International Journal Of Health, Engineering And Technology (IJHET) E-ISSN 2829 - 8683
Volume 5, Number 1, May 2026, *Page. 426 - 434*
Email : editorijhess@gmail.com

Safety And Effectiveness Of Supraglottic Airway Devices In Cesarean Sections Under General Anesthesia: A Systematic Literature Review

Patricia Mamuraja[1)*],Made Suandika[2)],Adiratna Sekar Siwi[3)]
[1,2,3)] Department of Anesthesia, Faculty of Health, Harapan Bangsa University, Indonesia

*Corresponding Author
Email : patriciamamuraja22@gmail.com

Abstract

Airway management during cesarean section (CS) under general anesthesia carries risks of complications such as aspiration, hypoxemia, and hemodynamic responses resulting from airway manipulation. Second-generation supraglottic airway devices (SADs), such as the LMA Supreme, have been developed as an alternative to endotracheal tubes (ETTs). The purpose of this study is to evaluate the safety and efficacy of second-generation SAD compared to ETT in SC under general anesthesia. This study employed a Systematic Literature Review (SLR) method in accordance with the PRISMA 2020 guidelines. The literature search was conducted in the PubMed, ScienceDirect, and Google Scholar databases, covering the years 2015–2025. The included studies comprised Randomized Controlled Trials (RCTs), cohort studies, and retrospective studies evaluating the use of SAD in SC. Quality assessment was performed using the Joanna Briggs Institute (JBI) instrument. A total of 8 studies met the inclusion criteria. The results showed that second-generation SADs had high insertion success rates, adequate ventilation, and maternal and neonatal outcomes comparable to those of ETT. No significant increase in aspiration, hypoxemia, or airway complications was observed. Supraglottic Airway Devices (SADs) demonstrated more stable hemodynamic responses and faster insertion times. Second-generation supraglottic airway devices (SADs) are an effective and relatively safe alternative to endotracheal intubation (ETI) in selected patients undergoing cesarean section under general anesthesia. Evidence regarding high-risk populations, particularly those with hypertension during pregnancy, remains limited.

Keywords: Airway Management, Cesarean Section, General Anesthesia, LMA, SAD, Supreme.

INTRODUCTION

Obstetric complications such as hypertension in pregnancy, including preeclampsia and eclampsia, remain the leading cause of maternal mortality worldwide. These conditions often require cesarean section under general anesthesia, particularly in emergency cases. Eclampsia is characterized by seizures in patients with preeclampsia accompanied by hypertension, edema, and proteinuria ≥300 mg/24 hours, thus requiring rapid and multidisciplinary management (Bohsas et al., 2024).

In cesarean section procedures under general anesthesia, airway management is a critical aspect, particularly in patients at risk for difficult airways, such as those with eclampsia. The endotracheal tube (ETT) is the gold standard, but this procedure is invasive and can trigger a hemodynamic response. Supraglottic airway devices (SADs), particularly the LMA, have been developed as simpler and faster alternatives for placement (Lim et al., 2020).

The use of the LMA has shown a high success rate in cesarean sections, with a relatively low rate of first-attempt failure, although this is influenced by patient conditions such as stage of labor (Lim et al., 2020). Globally, the prevalence of eclampsia varies, being higher in developing countries than in developed countries, and in Indonesia, it contributes significantly to maternal mortality through the category of hypertension in pregnancy (Fishel Bartal & Sibai, 2022).

Several studies have shown that the use of an LMA during cesarean section under general anesthesia does not increase the risk of serious complications such as aspiration or hypoxia. The Laryngeal Mask Airway (LMA) may even reduce the risk of postoperative hypoxia and coughing compared to the endotracheal tube (ETT) and provide a more stable hemodynamic response, although there remains a risk of mucosal trauma in some cases (Dong et al., 2023; Lim et al., 2022).

In patients with eclampsia, the use of an LMA has been reported to be safe and effective without increasing the incidence of aspiration, laryngeal spasm, or hemodynamic disturbances. Placement is generally successful on the first attempt and does not cause significant spikes in blood pressure or heart rate, making it a good alternative in emergency situations (Borkar Patil & Upadhye, 2018).

Scientific evidence regarding the use of LMA in patients with eclampsia remains limited, and there are currently no clear guidelines. Most studies are retrospective with small sample sizes and have not specifically evaluated the preeclampsia population. A systematic review is needed to comprehensively assess the safety and efficacy of LMA compared to ETT in high-risk preeclampsia patients (Geng et al., 2023; Krug et al., 2025).

RESEARCH METHODS

Study Design and Search Strategy. This study employed the SLR method using the PRISMA 2020 guidelines. Data Sources and Search Strategies A comprehensive literature search was conducted in the electronic databases PubMed, ScienceDirect, and Google Scholar to identify relevant studies. The search covered publications from January 2015 to January 2025. The keywords and Medical Subject Headings (MeSH) terms used included: “supraglottic airway device” OR “laryngeal mask airway” OR “LMA Supreme” AND “endotracheal tube” OR “tracheal intubation” AND “cesarean section” OR “caesarean section” AND “general anesthesia” OR “general anaesthesia” AND “obstetric anesthesia”. Additional keyword combinations were also used to expand the search, such as: “airway management” AND “pregnancy” OR “obstetric patient” AND “aspiration” OR “hypoxemia” OR “airway complications”. Boolean operators (AND/OR) were used to combine search terms to improve the sensitivity and specificity of the search results. There were no language restrictions in the literature search process. The reference lists of relevant articles were also manually searched to ensure comprehensive coverage of the search.

Eligibility and Selection Criteria for the Study. The studies included in this review were randomized controlled trials (RCTs), cohort studies, or retrospective studies involving cesarean section (CS) patients under general anesthesia. The intervention evaluated was the use of a soft airway device (SAD), specifically a second-generation laryngeal mask airway (LMA), with or without comparison to an endotracheal tube (ETT). The outcomes evaluated included placement success, ventilatory effectiveness, and safety of use, such as aspiration, hypoxemia, and airway complications. Additional outcomes, including hemodynamic stability, placement time, and maternal outcomes, were also considered. Studies were excluded if they did not use an SAD, did not involve cesarean section under general anesthesia, or lacked relevant outcome data. Articles in the form of literature reviews, meta-analyses, and case reports were excluded. Study selection was conducted through title and abstract screening, followed by a full-text review. Disagreements were resolved through consensus discussions.

Data Extraction and Assessment of Risk of Bias. Data extraction was performed independently by two researchers using a pre-designed standardized form. The extracted data included author names, year of publication, country of study, study design, sample size and characteristics, type of intervention (use of SAD), ETT comparison group, and reported clinical outcomes. Methodological quality and risk of bias were assessed using the Joanna Briggs Institute (JBI) tool according to each study’s design. Each study was then categorized as having a low, moderate, or high risk of bias.

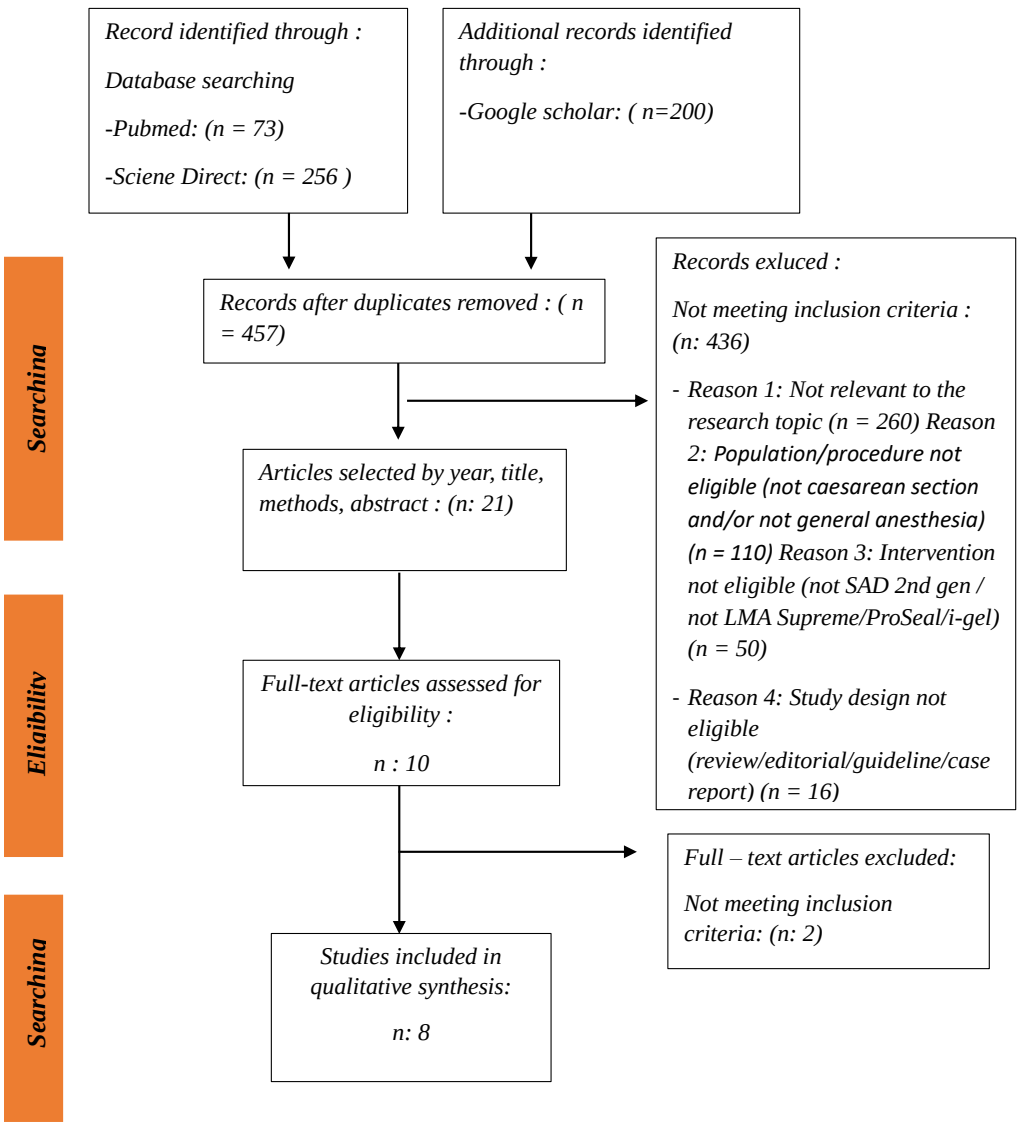
The primary outcomes of this study are the effectiveness and safety of SAD use in cesarean section patients under general anesthesia. Effectiveness is measured by successful device placement

and adequate ventilation, while safety includes incidents of aspiration, hypoxemia, and airway complications.

Secondary outcomes include hemodynamic stability, device insertion time, and maternal and neonatal outcomes. Additionally, postoperative complications such as sore throat and cough are also considered as additional indicators.

Data analysis was conducted using a descriptive approach with a narrative synthesis methodology due to the heterogeneity of study designs, types of interventions, and outcome measures. The data are presented in tables and descriptive narratives to facilitate comparisons across studies.

RESULTS AND DISCUSSION



Picture 1. PRISMA Flow Diagram

A systematic literature search was conducted on PubMed, ScienceDirect, and Google Scholar, identifying a total of 529 articles (PubMed n = 73, ScienceDirect n = 256, Google Scholar n = 200). After deduplication, 457 articles were screened based on their titles and abstracts. A total of 436 articles were excluded for failing to meet the inclusion criteria, leaving 21 articles for further

assessment. A total of 10 articles were reviewed in full text, and 2 articles were excluded for failing to meet the criteria, resulting in 8 studies analyzed. The selection process is presented in a PRISMA diagram. The selected studies were assessed using the JBI Critical Appraisal tool and data were extracted based on the PICO framework. The results of the analysis showed that the use of second-generation SADs, particularly the LMA Supreme, provided outcomes comparable to those of endotracheal tubes (ETTs) in terms of placement success, incidence of hypoxemia, airway complications, hemodynamic stability, and neonatal outcomes in SC patients under general anesthesia.

Title	**Author's name & Year of publication**	**Research Methodology**	**Sample Size and Characteristics**	**Interventions Used**	**Key Findings**
Supreme laryngeal mask airway for cesarean section under general anesthesia: a 10-year retrospective cohort study	Geng Z, Li C, Kong H, Song L (2023)	Retrospective cohort study with propensity score matching	723 patients undergoing cesarean section under general anesthesia (221 LMA, 502 ETT). After matching: 189 vs. 189. Tertiary hospital in China (2010–2019)	LMA Supreme versus ETT in cesarean section under general anesthesia	There were no significant differences in aspiration, regurgitation, maternal hypoxemia, 1- and 5-minute Apgar scores, NICU admission, or ICU admission. LMA did not increase adverse maternal or neonatal outcomes compared to ETT
Comparison of I-gel versus Endotracheal Tube in Patients Undergoing Elective Cesarean Section: A Prospective Randomized Control Study	Panneer M, Babu S, Murugaiyan P (2017)	RCT *prospektif, randomized, double-blinded*	80 ASA II patients, aged 20–30 years, who were pregnant women undergoing elective cesarean section under general anesthesia; divided into 2 groups (n=40 per group)	*Group I: I-gel Group E: Endotracheal Tube* (ETT)	I-gel offers: • Faster insertion time (10.3 s vs. 12.5 s) • More stable hemodynamic response • Lower incidence of sore throat (10% vs. 75%)

					• No aspiration or major complications
Supreme™ laryngeal mask airway use in general anesthesia for category 2 and 3 Cesarean delivery: a prospective cohort study	Li SY et al., 2017	*Prospective cohort study*	584 women undergoing cesarean section (CS) in categories 2 and 3 under general anesthesia; category 2 (n=193), category 3 (n=391); BMI <35 kg/m²; without GERD; without airway complications	The Use of the Supreme™ Laryngeal Mask Airway (SLMA) as an Airway Device in General Anesthesia	- First-attempt insertion success rate: 98.3% - Overall success rate: 100% - No clinical aspiration or regurgitation - No hypoxemia, laryngospasm, or bronchospasm - Low complication rate (sore throat: 6.5%) - High maternal satisfaction
To evaluate the use of ProSeal laryngeal mask airway in patients undergoing elective lower segment cesarean section under general anesthesia: A prospective randomized controlled study	Saini S., Ahuja S., Guleria K. (2016)	*Prospective Randomized Controlled Trial* (RCT)	60 pregnant patients, ASA I–II, underwent elective cesarean section under general anesthesia	PLMA *(ProSeal Laryngeal Mask Airway)* vs *Endotracheal Tube* (ETT)	PLMA has a placement time comparable to that of ETT, causes fewer hemodynamic changes than ETT, involves no regurgitation or aspiration, and is associated with a lower incidence of sore throat
Comparison of Supreme laryngeal mask airway	Yao WY et al., 2019	*Randomized Controlled Trial* (RCT),	920 parturients (460 SLMA, 460 ETT); aged 18–50 years; ASA	Group 1: Supreme LMA (SLMA)	The success rates of the first intubation

versus endotracheal intubation for airway management during general anesthesia for cesarean section: a randomized controlled trial		*equivalence trial*	II; singleton pregnancy; undergoing elective cesarean section under general anesthesia; exclusion criteria: BMI ≥35, GERD, anticipated difficult airway	Group 2: Endotracheal Tube (ETT)	were similar (99.1% vs. 99.1%); SLMA achieved effective ventilation more quickly; hemodynamic changes were milder with SLMA; there was no aspiration; maternal and neonatal outcomes were similar
The effects of labor on airway outcomes with Supreme™ laryngeal mask airway in cesarean section under general anesthesia	Lim Y, et al., 2020	*Prospective cohort study*	±584 ASA II–III parturients who underwent cesarean section under general anesthesia using the Supreme™ LMA; compared to the labor vs. non-labor group	The use of the Supreme™ LMA as an airway device in cesarean section under general anesthesia	No complications. High success rates for delivery in both groups. Labor status did not increase the risk of airway complications. Maternal and neonatal outcomes (Apgar scores) were good.
General Anesthesia with the Use of SUPREME Laryngeal Mask Airway for Emergency Cesarean Delivery: A Retrospective Analysis of	Fang X, Xiao Q, Xie Q, Liao R, Zhu T, Li S, Bo Z (2018)	*Retrospective cohort study*	1,039 women who underwent emergency cesarean section under general anesthesia using SLMA; ASA II–IV; including patients with gestational diabetes, gestational hypertension,	The SUPREME™ Laryngeal Mask Airway (SLMA) as an airway device for general anesthesia in emergency cesarean sections	No aspiration or regurgitation; first-attempt success rate of 99.8%; no conversion to endotracheal intubation; no maternal deaths; 5-minute Apgar scores of 7–10

1039 Parturients			preeclampsia, and obesity (BMI ≥30 = 17.4%)		in 96.7% of newborns; very low incidence of airway complications
Laryngeal Mask Airway for Cesarean Delivery: A 5-Year Retrospective Cohort Study	Geng ZY & Wang DX (2017)	*Retrospective cohort study*	192 patients undergoing general anesthesia for cesarean section (2010–2014); 180 patients were analyzed (ET=124, LMA=56); pregnant women undergoing cesarean section under general anesthesia; various indications (neuraxial contraindications / failed block); BMI in the LMA group: 28.1 ± 3.4	Comparison of the Supreme LMA (second generation) vs. Endotracheal Tube (ETT) in Cesarean Section under General Anesthesia	No cases of aspiration or regurgitation; no significant differences in Apgar scores or maternal and neonatal outcomes; the LMA was deemed safe in

Study Characteristics A total of 8 studies published between 2015 and 2025 were included in this review, involving obstetric patients undergoing cesarean section (CS) under general anesthesia. The study designs included randomized controlled trials (RCTs), cohort studies, and retrospective studies, with varying sample sizes. The interventions studied included the use of second-generation SADs, such as the LMA Supreme, ProSeal, and i-gel, compared with ETT. The outcomes evaluated primarily focused on placement success, ventilatory effectiveness, incidence of hypoxemia, airway complications, as well as hemodynamic stability and neonatal outcomes. Variations in study design, patient characteristics, and the types of devices used reflect the diversity of approaches in airway management during obstetric anesthesia.

Risk of Bias Assessment. Bias risk assessment was conducted using the Joanna Briggs Institute (JBI) tool according to the design of each study. Most studies demonstrated good methodological quality with low to moderate risk of bias, particularly regarding the clarity of the intervention and outcome measurement. Some studies had limitations, such as retrospective design, lack of randomization, and lack of blinding, which could potentially introduce selection bias and measurement bias. Relatively small sample sizes and population heterogeneity are also factors that may affect the validity of the results. Overall, the quality of evidence in this review is considered sufficient to support conclusions regarding the effectiveness and safety of second-generation SAD compared to ETT in SC under general anesthesia.

The results of this systematic review indicate that second-generation SADs, particularly the LMA Supreme, are effective as airway management devices in cesarean sections under general anesthesia in selectively chosen patients (Li et al., 2017). High placement success rates are also supported by studies in emergency cases with consistent results (Fang et al., 2018). Randomized controlled trials indicate that SAD performance is comparable to that of an endotracheal tube (ETT) in terms of placement success (Yao et al., 2019).

Regarding safety, second-generation SADs do not show an increased incidence of aspiration, regurgitation, or hypoxemia (Li et al., 2017). Long-term cohort studies also report no difference in maternal and neonatal outcomes between SAD and ETT (Geng et al., 2023). Similar findings are supported by an RCT study showing comparable maternal and fetal outcomes between the two methods (Yao et al., 2019).

In a direct comparison, second-generation SADs were shown to be non-inferior to ETT in terms of placement success and ventilatory effectiveness (Yao et al., 2019). In some studies, SADs were even easier to use, particularly in situations where intubation was potentially difficult (Panneer et al., 2017). Other studies have also shown that SAD placement has a lower difficulty level compared to ETT (Saini et al., 2016). Maternal hemodynamic stability is crucial as it directly impacts the safety of both the mother and the fetus (Yao et al., 2019).

The use of SAD has limitations, particularly in emergency situations and in patients in labor (Lim et al., 2020). The risk of placement failure and airway trauma may increase in these situations (Lim et al., 2020). Most studies have been conducted on selected populations, making the results difficult to generalize widely (Fang et al., 2018).

Evidence regarding the use of SAD in patients with pregnancy-induced hypertension remains limited (Geng et al., 2023). Most studies do not specifically analyze populations with preeclampsia or eclampsia, so conclusions remain indirect (Fang et al., 2018). Further research is needed to confirm the safety and efficacy of SAD in these high-risk groups (Geng et al., 2023).

CONCLUSION

Based on the results of the Systematic Literature Review, it can be concluded that second-generation SADs, particularly the LMA Supreme, are an effective and relatively safe method of airway management in patients undergoing cesarean section under general anesthesia. Supraglottic Airway Devices (SADs) demonstrate a high placement success rate and ventilatory performance comparable to that of endotracheal tubes (ETTs). From a safety perspective, the use of SADs does not increase the risk of aspiration, hypoxemia, or airway complications, and yields maternal and neonatal outcomes comparable to those of ETT. Supraglottic Airway Devices (SADs) also offer the advantages of a more stable hemodynamic response and a lower incidence of minor complications.

The use of SADs still has limitations, particularly in emergency situations, in laboring patients, and in high-risk populations such as those with hypertension during pregnancy. Scientific evidence in these groups remains limited and cannot yet be definitively concluded. Second-generation Supraglottic Airway Devices (SADs) may be considered as an alternative to ETT in selected patients; however, further research is needed, particularly in high-risk populations, to strengthen the evidence regarding their safety and efficacy.

REFERENCES

Bohsas, H., Alibrahim, H., Swed, S., Abouainain, Y., Aljabali, A., Masoud, S., Saleh, H. H., Aldawoud, T., Taleb, F., Alsheikh, R. A., Fawaz, H., Mourad, D., Mohamed, W. F., Aboushady, R., & Hafez, W. (2024). a. *BMC Pregnancy and Childbirth*, *24*(1), 1–9. https://doi.org/10.1186/s12884-024-06368-4

Borkar Patil, V. P., & Upadhye, J. J. (2018). Anesthetic complications in cesarean section. *International Journal of Research in Medical Sciences*, *6*(10), 3215. https://doi.org/10.18203/2320-6012.ijrms20183849

Dong, W., Zhang, W., Er, J., Liu, J., & Han, J. (2023). Comparison of laryngeal mask airway and endotracheal tube in general anesthesia in children. *Experimental and Therapeutic Medicine*, *26*(6), 1–8. https://doi.org/10.3892/etm.202223.12253

Fang, X., Xiao, Q., Xie, Q., Liao, R., Zhu, T., Li, S., & Bo, Z. (2018). General Anesthesia with the Use of SUPREME Laryngeal Mask Airway for Emergency Cesarean delivery: A Retrospective Analysis of 1039 Parturients. *Scientific Reports*, *8*(1), 1–7. https://doi.org/10.1038/s41598-018-31581-5

Fishel Bartal, M., & Sibai, B. M. (2022). Eclampsia in the 21st century. *American Journal of Obstetrics and Gynecology*, *226*(2), S1237–S1253. https://doi.org/10.1016/j.ajog.2020.09.037

Geng, Z., Li, C., Kong, H., & Song, L. (2023a). Supreme laryngeal mask airway for cesarean section under general anesthesia: a 10-year retrospective cohort study. *Frontiers in Medicine*, *10*, 1–8. https://doi.org/10.3389/fmed.2023.1181503

Geng, Z., Li, C., Kong, H., & Song, L. (2023b). Supreme laryngeal mask airway for cesarean section under general anesthesia: a 10-year retrospective cohort study. *Frontiers in Medicine*, *10*. https://doi.org/10.3389/fmed.2023.1181503

Krug, N., Thieme, V., Voelker, M. T., & Bercker, S. (2025). Results of an international survey on the use and perceptions of the laryngeal mask airway (LMA). *PLoS ONE*, *20*(4 April), 1–10. https://doi.org/10.1371/journal.pone.0321421

Li, S. Y., Yao, W. Y., Yuan, Y. J., Tay, W. S., Han, N. L. R., Sultana, R., Assam, P. N., Sia, A. T. H., & Sng, B. L. (2017). Supreme^{TM} laryngeal mask airway use in general Anesthesia for category 2 and 3 Cesarean delivery: A prospective cohort study. *BMC Anesthesiology*, *17*(1), 1–7. https://doi.org/10.1186/s12871-017-0460-x

Lim, M. J., Tan, H. Sen, Tan, C. W., Li, S. Y., Yao, W. Y., Yuan, Y. J., Sultana, R., & Sng, B. L. (2020). The effects of labor on airway outcomes with Supreme^{TM} laryngeal mask in women undergoing cesarean delivery under general anesthesia: a cohort study. *BMC Anesthesiology*, *20*(1), 1–7. https://doi.org/10.1186/s12871-020-01132-5

Panneer, M., Babu, S., & Murugaiyan, P. (2017). *Comparison of I - gel versus Endotracheal Tube in Patients Undergoing Elective Cesarean Section : A*