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A Comparative Study To Predict Difficult Intubation By Using Palm Print, Prayer's Sign, And Upper Lip Bite Test In Diabetic And Non- Diabetic Patients.

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ABSTRACT

Introduction: Difficult intubation is a most common complication related to anaesthesia when the airway assessment (Mallampati score, thyromental distance) is inadequate or low specificity and sensitivity in some specific conditions. Whereas, diabetic mellitus is a metabolic disease which causes more than 50% of difficult intubation than normal population. This is due to diabetic cheiroarthropathy or diabetic stiff joint syndrome or limited joint mobility syndrome which is characterized by short stature, tight waxy skin, joint rigidity. It occurs when the NON-ENZYMATIC GLYCOSYLATION OF COLLAGENS deposited in joints (first seen in 4th and 5th proximal phalangeal joints and later in Atlanto-occipital joint) in long standing diabetic mellitus. Due to involvement of Atlanto-occipital joint, LIMITED EXTENSION OF HEAD & NECK during intubation leads to difficulties in managing the airway patency. Here, we undertaken the comparative study to predict difficult intubation by using palm print, prayer's sign, upper lip bite test in diabetic and non-diabetic patients.

Methods and Materials: After obtaining Institute Ethics Committee approval, A study design was cross sectional analytical study with a total of 200 patients including diabetics (100) and non-diabetics (100) were assessed pre-operatively for airway indices using palm print, prayer's sign & upper lip bite test grades were noted. Statistical analysis performed using chi-square test. A p value of < 0.05 is considered as significant.

Results: In diabetic mellitus patients, upper lip bite test and palm print was the best predictor for difficult intubation. And in non-diabetic mellitus patients, palm print was the best predictor for difficult intubation.

Conclusion: In diabetic and non-diabetic patients, palm print was the best predictor for difficult intubation.

Further this study conducted to obtain more accurate results by correlating the palm print with Cormack Lehane grades. Studies with a large sample size are suggested to obtain more accurate results.

Keywords: *Diabetic Cheiroarthropathy, Difficult intubation, Palm print, Prayer's sign, Upper lip bite test.*.

1. INTRODUCTION

Anaesthesiologist, who were once undoubtedly experts in the airways, are now operating in an environment where several speciality areas, including emergency medicine, critical care& surgery, have access &practiced an ever-increasing rate of airway management techniques. The maintenance of stable and patent airways is an essential care of acute medical practice by intubating the patient. Difficult intubation is a clinical situation in which unanticipated or anticipated difficulties experienced by well skilled anaesthesiologist. The consequence of DI after intubation is well-known cause of morbidity and mortality in the practice of anaesthesia. Difficult or failed intubation is a major factor in anaesthesia related morbidity and mortality. The most common causes of difficult intubation are anatomical deformities, physiological deformities, obesity, stiffness-arthritis of neck/jaw/larynx, & congenital abnormalities. The common airway parameters are Mallampati grade, Thyromental distance, Neck mobility, Cormack Lehane grade used in now a day. Difficult intubation in diabetic due to diabetic Cheiroarthropathy or limited joint mobility syndrome or stiff joint syndrome and periodontitis.

"**STIFF JOINT SYNDROME**" is also known as diabetic cheiroarthropathy or limited joint mobility syndrome is a condition characterized by unfamiliar, short stature & joint contractures. It is most commonly involved in small joints (4^{th} and 5^{th} proximal phalangeal joints) are exhibits contracture and tight waxy skin, & large joints (cervical spine) at Atlanto-occipital

joints due to the glycosylation of the joints results in limited head and neck extension during laryngoscopy that made the endotracheal intubation of the patient is difficult.

"**PERIODONITIS"** is a slowly progressing disease which infection of the gums & bone that the teeth in place. It is associated with worsening glycaemic control of diabetic patients. It is a chronic inflammatory disease characterized by destruction of the supporting structures of the teeth (the periodontal ligament & alveolar bone). It can result tooth loss and bone loss. This can cause difficult intubation.

Pre-operative airway assessment is the most important responsibilities of an anaesthetist in pre anaesthetic care. Appropriate pre op airway assessment, planning, equipment for specific cases will decrease the incidence of unanticipated difficult intubation. Sometimes, these airway indices are inadequate / insufficient assessment leads to difficult intubation and laryngoscopy. Mostly, not even single test is adequate to predict difficult intubation only combination of these tests will be used to predict difficult intubation. Chronic hyperglycaemia patients (more than 5 years or 10 years) have DI due to diabetic cheiroarthropathy and tooth gum disease.

Patients with chronic diabetic mellitus was higher incidence of difficult intubation due to involvement of Atlanto-occipital joint, which limits neck and head mobility during laryngoscopy. So, we undertake the study to evaluate the various clinical parameters (palm print, prayer's sign, upper lip bite test) of airway assessment and to predict difficult intubation in diabetic patients compared with non –diabetic patients.

2. METHODS & MATERIALS:

Design and Setting of the Study:

This cross-sectional analytical study was conducted between October 2023 and April 2024.

Study Area:

- ACS Medical College & Hospital, Chennai.
- Sri lalithambigai Medical College & Hospital, Chennai.
- At pre-operative ward, operation theatre.

Ethical Committee Approval:

We got approval from Institutional Ethical Committee in **Dr.M.G.R. Educational Research and Institute, Maduravoyal-Chennai. Approved No: 1043/2023/IEC/ACSMCH Dt. 17/11/2023.**

Sample Size & Sampling Technique:

We have selected **200** samples for our study, diabetic group have 100 samples & non- diabetic group have 100 samples.

Data Collection Tool:

1. Demographic Profile
2. Upper Lip Bite Test
3. Palm Print
4. Prayer's Sign

1. DEMOGRAPHIC PROFILE:

1. Age category:

a) 18 years to 30 years

b) 31 years to 60 years

c) >60 years.

2. Sex:

a) Male.

b) Female.

3. In diabetes (in years):

a) 5 to 10 years.

b) 10 to 15 years

c) >15 years.

2.UPPER LIP BITE TEST:

Class 1- lower incisors can bite upper lip above the vermilion line.

Class 2- Lower incisors can bite upper lip below the vermilion line.

Class 3- Cannot bite the upper lip.

(Class 3 was considered be difficult intubation)

3.PALM PRINT:

Grade 0: All the phalangeal areas are visible.

Grade 1: Deficiency in the interphalangeal areas of the 4th and 5th digit.

Grade 2: Deficiency in the interphalangeal areas of the 2nd to 5th digits.

Grade 3: only tip of the digits is visible.

(Grade 2 & 3 was considered to be difficult intubation)

4.PRAYER'S SIGN:

Positive: when there is a gap between the palms.

Negative: when there is no gap between the palms.

(Positive was considered to be difficult intubation)

Data Collection Procedure:

Prior to the day of surgery, Pre -Aesthetic examination (Airway Assessment) should be done by well experienced Anaesthesiologists. During airway examination, asked patients to sit upright position. Ask the patients for,

ULBT: Ask the patients to bite the upper lip by lower incisors.

Prayers sign: Ask the patients to say "Namaste".

Palm Print: Apply the ink on left hand by using an ink roller and compress the hand on white paper.

By this assessment, we will report the grade of each airway parameters.

On the day of Surgery, dose of Oral hypoglycaemic agents was withheld. Nil per oral was ensured for six hours. In OT, IV line was secured and attach the standard monitoring's (Pulse oximeter, ECG, BP, Etco2). Before induction, all patients were given IV glycopyrrolate 0.2 mg, IV midazolam 1.0mg and IV fentanyl 2mcg/kg. In all patient's anaesthesia was induced with IV propofol 2mg/kg followed by preoxygenation (2-3mins), IV atracurium 0.5mg /kg or IV vecuronium 0.08- 0.1mg/kg. Laryngoscopy was done after 3 minutes in sniffing position by using standard appropriately sized Macintosh blade. After visualization of vocal cord insert the appropriate sized endo- tracheal tube and confirmed the ET tube position by auscultation of chest, capnography, bilateral air entry of lungs and Reservoir bag movement. In case of difficulty, actions and devices such as external laryngeal manipulation, change of position of the head, different sizes and types of laryngeal blade, by more experienced Anaesthesiologists were performed. Anaesthesia was maintained by using sevoflurane 1- 2% in O2:N20 - 50:50 with controlled ventilation, supplement dose of IV atracurium were given to the patients as required.

Statistical Analysis:

Data was collected and entered into Excel in 2024 and analysis of data using statistical package for the social science (SPSS). The comparison of quantitative and qualitative variables between the group was done by using Chi -square test. The significance $p<0.05$ and fixed at 95%.

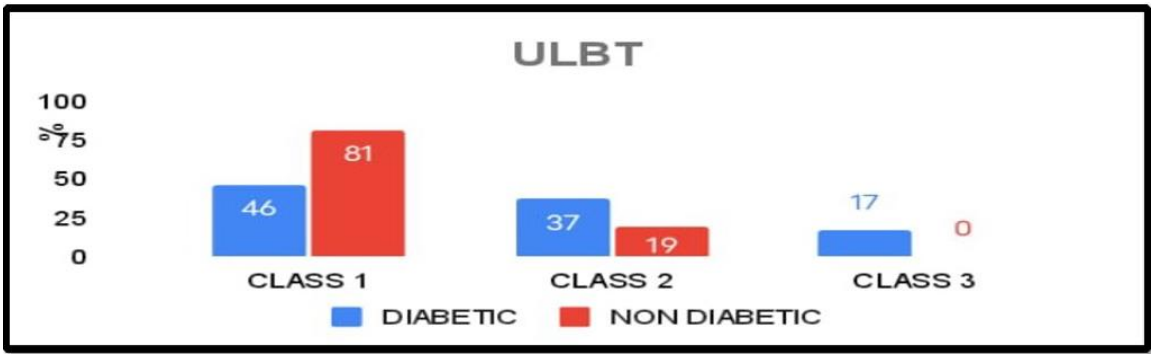
3. RESULTS

Table 1: Association Table of Airway Parameters for Diabetic & Non-Diabetic Mellitus.

AIRWAY PARAMETER	CATEGORIES	DIABETIC MELLITUS	NON-DIABETIC MELLITUS	P-VALUE
UPPER LIP BITE TEST	CLASS 1	46	81	**0.000***
	CLAAS 2	37	19	

	CLASS 3	17	0	
PRAYER'S SIGN	POSITIVE	52	53	0.887
	NEGATIVE	48	47	
PALM PRINT	GRADE 0	43	81	**0.000***
	GRADE 1	33	13	
	GRADE 2	23	5	
	GRADE 3	1	1	

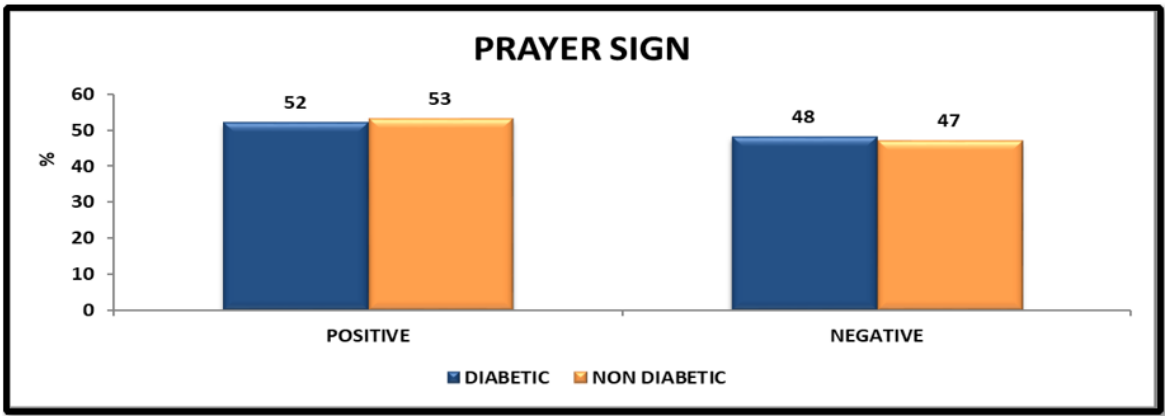
Chart 1: Distribution of Patients According to Their Upper Lip Bite test



Prediction:

In our study, we predicted that in upper lip bite test class 3 is higher among diabetic than the Nondiabetic patients.

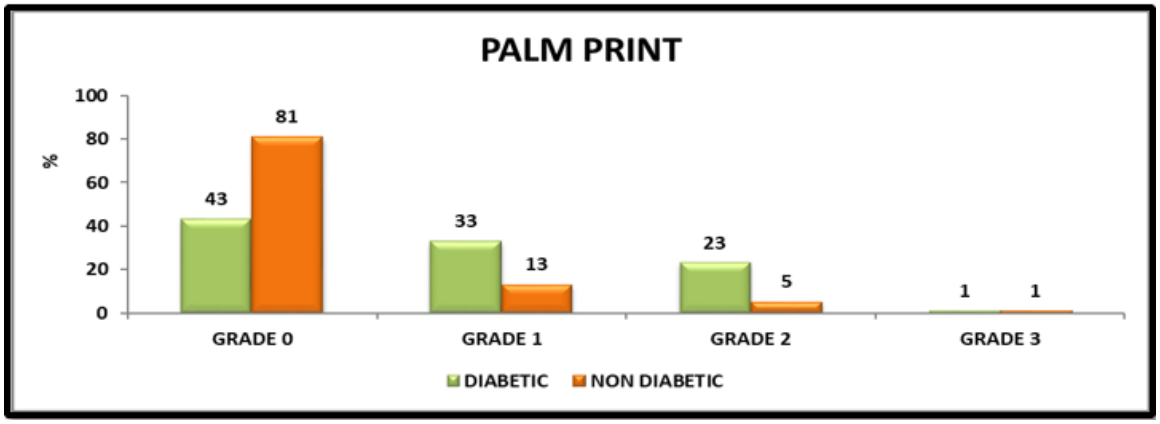
Chart 2: Distribution of Patients According to Their Prayer's Sign



Prediction:

In our study, we predicted that Positive is more among non-diabetic patients than the Diabetic Patients.

Chart 3: Distribution of Patients According to Their Palm Print



Prediction:

In our study, we predicted that grade 2 is higher among diabetic patients than the non-diabetic patients. And grade 3 is same in both diabetic and non-diabetic patients.

Table 2: Comparison of Upper Lip Bite Test with Prayer's Sign for Diabetic & Non-Diabetic Mellitus

AIRWAY PARAMETER	CATEGORIES	DIABETIC MELLITUS		NON- DIABETIC MELLITUS		P-VALUE
		PRAYER'S SIGN		PRAYER'S SIGN		
		POSITIVE	NEGATIVE	POSITIVE	NEGATIVE	
UPPER LIP BITE TEST	CLASS 1	29	17	41	40	**0.304**
	CLASS 2	17	20	12	7	
	CLASS 3	6	11	53	47	

Table 3: Comparison of Upper Lip Bite Test with Palm Print for Diabetic & Non-Diabetic Mellitus

AIRWAY PARAMETER	CATGORIES	DIABETIC MELLITUS				NON- DIABETIC MELLITUS				P-VALUE
		PALM PRINT				PALM PRINT				
		G0	G1	G2	G3	G0	G1	G2	G3	
UPPER LIP BITE TEST	CLASS 1	26	14	6	0	66	11	3	1	**0.001**
	CLASS 2	12	13	11	1	15	2	2	0	
	CLASS 3	5	6	6	0	0	0	0	0	

Table 4: Comparison of Prayer's Sign with Palm Print for Diabetic & Non-Diabetic Mellitus

AIRWAY PARAETER	CATEGORIES	DIABETIC MELLITUS				NON- DIABETIC MELLITUS				P-VALUE
		PALM PRINT				PALM PRINT				
		G0	G1	G2	G3	G0	G1	G2	G3	

PRAYER'S SIGN	POSITI VE	34	11	6	1	52	1	0	0	**0.000***
	NEGATIVE	9	22	17	0	29	12	5	1	

4. DISCUSSION

Among the various endocrine disorders, diabetic mellitus is the commonest an anaesthesiologist encounter. Improvement in diabetes management has resulted in an increase in the number of diabetic patients who undergo elective & emergency surgery, many of whom requires general anaesthesia with endotracheal intubation.

The present study was conducted to evaluate the clinical airway parameters such as upper lip bite test, prayer's sign & palm print was assessed pre operatively to predict difficult intubation in diabetic (100 samples) and non-diabetic (100 samples) as per the grades of airway parameters.

Studies by Hashmi et al., Reissell et al., Hogan et al., Nadal et al., & Vani et al., have reported that 27.1%, 31%, 32%, 27%, 16% incidence of difficult intubation among diabetes mellitus patients. The increases in the frequency of difficult intubation in diabetic patients is believed to be due to development if LJM syndrome. The exact mechanism of LMJ syndrome has not been clarified. Existing evidence suggests that the syndrome may be another example of tissue glycosylation associated with chronic hyperglycaemia. Diabetic patients have abnormal metabolic patterns of collagens and an increase in cross-link formation, resulting in collagen fibrils, relatively insoluble and resistant to enzyme degradation. Reissell et al., hypothesized that glycosylation of larynx and cervical vertebrate joints may be responsible for increasing the incidence of difficult intubation. The Changes in LMJ syndrome usually begins in the joints of the 5th fingers metacarpophalangeal & proximal interphalangeal joints and gradually spread downwards. The patients can't approximate the palm and fingers. The limitation of the joints is painless and uncomplicated.

There was no correlation between LJM syndrome and diabetes whether gender, race & control. The duration of diabetes & age are the important variables in the development of LMJ syndrome. In the studies done by Vani et al., George et al., & Hashim et al., the duration of diabetes were 5.3 years,4.8 years & 6.7 years respectively. In Nadal et al., studies that the duration of diabetes more than 10 years was found to be a sensitive indicator of difficult intubation. However, in our study the duration of diabetes 5 or more than 5 years with ease & difficult intubation respectively, even though statistically not significant.

Studies by Hashim et al., Reissell et al., reported that the palm print had a significant association with difficult intubation & higher the palm print the more difficult intubation. Mahmoodpoor et al., reported that 8.9% incidence of difficult intubation, there was a significant correlation between BMI & DM ($p = 0.004$). Amirreza Vakilian et al., 2023 that highest accuracy was reported for Mallampati grade, palm print & prayer' sign. (>86%). Neha Tilak 2022, reported that palm print is an ideal predictor of difficult intubation patients with DM, followed by Mallampati grade & prayer's sign.

We found that in DM patients upper lip bite test & palm print was the best predicator. In non-diabetic patient's palm print was best predictor. In other studies, palm print was the best predictor for difficult intubation only for diabetes mellitus patients. But in our study, both DM & NON-DM patients, palm print was an ideal predictor for difficult intubation. May be large sample size to obtain more accurate results than now. This study further continues to obtain more accurate results by correlating the palm print with Cormack lehane score & large sample size.

Limitations of our study includes sample size is minimum (200 Samples), airway parameters were assessed only during pre-operative, duration of study was 6 months, not correlated with Cormack lehane score (intra- operative assessment of difficult intubation).

5. CONCLUSION:

- In DM patients, palm print & upper lip bite test was the best predictor of a difficult intubation. In non-DM patients, palm print was the single best predictor of a difficult intubation.
- In both diabetic & non-diabetic patients, palm print was the best predictor of a difficult intubation.
- This study further continues to obtain more accurate results by correlating the palm print with Cormack Lehane grades.
- Studies with a large sample size are suggested to obtain more accurate results.

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