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Prevalence and prediction of difficult intubation in Nepalese population

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Abstract

Background: Prevalence of difficult intubation is estimated as 3 -18% during routine anesthesia. There are various bedside tests to predict the difficult intubation, like Mallampati test, Thyromental distance, Sternomental distance and mouth opening. However, the prevalence and prediction in Nepalese population is still not estimated. So this study is to see the prevalence and to compare the efficacy of airway parameters to predict the difficult intubation in Nepalese population.

Methods: A prospective study was done to estimate the prevalence and prediction of difficult intubation in Nepalese population. During six months period, 182 patients who were undergoing routine surgery under General anesthesia were included in the study. Mallampati grading, thyromental distance, mouth opening and sternomental distance were recorded in preoperative assessment. Cormack and Lehane grading were done during intubation and Grade I and II are considered as easy intubation/ laryngoscopy and III and IV are considered as difficult intubation.

Results: The prevalence of difficult intubation was 4.9%. Sensitivity of different tests were as follows; Mallampati test – 55%, thyromental distance – 33%, mouth opening – 22% and sternomental distance – 11%. The Specificity of the test as Mallampati test – 98%, thyromental distance – 89%, mouth opening – 96% and sternomental distance – 97%. So the Mallampati test is more sensitive and specific among the tests done.

Conclusion: This prospective study shows that the prevalence of difficult intubation is not different in Nepalese population and the bedside predictors also are good tests that could be continued in our population.

Key Words: Difficult laryngoscopy; Nepal; Prediction; Prevalence.

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Introduction

The incidence of difficult tracheal intubation has been estimated as 3 to 18% during routine anesthesia.[1] Difficulties in intubation with failure to maintain patent airway is associated with serious complications like brain damage or death. Anesthesia in a patient with difficult airway can lead to direct airway trauma or morbidity from hypoxia and hypercarbia.[2] If it can be predicted then the risk of anesthesia can be considerably reduced.

There have been various attempts at defining what is meant by a difficult intubation. Repeated attempts at intubation, the use of a bougie or other intubation aid have been used in some papers, but perhaps the most widely used classification is by Cormack and Lehane[3] which describes the best view of the larynx seen at laryngoscopy. As difficult intubation occurs infrequently and is not easy to define, research has been directed at predicting difficult laryngoscopy, that is when is not possible to visualize any portion of the vocal cords after multiple attempts at conventional laryngoscopy. Of available method, the Modified Mallampati test is often used as a preoperative bedside test to predict difficult airway.[4] Other tests are the Thyromental distance, Sternomental distance and mouth opening.

There are previous studies calculating prevalence and predicting difficult intubation in different populations.[5-7] This study was an attempt to see the prevalence and prediction of difficult intubation in Nepalese population. Objective of the study was to see the prevalence of difficult intubation and to compare the different bedside tests for prediction of difficult intubation in Nepalese population.

Methods

This is the prospective observational study was conducted after institutional approval. The study period was six months and cases were taken from Tansen Mission Hospital, Tansen, Palpa during the study period. All the routine cases of American Society of Anesthesiologists Physical status (ASA) I and II between the age group of 16 to 65 years who required general anesthesia with endotracheal intubation were included. Patients with gross abnormality of airway including the neck swelling, obstetrics and all emergency cases were excluded.

The consent for the patient enrollment in study was taken for all patients during the preoperative evaluation. The patients were assessed a day before surgery in the ward. All the measurements were taken with the help of scale in centimeter. A pre-anesthetic form with all measurement was filled. A proforma was filled for all cases including preoperative findings and findings after intubation attempts.

Mallampati grading was assessed as the patient sitting in front of the anesthetist with neck extended and full mouth opening and tongue protrusion without phonation. Thyromental distance is measured from the thyroid cartilage to tip of chin with a scale in centimeter. Sternomental distance is measured from the sternal notch to the tip of chin with scale in cm. Mouth opening is measured between the interincisor gaps with full mouth opening.

All patients received Morphine 0.05 mg per kg before induction after attachment of monitoring devices including electrocardiogram (ECG), Non-invasive blood pressure (NIBP) and Pulse Oximetry. Anesthesia was induced with Sodium Thiopentone 4 mg/kg and Succinylcholine 2 mg/kg (not exceeding 100mg) in all the cases. Cormack and Lehan grading during intubation was done by the anesthetist who was blind about the preoperative findings.

Mallampati grade 1 and 2 were considered as predictors for easy intubation, and 3 and 4 were considered as predictors for difficult intubation. Thyromental distance of 6 cm below was considered as predictor for difficult intubation. Sternomental distance of 12 cm below was considered as predictor for difficult intubation. Mouth opening of 4 cm below was considered as predictor for difficult intubation. Cormack and Lehane grade 1 and 2 were considered as easy laryngoscopy, and grade 3 and 4 were considered as difficult laryngoscopy.

SPSS 11.5 version was used to calculate cross tabulation and the frequencies. And formulas for the sensitivity, specificity, positive and negative predictive values were used to calculate the respective values.

Results

There were total 182 patients of ASA I and II. The demographic data is presented in Table 1.

Table 1: Demographic data

Patients Characteristics		Values
Age in years (mean+/-SD)		38.5+/- 13.5
Sex	Male	48 (26.4%)
	Female	134 (73.6%)
Weight in Kg (mean+/- SD)		55.5 +/-10

The prevalence of difficult intubation was 4.9% as calculated from Cormack and Lehane grading 3 and 4. The frequencies of patients in various predictors category are listed in Table 2. Mallampati Grading 3 and 4 (3.8%), Thyromental distance < 6 cm (11.5%), Mouth opening < 4 cm (4.4%), Sternomental distance < 12 cm (3.3%) and Cormack and Lehane grading 3 and 4 (4.9%) are considered as predictors of difficult intubation.

Table 2: The frequency Analysis

Airway Parameters	Group	Frequency
Modified Mallampati Grading	Grade 1 and 2 Grade 3 and 4	96.2% (175) 3.8% (7)
Thyromental Distance	> or = 6cm < 6cm	88.5% (161) 11.5% (21)
Mouth Opening	> or = 4cm <4cm	94.6% (174) 4.4% (8)
Sternomental Distance	> or = 12cm < 12cm	96.7% (176) 3.3% (6)
Cormack and Lehane Grading	Grade 1 and 2	95.1% (173)
	Grade 3 and 4	4.9% (9)

Considering Cormack and Lehane grade 3 and 4 as difficult laryngoscopy Mallampati grading has five true positive and 171 true negative, mouth opening has two true positive and 167 true negative, thyromental distance has three true positive and 155 true negative and sternomental distance has one true positive and 168 true negative. These clinical data of each test is used to obtain sensitivity, specificity, positive and negative predictive values in percentage as demonstrated in Table 3.

Table 3: Comparative analysis of different predictors

	Sensitivity	Specificity	+ve Predictive test	-ve predictive test
Malampati grade	55	98	71	97
Mouth opening	22	96	25	96
Thyromental distance	33	89	14	96
Sternomental distance	11	97	16	95

Discussion

In this study the prevalence of difficult laryngoscopy in Nepalese population is estimated to be 4.9%, which is comparable with the previous studies done elsewhere with different population.[5,6,7] Difficult laryngoscopy was studied instead of difficult airway or difficult intubation because it is easier to define and the prevalence of difficult laryngoscopy is more than that of difficult intubation.

Among the predictors of difficult intubation Mallampati grading is most widely used and is frequently studied. Our study shows that the modified Mallampati test has the sensitivity of 55% with specificity of 98% and positive predictive value (PPV) of 71% with negative predictive value (NPV) of 97%. It is comparable with various studies and metaanalysis which showed that sensitivity ranges from 12 to 100% with specificity of 44 to 98%[8]. They also found that accuracy of modified Mallampati test in predicting difficult laryngoscopy in obstetric patient is five times more than non obstetric. Since the obstetric were excluded in our study which may have decreased the sensitivity. Still with its high specificity and negative predictive value we can say that it could still be considered as screening test for difficult laryngoscopy.

Other predictors are mouth opening, thyromental distance and sternomental distance which in our study have very less sensitivity and positive predictive value but the specificity and negative predictive value are high enough to say that the test could be useful as a screening test. These findings are similar to the metaanalysis done by Toshiya et al[9] and they consider it as the inadequate predictor of difficult laryngoscopy and explained as due to limited data available.

The study done by D Savva et al[6] as predicting the difficult intubation shows that the sternomental distance the indicator of head and neck mobility was more sensitive and specific than other predictors. The other studies suggest that the combination of the predictors is better than the single predictor. Study done by Banjong et al[10] suggest that ratio of height to thyromental distance is more sensitive than other predictors in screening false negatives. Similarly study in obese patient shows that the Mallampati is good predictor for difficult intubation and the neck circumference also affect the prediction of difficult intubation.[11,12] These findings may not be true in our cases where the mean weight was only 55 +/- 10 kg and we did not calculate the Body Mass Index.

Our study did not consider the combination of the predictors to determine the difficult laryngoscopy and the use of multivariate approach. This could be done in future studies. The correlation between difficult airway and laryngoscopy also needs to be studied.

Ideally, any preoperative assessment scheme for difficult laryngoscopy should have a high sensitivity and specificity and produce few false positives and negatives. The consequence of a false-negative result may be deleterious and even life-threatening; therefore, decreasing false-negative prediction is far more important than falsely predicting difficult laryngoscopy in unaffected patients.[13] Nevertheless, a test should be sufficiently sensitive to detect possible difficulties with laryngoscopy.

This study did not include whole of Nepal and all ethical groups. That was the limitation of this study. Future studies should take account of different population in different parts of Nepal and should include obstetric patients also.

Achieving and maintaining a patent airway depends principally on anatomic and individual factors, but experience and alternative endotracheal intubation aids

also play a significant role in these endeavors. For our daily practice, reducing the incidence of false negative prediction is important, but preparedness for possible difficulty in airway management is absolutely necessary, and a difficult-airway cart with selected alternative airway adjuncts/devices should be readily available.

Conclusion

This prospective observational study showed that the prevalence of difficult laryngoscopy in Nepalese population is similar to that of other populations. The predictors for difficult intubation are not much sensitive but are specific. So these predictors can be used as a screening bed side test and the preparedness for possible difficult airway management is always necessary.

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Conflict of Interest Statement

The author certifies that she has no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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