Journal of Cardiovascular Disease Research
ISSN: 0975-3583, 0976-2833 VOL15, ISSUE7, 2024

# To study the Airway Management in Neonates and Infants.

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## Abstract

**Background:** Airway management in neonates and infants poses unique challenges due to anatomical and physiological characteristics. Limited data from low- and middle-income settings necessitate updated evidence.

**Objective:** To evaluate the success rates, complications, and device performance during airway management among 100 neonates and infants undergoing elective or emergency surgery.

**Methods:** A prospective observational study was conducted on 100 patients (0–12 months). Data recorded included demographic variables, airway assessment, device used, first-attempt success, number of attempts, time to secure airway, and complications.

**Results:** The overall first-attempt success rate was 82%. Video laryngoscopy (VL) demonstrated higher success (92%) than direct laryngoscopy (DL) (76%). Complication rate was 14%, with desaturation being most common. Difficult intubation occurred in 6% of patients.

**Conclusion:** VL improves success and reduces complications in neonatal and infant airway management. Routine availability and training in VL may improve outcomes in this population.

**Keywords:** airway, management, neonates & infants.

**Study Design:** Observational Study.

## Introduction

Managing the airway in newborns and infants presents a considerable hurdle for anesthesiologists, stemming from distinct anatomical characteristics[1]. These include a proportionally larger tongue, a larynx positioned higher in the head, a pliable epiglottis, and a diminished functional residual capacity, all of which elevate the likelihood of oxygen deprivation and unsuccessful intubation.

Securing the airway in neonates is frequently problematic, irrespective of whether the professional responsible is a neonatologist, pediatrician, anesthesiologist, another specialist, or an advanced practice provider[2]. The neonatal demographic experiences the highest frequency of airway difficulties during intubation. Furthermore, among intubated patients, neonates face the greatest risk of accidental extubation compared to any other age group.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE7, 2024

While neonates encounter the most significant challenges during tracheal intubation, they also endure more pain and distress during this procedure than older patients, often due to insufficient premedication aimed at mitigating pain, procedural stress, and the potential for failure[3].

While tools like video laryngoscopes have enhanced visualization capabilities, there's still a scarcity of research comparing various devices and their results in this particularly susceptible group. This research aims to examine the methods, success percentages, and issues encountered during airway management in newborns and young children[4]. Children's airways present unique challenges compared to adults. It's commonly thought that unexpected difficulties with airway management are infrequent in children, and that most such cases can be predicted beforehand. However, recent findings suggest distinctions between newborns and older children. Specifically, newborns and infants experience a greater rate of difficult tracheal intubation compared to older children[5]. Furthermore, unpredictable intubation challenges may arise more often in neonates and infants than in their older counterparts, meaning the common assumption that most difficult airways in children can be foreseen might not hold true for this younger demographic. Additionally, newborns and infants are more prone to hypoxemia when undergoing tracheal intubation than older children. Lastly, when a standard direct laryngoscope is employed for newborns and infants with challenging airways, the success rate for initial tracheal intubation attempts is remarkably low[6-7].

## Methods

### Study Design and Setting

A prospective observational study was conducted at the Department of Anesthesiology, Sudha Medical College and Hospital Kota for 01 Year.

### Participants

100 neonates and infants aged 0–12 months scheduled for elective or emergency procedures requiring airway management.

### Inclusion criteria:

1. Age 0–12 months
2. ASA I–III
3. Procedures requiring airway control using mask, supraglottic airway device (SAD), or endotracheal intubation

### Exclusion criteria:

1. Congenital airway anomalies
2. Facial deformities
3. Hemodynamic instability prior to induction

### Data Collection:

The following parameters were recorded:

- Demographics
- Type of airway device used
- Need for airway adjuncts
- Number of attempts
- Time to secure airway
- Adverse events

**Outcome Measures**

Primary outcome:

- First-attempt success rate

Secondary outcomes:

- Overall success rate
- Time to secure airway
- Complications

**Statistical Analysis**

Data were summarized using descriptive statistics. Continuous variables are presented as mean ± SD; categorical data as percentages.

**Results**

**Table 1: Demographic and Baseline Characteristics (N=100)**

| Variable | Mean ± SD / n (%) |
|---|---|
| Age (months) | 4.2 ± 3.1 |
| Weight (kg) | 4.8 ± 1.7 |
| Sex (Male/Female) | 58 (58%) / 42 (42%) |
| ASA I / II / III | 44% / 39% / 17% |
| Elective / Emergency | 72% / 28% |

**Table 2: Airway Devices and Success Rates**

| Airway Device | Used in n (%) | First-Attempt Success n (%) | Overall Success n (%) |
|---|---|---|---|
| Direct Laryngoscopy (DL) | 50 (50%) | 38 (76%) | 48 (96%) |
| Video Laryngoscopy (VL) | 30 (30%) | 28 (92%) | 30 (100%) |
| Supraglottic Airway Device (SAD) | 15 (15%) | 13 (87%) | 14 (93%) |
| Face Mask Only | 05 (5%) | — | 05 (100%) |

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE7, 2024

**Table 3: Airway Difficulty and Procedure Metrics**

| Variable | Value |
|---|---|
| Difficult mask ventilation | 5% |
| Difficult intubation | 6% |
| Mean time to secure airway (seconds) | 23.5 ± 6.8 |
| Airway adjunct use (stylet/bougie) | 21% |

**Table 4: Complications Observed**

| Complication | Frequency n (%) |
|---|---|
| Desaturation (<90%) | 08 (8%) |
| Bradycardia | 03 (3%) |
| Airway trauma (minor bleeding) | 02 (2%) |
| Laryngospasm | 01 (1%) |
| Total complications | 14 (14%) |

## Discussion

This prospective study indicates that managing airways in newborns and young children is typically safe, achieving high success rates with various devices. Video laryngoscopy (VL) proved more effective than direct laryngoscopy (DL) for initial success, mirroring recent findings that suggest better glottic visibility with VL. The observed complication rate of 14% is in line with prior pediatric airway research, with oxygen desaturation being the most frequent issue, attributed to the limited oxygen reserves in this age group[8].

The management of airways in neonates and infants poses distinct challenges, markedly different from those faced with older children and adults. These distinctions stem from unique anatomical, physiological, and developmental traits that impact how airway assessments are approached and which interventions are most suitable.

From an anatomical perspective, neonates and very young infants have a proportionally larger occiput, causing their necks to naturally flex when lying on their backs, which can obstruct the airway[9]. Their tongues are relatively large compared to the size of their mouths, and their larynx is situated higher and more forward, often making it harder to see during laryngoscopy. Furthermore, the epiglottis is usually omega-shaped and more pliable, adding to the difficulties of direct airway procedures. These developmental variations highlight the necessity of a gentle approach and careful positioning, often requiring a shoulder roll to achieve a neutral neck alignment[10].

Physiologically, neonates and infants have a high oxygen consumption rate and reduced functional residual capacity, leaving less physiologic reserve during periods of apnea. Consequently, rapid desaturation is common during airway manipulation, underscoring the need for thorough preparation, effective pre-oxygenation, and efficient execution of airway

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE7, 2024

procedures. Their immature respiratory control mechanisms and increased susceptibility to fatigue necessitate careful monitoring during both spontaneous and assisted ventilation[11].

Selecting the right equipment is also a crucial factor. Given the reduced room for error with this patient group, it is vital to select the appropriate size for face masks, laryngoscope blades, endotracheal tubes, and supplementary devices like oropharyngeal or nasopharyngeal airways. Although standard direct laryngoscopy is still commonly employed, video laryngoscopy has become more popular because it can enhance visualization of the glottis, particularly in cases where intubation is anticipated to be difficult. Nevertheless, being comfortable with the selected device and skilled in its application are fundamental aspects of safe practice[12].

Non-invasive approaches to airway management, including continuous positive airway pressure (CPAP), positive pressure ventilation using a bag-mask, or supraglottic airway devices, are very important, especially in neonatal intensive care units. These techniques can help stabilize fragile infants, decrease the necessity for endotracheal intubation, and lessen related issues like trauma, subglottic narrowing, or lung damage from ventilators. However, they should be employed carefully, with an understanding of possible negative consequences such as air entering the stomach or air leakage[13].

Managing the airway in this population also necessitates preparing for unique circumstances, such as congenital abnormalities (e.g., Pierre Robin sequence, cleft palate, choanal atresia, tracheomalacia), prematurity, and the requirement for immediate resuscitation. These conditions can considerably change airway structure or breathing mechanics and require tailored strategies involving collaboration among various medical specialists[14]. Training that uses simulations has become a useful method for improving healthcare providers' readiness and minimizing mistakes during critical neonatal airway procedures.

**Strengths**

- Prospective design
- Uniform protocol
- Inclusion of both elective and emergency cases

## Limitations

- Single-center study
- Limited sample size
- Operator skill variations

## Conclusion

Video laryngoscopy significantly improves first-attempt success in airway management for neonates and infants compared to direct laryngoscopy. Ensuring VL availability and incorporating hands-on training can enhance patient safety and outcomes.

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