).

With simple steps and protocols, post-adenotonsillectomy dehydration could be prevented (29). Currently, it is a common practice to administer dexamethasone intraoperatively with strong evidence about its effect in reducing nausea and vomiting and ultimately decreasing the risk of dehydration (5). In addition, IV fluids and oral rehydration therapy are routinely administered to prevent dehydration post adenotonsillectomy (8, 17). Moreover, proper pain management could control throat pain and with caregiver encouragement, oral feeding could be resumed, and dehydration would be avoided (30).

Several articles have reported innovative ideas to prevent dehydration post adenotonsillectomy, such as using a medical mobile application to tackle this issue, post-discharge mandatory nursing follow-up phone calls and verbal or written educational messages with a special focus on children living in challenging socio-economic settings (31-33).

One health economic study estimated that a hospital admission to managing dehydration post-tonsillectomy would cost around 1,400 dollars in the USA (30). Therefore, post-adenotonsillectomy dehydration prevention and management is not only lifesaving, but it is also a cost-effective measure (3, 17).

Similar to all other retrospective cross-sectional studies, this research has several limitations. The collected data in this study depends on the accuracy and completeness of medical records. It also depends on observation at a single center with relatively small sample size and this limits the generalization of study findings. However, the sample size of the current study is bigger than several other published adenotonsillectomy articles (3, 33). Additionally, dehydration severity was not collected in this study. Finally, a child with post-operative complications could receive dehydration management at another health facility. However, from our knowledge of the current study population, this is highly unlikely.

Regardless of all of these limitations, this study has several strengths. It is one of the very first studies that focused on a single post adenotonsillectomy complication other than hemorrhage. Furthermore, the current study included pediatric patients that have undergone adenotonsillectomy under different surgical techniques, in day-case or inpatient settings, and this variation in patient cohort could help with the generalization of study results.

Conclusion

Dehydration is a serious yet rare complication post adenotonsillectomy The risk of this complication increases in under three years old children. Screening for dehydration pre and post-discharge is highly recommended. Several dehydration prevention measures could be implemented and usually, they require multidisciplinary team efforts for proper prevention and management of adenotonsillectomy dehydration

There is a need for further multi-center and population-based studies to examine the full extent of dehydration complication post adenotonsillectomy. In addition, interventional studies are needed to identify the best evidence-based measures to prevent and manage dehydration in pediatric adenotonsillectomy cases.

It is in the best interest of surgeons and all caregivers to provide the best quality of care for adenotonsillectomy cases. Avoiding dehydration and all other surgical complications would be part of the standards of high-quality health care.

There are some promising studies that relate pain control through infiltration of local anesthetics and the prevention of dehydration. However, more studies should be carried out in multiple centers in order to make it an approach in tonsillar and adenoid surgeries.

Ethics approval and consent to participate

The ethical committee at Ibn Al-Haytham Hospital approved this descriptive, retrospective cross-sectional study. This study was carried out in accordance with the Helsinki Declaration regulations to protect human research participants.

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Not Applicable.

Conflict of Interests

The authors declare that they have no competing interests.

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