Original Research Article

THE RISK OF OBSTRUCTIVE SLEEP APNOEA IN PATIENTS WITH TYPE 2 DIABETES MELLITUS USING STOP BANG SCORE: A HOSPITAL BASED OBSERVATIONAL STUDY

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ABSTRACT

Background: Obstructive Sleep Apnoea (OSA) is a prevalent sleep disorder characterized by recurrent episodes of upper airway collapse, leading to disrupted breathing. Type 2 Diabetes Mellitus (T2DM) is a significant risk factor for OSA due to associated obesity, insulin resistance, and metabolic dysfunction. Despite the well-established relationship between T2DM and OSA, there is a lack of studies assessing. OSA risk in diabetic patients, particularly in Northeast India. This study evaluates the risk of OSA among T2DM patients using the STOP-BANG questionnaire. **Objective**: To estimate the risk of OSA in patients with T2DM using the STOP-BANG score and assess its correlation with clinical and metabolic parameters.

Materials and Methods: This hospital-based observational study was conducted at Tezpur Medical College and Hospital, Assam. A total of 150 T2DM patients were included based on predefined inclusion and exclusion criteria. Data collection involved personal and medical history, anthropometric measurements (BMI, neck circumference), and laboratory assessments (HbA1c, fasting blood glucose, postprandial blood glucose). OSA risk was assessed using the STOP-BANG questionnaire. Statistical analyses were performed to determine the correlation between OSA risk and clinical variables

Results: Among 150 participants, 57.33% were classified as high risk (STOP-BANG score ≥5), 32.00% as intermediate risk (3-4), and 10.67% as low risk (0-2). A significant association was found between OSA risk and BMI, neck circumference, and HbA1c levels ($p < 0.001$). Longer diabetes duration also correlated with higher OSA risk.

Conclusion: A high prevalence of OSA risk was observed among T2DM patients. Obesity, poor glycaemic control, and longer diabetes duration were significant predictors of OSA risk. Screening for OSA using the STOP-BANG questionnaire can help in early identification and intervention, potentially improving metabolic and cardiovascular outcomes in diabetic patients.

Keywords: Obstructive Sleep Apnoea, Type 2 Diabetes Mellitus, STOP-BANG Score, BMI, Neck Circumference, Glycaemic Control, Sleep Disorder.

INTRODUCTION

Obstructive Sleep Apnoea (OSA) is a sleep disorder marked by repeated episodes of partial or complete obstruction of the upper airway during sleep. These episodes, known as apnoea(complete cessation of airflow) and hypopneas (partial reduction in airflow), frequently disturb sleep and cause intermittent oxygen desaturation. The pathophysiology of OSA typically involves the collapse of the pharyngeal airway during REM

sleep, a time when muscle tone is naturally reduced. Each apnoea episode ends with a brief arousal, restoring the airway but disrupting normal sleep, leading to fragmented sleep and daytime fatigue.

OSA shares a strong connection with type 2 diabetes mellitus (T2DM). It is estimated that 60-80% of individuals diagnosed with T2DM also suffer from obstructive sleep apnoea (OSA), with a bidirectional relationship existing between the two conditions. T2DM increases susceptibility to OSA due to obesity and diminished airway muscle tone, while untreated OSA exacerbates insulin resistance and negatively affects blood glucose regulation. The repeated episodes of nocturnal hypoxia and sleep interruptions characteristic of OSA contribute to metabolic imbalances, leading to impaired glucose tolerance.

Recognizing and addressing the link between T2DM and OSA is essential to enhancing patient outcomes. Proper management of OSA—particularly through Continuous Positive Airway Pressure (CPAP) therapy—has been shown to improve blood sugar control and reduce cardiovascular risks.

One of the most reliable tools for OSA screening is the STOP-BANG questionnaire, a simple and widely adopted method that evaluates OSA risk based on eight clinical criteria: snoring, tiredness, observed apnoea, blood pressure, body mass index (BMI), age, neck circumference, and gender. Each "yes" response adds to the total score, which ranges from 0 to 8. Scores between 3 and 4 suggest moderate risk, while scores of 5 or more indicate a high risk for OSA.

Multiple studies have confirmed the effectiveness of the STOP-BANG questionnaire as a reliable tool for OSA screening across various populations, including individuals with T2DM. Research indicates that the STOP-BANG score demonstrates high sensitivity, particularly in identifying moderate to severe cases of OSA. However, its specificity tends to be lower, necessitating follow-up diagnostic tests such as polysomnography to establish a definitive diagnosis.

In summary, the relationship between T2DM and OSA—driven by common factors like insulin resistance, obesity, and systemic inflammation—highlights the critical importance of early identification and treatment of OSA in T2DM patients.

Managing OSA can lead to improvements in sleep quality, blood glucose regulation, and overall health, while reducing the risk of long-term complications, including cardiovascular and metabolic diseases. The STOP-BANG score serves as a valuable screening tool, enabling timely intervention and contributing to better patient outcomes and enhanced quality of life.

Aims and Objectives

To estimate the risk of obstructive sleep apnoea (OSA) among patients with Type 2 Diabetes Mellitus.

MATERIALS AND METHODS

Study Design

This study is a hospital-based observational study conducted at Tezpur Medical College and Hospital, Assam. The study aims to assess the risk of Obstructive Sleep Apnoea (OSA) in patients diagnosed with Type 2 Diabetes Mellitus (T2DM) using the STOP-BANG questionnaire. The study duration is one year, from 1 st September,2024 30 th August 2025. The estimated sample size for the study is 150 participants, calculated using the standard formula for sample size calculation.

Sample size (n) = $z2 \times$ p (1-P)/€2

 n = required sample size

• p̂ = population proportion

• z = Z-score for the confidence level

• ε = margin of error

Study Population and Sample Selection

1. The study population comprises patients diagnosed with T2DM attending the Outpatient and Indoor departments of the General Medicine Department at Tezpur Medical College and Hospital. A purposive sampling technique is employed to select participants based on predefined inclusion and exclusion criteria.

Inclusion Criteria

1. Patients aged 18 years or older with a confirmed diagnosis of T2DM.
2. Patients willing to provide informed consent for participation.
3. Patients who can complete the STOP-BANG questionnaire independently or with assistance.

Exclusion Criteria

2. Patients classified as pre-diabetic.
3. Patients with diabetes types other than Type 2 (e.g., Type 1 Diabetes Mellitus, Gestational Diabetes).
4. Patients with severe comorbid conditions preventing participation.
5. Patients below 18 years of age.
6. Patients unwilling to consent to the study.
7. Patients previously diagnosed with OSA.

RESULTS

Table 1: Correlation Analysis Between Key Clinical Parameters in Type 2 Diabetes and OSA Risk		
Parameter	**Correlation coefficient**	**p-value**
('STOP BANG SCORE', 'Hb A1c')	0.71	<0.001
('STOP BANG SCORE', 'NECK CIRCUMFERENCE')	.54	.02

('Hb A1c', 'STOP BANG SCORE')	.54	.01
('Hb A1c', 'FBS')	.71	<.001
('Hb A1c', 'RBS')	.54	.02
('FBS', 'Hb A1c')	.54	.01
('RBS', 'Hb A1c')	.53	.01
('NECK CIRCUMFERENCE', 'STOP BANG SCORE')	.54	.02

The correlation analysis reveals significant associations between various clinical markers in Type 2 Diabetes Mellitus (T2DM) patients and their risk of OSA. The STOP-BANG Score and HbA1c show a strong positive correlation (r = 0.71, p< 0.001), indicating that patients with poor glycaemia control are at a higher risk for OSA. Additionally, Neck Circumference is moderately correlated with STOPBANG (r = 0.54, p = 0.02), suggesting that increased upper body fat distribution is a key risk factor for OSA. HbA1c is also significantly correlated with FBS (r = 0.54, p= 0.01) and RBS (r = 0.53, p = 0.02), reinforcing that poor glucose control is consistently linked to metabolic dysfunction. Overall, these results highlight the interplay between diabetes severity, obesity, and OSA risk, suggesting that targeted interventions for better glycaemic and weight control could reduce the likelihood of OSA in T2DM

This correlation analysis highlights the interplay between diabetes severity, obesity markers, and OSA risk factors. Patients with poor glycaemic control (high HbA1c) and obesity (increased neck circumference) may require targeted interventions to mitigate their risk of OSA.
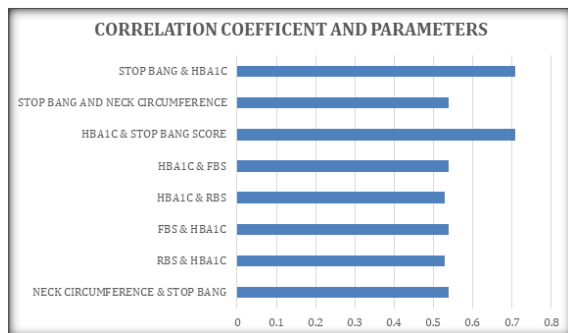
Figure 1: correlation analysis between key clinical parameters in type-2 diabetes mellitus and OSA risk

DISCUSSION

A critical observation in this study was the high prevalence of obesity in T2DM patients and its strong association with OSA risk. Hypertension was another significant risk factor for OSA identified in this study. Given the shared pathophysiological mechanisms between these two conditions, it is critical for patients to undergo screening for OSA in T2DM patients who also have hypertension to prevent further complications.

In our study, the sex distribution showed a predominance of male participants, comprising 66.67% (100 individuals) of the total sample, while females represented 33.33% (50 individuals), with 150 participants overall.

This research indicated that most patients with type 2 diabetes mellitus fell into high-risk categories for OSA based on their STOP-BANG scores. The chi-square statistic of 27.09, with a p-value of <0.001, indicated a statistically significant relationship between the STOP-BANG score and the risk of OSA in our study population.

In this study, the association between the duration of diabetes and the risk of obstructive sleep apnoea (OSA) demonstrated a clear pattern. Patients in the high-risk OSA category had a mean diabetes duration of 8.71 years (SD = 3.20), with a range from 3 to 18 years.

In our study, we conducted a correlation analysis to explore the relationship between key clinical parameters and the risk of obstructive sleep apnoea (OSA) in T2DM patients using the STOP-BANG score. The analysis revealed a strong positive correlation between the STOP-BANG score and Hb A1c (r = 0.71, p < 0.001), suggesting that higher Hb A1c levels are associated with a greater risk of OSA. Similarly, the correlation between the STOP-BANG score and neck circumference was moderate (r = 0.54, p = 0.02), indicating that a larger neck circumference is also a significant predictor of OSA risk. Other key correlations included moderate positive associations between Hb A1c and fasting blood sugar (r = 0.54, p = 0.01), as well as random blood sugar (r = 0.53, p = 0.02), which further emphasize the link between poor glycaemia control and increased OSA risk.

This study highlights the importance of early screening for OSA in patients with T2DM, particularly those with a high STOP-BANG score. Identifying OSA early in diabetic patients can help mitigate its complications, such as exacerbated hyper-glycaemia, poor diabetic control, and increased cardiovascular risk. The treatment of OSA, particularly with Continuous Positive Airway Pressure (CPAP) therapy, has been shown to improve insulin sensitivity and glycaemic control. Therefore, screening for and treating OSA in patients with T2DM may provide a dual benefit, not only address the sleep disorder but also improve metabolic outcomes and reducing the risk of cardiovascular events.

CONCLUSION

Summary
Obstructive Sleep apnoea (OSA) is a prevalent disorder with significant associations with metabolic

conditions such as Type 2 Diabetes Mellitus (T2DM). This study aimed to estimate the risk of OSA in T2DM patients using the STOP-BANG questionnaire and to analyse its correlation with clinical and anthropometric parameters. The study was conducted at Tezpur Medical College and Hospital, Assam, involving 150 T2DM patients. Key findings highlight the high prevalence of OSA risk among diabetic individuals and its strong association with obesity, glycaemia control, and diabetes duration.

Participants in the high-risk category had a mean diabetes duration of 8.71 years, significantly longer than those in the intermediate (4.96 years) and low-risk (1.75 years) groups. Longer diabetes duration was significantly correlated with increased OSA risk ($p < 0.001$).

A strong positive correlation ($r = 0.71$, $p < 0.001$) was found between STOP-BANG scores and HbA1c levels, indicating that poor glycaemia control increases OSA risk. Neck circumference also showed a significant correlation with STOP-BANG scores ($r = 0.54$, $p = 0.02$), reinforcing the role of obesity in OSA development. The Receiver Operating Characteristic (ROC) curve analysis confirmed the STOP-BANG questionnaire as an effective screening tool for severe OSA (AUC = 1.0).

Conclusion

The findings of this study indicate a high prevalence of OSA risk in T2DM patients, with obesity, neck circumference, and poor glycaemia control emerging as significant risk factors. Longer diabetes duration was also linked to an increased likelihood of OSA. Given these associations, routine screening for OSA using the STOP-BANG questionnaire should be incorporated into diabetes management protocols. Early identification and intervention could help prevent complications associated with untreated OSA, such as cardiovascular diseases and poor metabolic outcomes.

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