

## Original Research Article

# Comparison of Perioperative Respiratory Complications between Laryngeal Mask Airway and Endotracheal Tube in Elective Surgeries at Muhimbili National Hospital

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**Abstract: Background:** Perioperative Respiratory complications are usually encountered by most patients undergoing surgical procedures by using endotracheal tube or laryngeal mask airway under general anaesthesia. They are the major cause of morbidity, mortality, prolonged hospital stay and increased cost of care. The objective of the present study was to determine the perioperative respiratory of laryngeal mask airway and endotracheal intubation at Muhimbili National Hospital. **Methods:** This was a hospital based prospective comparative study. The minimum sample of 137 patients who met the inclusion criteria were recruited into the study. Target populations were patients admitted for elective surgery at Muhimbili national Hospital. A structured questionnaire was used to collect variables being measured. The Data entry and analysis was handled using SPSS version 20.0. Proportion was calculated for all categorical variables. Categorical data were analysed using Chi-square test, values  $<0.05$  was considered statistically significant. **Results:** Out of 137 patients who had elective surgery by anaesthesia with ETT or LMA 70 (51.1%) were put on ETT while 67 (48.9%) were put on LMA. Desaturation was observed in more than half (53%) of patients who were put in ETT group as compared to those under LMA (14%) with  $P < 0.001$ . Similarly cough was observed in more than half of patients who received ETT (53%) compared to 29% patients who received LMA with  $P = 0.004$ . **Conclusion:** There were lesser proportions of cough and desaturation among LMA patients when compared to ETT patients. LMA should be used as alternative to ETT in patients undergoing surgeries under general anaesthesia. Furthermore further studies should be deployed in larger sample and other study sites to explore factors associated with perioperative complications.

**Keywords:** Perioperative respiratory complications, Laryngeal mask airway (LMA) Endotracheal intubation (ETT), Desaturation, Cough.

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## INTRODUCTION

Perioperative Respiratory complications are usually encountered by most patients undergoing different surgical procedures by using endotracheal tube or laryngeal mask airway under general anaesthesia. They are the major cause of morbidity, mortality, prolonged hospital stay and increased cost of care. Every anaesthetic care provider has major responsibility in the improvement of the patient's respiratory outcomes [1].

Laryngoscopy and trachea intubation is gold standard, routine technique and most common way of maintaining patent airway in anaesthetized patient during general anaesthesia [1-3]. However, since it is invasive

in nature the respiratory system is particularly vulnerable when general anaesthesia with tracheal intubation is used [3]. Laryngeal mask airway has been increasingly used for airway maintenance during general anaesthesia as alternative to endotracheal tube. Laryngeal mask airway offers less invasive way of maintaining the airway. It does not require laryngoscope during its insertion [4-12] and is associated with improvement in different respiratory outcome parameters [18, 19, 21]. In the United States, Laryngeal mask airway is used in 35% as an alternative to endotracheal intubation [7]. Afzar in Oman have shown the overall complications to be 15.65% laryngeal mask airway versus 29% endotracheal tube [10]. Study in Nigeria suggested that endotracheal tube is associated with significant postoperative

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complications as compared to Laryngeal mask airway [27]. Through observation and practice at Muhimbili National Hospital, many patients have been suffering from potential perioperative respiratory complications secondary to either using endotracheal intubation or Laryngeal mask airway. Laryngeal mask airway which has recently gained popularity in the world as an airway management tool is not commonly used at Muhimbili National Hospital, instead endotracheal intubation is the main technique used. The objective of the present study was to determine the perioperative respiratory of laryngeal mask airway and endotracheal intubation at Muhimbili National Hospital.

## MATERIAL AND METHOD

### Study Site

This was a cross sectional study conducted from July 2018 to January 2019 at Muhimbili National Hospital (MNH). The selection of MNH was based on the fact that it is a National referral Hospital and MUHAS teaching Hospital. It is the largest hospital in Tanzania with multiple specialties and apart from the Dar es Salaam population, the hospital receives referrals from other hospitals all over the country. It is also a teaching hospital with many disciplines including medicine, dental, pharmacy, public health, nursing etc with competent teachers in each discipline. Data of this study were collected from three departments (general surgery, ophthalmology and paediatrics surgery due to availability of elective cases who fits for both LMA and ETT usage.

### Study Population

The present study recruited paediatric and adult patients between the age of 3 to 60 years who were ASA I and ASA II patients of both sexes to representing elective surgeries at MNH. A minimum of 137 participants were sufficient to estimate the prevalence of perioperative respiratory complications and were randomly assigned to either ETT or LMA group. The selected participants were visited at receiving area in theatre and were informed about the study and invited to participate. Patients who gave their consents were enrolled into the study. Exclusion criteria included participants with anticipated difficult airway, patients undergoing emergency operations, Patients with history of upper respiratory tract infection, patients with high risk of regurgitation e.g. obese and pregnant women, patients with known allergy to latex, patients with heart and patients with liver and renal diseases.

### Data Collection

A structured questionnaire was used to collect information. The demographic data, proposed surgery, type and size of airway device used, number of attempts, information on insertion time, duration of surgery and anaesthesia, and perioperative respiratory complications were included in the questionnaire.

Data was collected by principal researcher with the assistance from four research assistance. Data were collected direct from the patient through observation during anaesthesia, from patient files, patient's standard monitors, intraoperative anaesthetic charts, nursing charts and interview. Patient's screening for those who meet inclusion criteria was done through face to face interview. Study tools used were the device used (endotracheal tube or laryngeal mask airway), stop watch that was used for timing the length of insertion of laryngeal mask airway or endotracheal tube, standard patient monitors (Non Invasive Blood Pressure, electrocardiography, pulse oxymetry, and thermometer) that was used for patient monitoring of (Systolic blood pressure, diastolic blood pressure, mean arterial blood pressure, heart rate, arterial saturation of oxygen and temperature).

The outcome (dependant) variable was the perioperative respiratory complications (desaturation, cough, laryngospasm, bronchospasm and sore throat).

The independent variables were the demographic data (age and gender), number of insertion attempts, type of device used laryngeal mask airway versus endotracheal tube, duration of surgery, duration of anaesthesia and the size of the device used.

### Data Analysis

Collected data were then entered to the statistical software followed by data clearing. Variable coding was ensured for categorical data. Data were analysed with the help of Statistical Package for Social Scientists (SPSS) IBM computer program version 20.0. Proportion was calculated for all categorical variables. Categorical data were analysed using Chi-square test, values <0.05 was considered statistically significant.

### Ethical Consideration

The ethical clearance was obtained from Muhimbili University of Health and Allied Sciences (MUHAS) ethical review board before beginning the study. The permission to do the study was sought from the Head of teaching Research and consultancy coordination unit at Muhimbili National Hospital. Aims, importance and possible harm from the study were clearly explained, verbal and written informed consent was sought from each participants. All the information obtained from patients was kept confidential and not used for any other purpose other than for this study.

## RESULTS

### Social-demographic characteristics of the study population

Majority of the participants 35% were aged 6 to 18years. More than half were males 74 (54%) and majority resides in Dar-es-salaam 66.4%. Most surgeries done were those of general surgeries 48 (35.1%), (Table 1).

**Table 1: Socio-demographic characteristic among patients undergoing elective surgery at MNH (N=137)**

Characteristics	Count (n)	Percentage (%)
<b>Age (years)</b>		
3 to 5	21	15.3
6 to 18	48	35
19 to 30	14	10.2
30 to 50	27	19.7
50 to 60	27	19.7
<b>Sex</b>		
Male	74	54
Female	63	47
<b>Address</b>		
Dar-es-salaam	91	66.4
Outside Dar-es-salaam	46	33.6
<b>Surgery type</b>		
General surgery	48	35.1
Ophthalmology	46	33.5
Paediatric surgery	43	31.4

**Distribution of complications among patients undergoing elective surgery given LMA and ETT**

Perioperative respiratory complications were compared with type of device used as seen on Table 2. Desaturation was observed in more than half (52.9%) of

patients who were put in ETT as compared to those under LMA (13.4%) ( $p < 0.001$ ). Proportionally cough was observed in more than half of patients who received ETT (52.9%) compared to 28.4% patients who received LMA ( $p = 0.004$ ).

**Table 2: Distribution of complications among patients undergoing elective surgery given LMA and ETT**

Complication (s)	LMA	ETT	TOTAL	X <sup>2</sup> , p-value
<b>Desaturation</b>				
Yes	9 (13.4)	37 (52.9)	46 (33.6)	23.8, <0.001
No	58 (86.6)	33 (47.1)	91 (66.4)	
<b>Laryngospasm</b>				
Yes	7 (10.4)	12 (17.1)	19 (13.9)	1.280, 0.257
No	60 (89.6)	58 (82.9)	118 (86.1)	
<b>Bronchospasm</b>				
None	67 (100)	70 (100)	137 (100)	-
<b>Cough</b>				
Yes	19 (28.4)	37 (52.9)	56 (40.8)	8.5, 0.004
No	48 (71.6)	33 (47.1)	81 (59.2)	
<b>Sore throat</b>				
Yes	19 (28.4)	28 (40)	47 (34.3)	2.06, 0.151
No	48 (71.6)	42 (60)	90 (65.7)	

**DISCUSSION**

Perioperative Respiratory complications are common among perioperative patients secondary to air way device used. It has been documented previously ETT group to be associated mostly with complications as compared to LMA group reference. The present study focused on determining and comparing the perioperative complications among patients undergoing elective surgery by using LMA or ETT at MNH.

This research included 137 patients who were undergoing elective surgeries at MNH. The study looked at the data of patients from diversified age groups ranging from three years old to oldest sixty years. The considered range mimics to what have been done elsewhere [9, 14]. Furthermore, the present study looked

at a range of surgeries not limited to Ophthalmologic, General and Paediatric surgeries.

We discovered that ETT device was used in more than half surgical patients. Meanwhile LMA was used in almost half surgical patients. The proportion of LMA use in the present study is much higher with regards to what is being a practice in USA (50% versus 35%) (17). Higher proportions in this study could be attributed to equal distribution of study participants among the two groups. LMA insertion is a less invasive, hence less perioperative complications.

Further analysis had shown device type to be significantly associated with desaturation and cough as perioperative respiratory complications. No significance difference existed for bronchospasm, laryngospasm and

sore throat as perioperative complications between the two devices.

This study showed the proportions of patient presented with desaturation in ETT and LMA to be approximately 53% and 14% respectively. These high proportions of desaturation could be due to aggressive monitoring and recording any episodes of decrease in oxygen saturation below 95% by pulse oxymetry. Similar to what we found, other studies have discovered the same [8, 15–18]. However no clinical significance existed between two groups [19].

About half the patients in ETT group versus quarter of the patients in LMA group presented with cough. This shows that cough was significant in both groups with p value = 0.004. However, higher proportion of cough that was seen in ETT group could be due to the fact that ETT is much more invasive than LMA as it passes through the vocal cord and needs laryngoscopy. The proportion of cough in LMA and ETT patients that we found is lower to Naz *et al.*, observation [4]. Back then in 2012 Sieptina found proportion of Cough in ETT group and LMA group to be less than what we have seen [20]. Other studies also found similar findings [3, 16].

Sore throat is common complication amongst patients undergoing general anaesthesia secondary to airway devices. This can be due to airway mucosa dehydration, edema, ischemia secondary to pressure from LMA or ETT cuff, friction over airway mucosa from LMA or ETT tube and sometimes aggressive suctioning [21]. Airway mucosa dehydration and oedema seems to precipitate post ETT sore throat. Sore throat was noted in about 40% of all patients who were kept on ETT group and 29% on LMA group. This was previously noted in previous studies [22, 23]. The current findings are higher to what have been found by Shetty *et al.*, 2004 [8]. Contrastingly, what we found was low when compared to what was observed in France and Nigeria [15,18]. As compared to ETT, we noted however LMA to be associated with low rates of perioperative sore throat, however the study another study reported higher proportion of sore throat in LMA group as compared to that in ETT group [19].

No significance difference existed for bronchospasm and laryngospasm as perioperative respiratory complications between the two devices. The reasons could be minimizing the risk factors for developing these complications by providing deep anaesthesia and exclusion of all patients with history of allergies and previous upper respiratory tract infection. This finding was similar to what Zorembo documented [24]. Although one study reported significant difference regarding these devices [25].

## CONCLUSION

Our investigation was limited in several ways. Homogeneity of the study participants was limited, there

is physiological and anatomical difference between paediatric and adult patients. Study finding extracted from single centre. Study was done at the National hospital with extensive monitors for monitoring and medical specialists making our result less applicable to other sites at which these conditions do not apply such as district hospital and health centres, however these findings can be useful in improving perioperative respiratory complications. Our findings can't be applied to ASA III and above because all of our enrolled participants were ASA I and ASA II. Double blind was not possible during airway management as it is not possible to blind the personnel using the airway device and recording the outcome. There were lesser proportions of cough and desaturation among LMA patients when compared to ETT patients. LMA should be used as alternative to ETT in patients undergoing surgeries under general anaesthesia. Furthermore further studies should be deployed in larger sample and other study sites to explore factors associated with perioperative complications.

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