SLEEP QUALITY AMONG TYPE 2 DIABETICS WITH NICOTINE DEPENDENCE
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ABSTRACT: INTRODUCTION: Sleep disorders are reported due to varied reasons and are on the rise. Diabetes is established as the one of the reasons for alterations in the quality of sleep. Studies have established that nicotine acts on the neurotransmitter system and influence the quality of sleep. Nicotine use by the diabetic patients is an added factor and will interfere with their quality of sleep. The objectives of the study were to assess the quality of sleep among uncontrolled and uncomplicated type 2 diabetics with and without nicotine dependence and to find out the effect of nicotine in the day time functioning of the study population. MATERIALS AND METHODS: This study was carried out in a tertiary care teaching hospital among 50 individuals without Nicotine dependence and 50 individuals with Nicotine dependence of uncontrolled and uncomplicated known type 2 Diabetes mellitus. A pretested questionnaire, Fagerstrom test form for Nicotine dependence for smokers, the Pittsburg Sleep Quality Index and Epworth Sleepiness Scale were used to collect data from the study subjects in order to assess the quality of sleep among the study group. RESULTS: The sleep quality among the smokers was different in terms of time of going to bed, time to sleep, hours of sleep, time taken to fall asleep, waking up in the middle of sleep, breathing problem, pain in the leg, and afternoon nap and cough or snore during sleep [p<0.05]. Whereas no significance was noticed in getting up early in the morning [p>0.05]. In this study, 92% of the smokers belonged to the low to moderate dependence category as per the Fagerstrom test. DISCUSSION: The sleep quality of low and moderate nicotine dependent type 2 diabetics differed significantly from the non-nicotine users. Most of the study population belonged to low to moderate nicotine dependence [92%]. Health education and enforcement on prevention of smoking in public places is found to have an effect on the Nicotine use in Tamil Nadu.

KEYWORDS: Sleep Quality, Fagerstrom test, Pittsburg Sleep Quality Index, Epworth Sleepiness Scale.

INTRODUCTION: A good sleep is considered as an essential component of the biological processes of the body for all human beings. Inadequate sleep is found to have an impact on learning, memory processing, cellular repair, brain development and proper functioning of the human systems.1-4 On the other hand adequate sleep habits have positive role on the neurobehavioral performance. Sleep disorder has a direct impact on the functioning of all body organs and systems.5 Several studies have proved the poor level of sleep to increase the mortality among individuals.

Sleep below optimal level will cause neurobehavioral deficits, impaired attention, slowed down working memory, cognitive thought and depression, lessening concentration which leads to accidents or even death.6 Among the non-communicable diseases, diabetes is considered as a major cause of death and disability in the world today. According to the WHO fact sheet 347 million people suffer from diabetes and more than 80% of deaths occur due to diabetes among the lower and middle income category.7 In the South East Asian region nearly 71 million people are suffering from diabetes and 1 million deaths
occur every year. Diabetes mellitus once considered as a mild disorder of the aged persons, now has become the major issue among the non-communicable disease burden in the world as well as in India.

A study conducted by Indian Council of Medical Research in 1972-75 showed that the prevalence of diabetes was 2.1% in urban and 1.5 in rural population. Now diabetes has emerged as an epidemic in nature worldwide including India. Further studies during 1988 revealed a rising trend of diabetes in India. A recent study published by the Indian Council of Medical Research in 2011 shows that 10.4% and 8.3 % of the population are in the diabetic and pre diabetic state respectively in Tamil Nadu, which accounts for 4.8 million diabetes and 3.9 million people with pre diabetes.

Diabetes is considered as one of the reasons for sleep disorder and sleep disorder in turn affects the blood glucose levels. Diabetic patients frequently complained of sleeplessness, excessive daytime sleepiness and unpleasant sensation in the leg.

Nicotine use has been associated with a range of sleep disorders, including shorter sleep duration, difficulty in initiating and maintaining sleep, snoring and daytime sleepiness. Previous cross-sectional studies have reported an association between active Nicotine use and insufficient rest/sleep.

The objectives of the study were to assess the quality of sleep among uncontrolled and uncomplicated type 2 diabetics with and without nicotine dependence and to find out the effect of nicotine use in the day time functioning of the study population among diabetic patients attending a tertiary care teaching hospital in Tamil Nadu, India.

MATERIALS AND METHODS:

STUDY SITE: This cross sectional observational study was carried out in the Department of Psychiatry in collaboration with the Department of Medicine of a tertiary care teaching hospital located in a rural area of Trichy District, Tamil Nadu, India. Between the months of May and October 2013.

SAMPLE COLLECTION: The subjects who were included in this study were known diabetic patients free from any overt complication of type 2 Diabetes Mellitus, fifty patients with Nicotine Dependence and fifty patients without Nicotine dependence who attended the Diabetic review Outpatient Department (OPD). Subjects were taken up for this study by the convenience sampling method. All male subjects aged between 25 and 65 years were included in this study.

Inclusion Criteria: Only male members were selected for this study since female smokers are extremely rare in our region.

Exclusion Criteria: People aged more than 65 years, those with severe medical illness, those who did not give the consent, those on sleep medications and those who use other psychoactive substances in a dependent manner were excluded from the study.

Institutional Ethics Committee Clearance: The study was approved by the Institutional Ethics Committee and informed consent was obtained from each individual.
**ORIGINAL ARTICLE**

**Method of Study:** A semi structured pretested questionnaire was used to assess the Sociodemographic profile, Anthropometric measures, information on diabetes status and control. The Pittsburg Sleep Quality Index (PSQI) was used to assess the quality of sleep and the impact of sleeplessness on daytime functioning was assessed with The Epworth sleepiness scale (ESS). Nicotine dependence was assessed with the Fagerstrom test.

The instruments used to find out the difference between smokers and non-smokers of the type 2 diabetics are all scalable measurements. Non-parametric Moses test was performed to find out the significance level of the two groups considering non-smokers as a control group and smokers as the experimental group. Observations of nonsmokers and smokers are combined, grouped and then ranked for analysis. The data were analyzed by computing the data in the SPSS version 21 software.

**RESULTS:** Descriptive statistics for the variables of sociodemographic data are presented in Table 1. In this study group, all the subjects were males and the mean age ± standard deviation of the smokers and non-smokers were 52.28 ± 9.154 years (34-65) and 50.08 ± 9.223 years (28-65) respectively. Most of them belonged to the rural setup- 58% of the smokers and 70 % of the nonsmokers. The mean ± SD for body mass index of smokers and nonsmokers was 23.43± 4.12 Kg/m² (15.11-34.19) and 24.39± 2.87 Kg/m² (15.4-29.67) respectively.

The duration of diabetes of smokers and nonsmokers ranged from 0 to 936 and from 0-1716 respectively, and it had a mean and SD of 203.21 ± 251.05and 184.84 ±268.47. 86% of the smokers and 90% of nonsmokers were on anti-diabetic measures out of which about two thirds were on oral hypoglycemic drugs. About 46% of the subjects followed regular aerobic exercises along with a diabetic diet.

| SL. No. | Variable                  | Smokers       | Non Smokers   | P value |
|---------|---------------------------|---------------|---------------|---------|
| 1.      | Age (yrs.)                | 52.28 ± 9.15  | 50.08 ± 9.223 | 0.298   |
| 2.      | Height (cms)              | 162.17 ± 6.58 | 162.79 ± 6.43 | 0.634   |
| 3.      | Weight (Kgs)              | 61.74 ± 11.80 | 64.84 ± 9.71  | 0.155   |
| 4.      | BMI (Kg/m²)               | 23.43 ± 4.12  | 24.39 ± 2.87  | 0.122   |
| 5.      | Fasting Blood Glucose (mg/dl) | 185.81 ± 96.06 | 196.9 ± 113.12 | 0.890 |
| 6.      | Post Prandial Blood Glucose (mg/dl) | 266.67 ± 126.41 | 288.67 ± 130.88 | 0.392 |
| 7.      | Duration of diabetes (in weeks) | 203.21 ± 251.05 | 184.84 ± 268.47 | 0.593 |

Table 1: Sociodemographic and clinical data of Smokers and Non Smokers

Sociodemographic and clinical data of smokers and non- smokers did not vary significantly [p >0.05]. Descriptive statistics for the variables of the Fagerstrom test for Nicotine dependence are presented in Table 2. About 92% of the diabetic smokers in this study belonged to low to moderate levels of nicotine dependence category (low-38%, low to moderate-18%, moderate-36% and high-8%) using the Fagerstrom test for nicotine dependence and only 8% of them belonged to the high dependence category.
How soon after waking do you smoke your first cigarette?  
Within 5 minutes: 19 (38)  
5-30 minutes: 12 (24)  
31-60 minutes: 19 (38)  

Do you find it difficult to refrain from smoking in places where it is forbidden? e.g. Church, Library, etc.  
Yes: 14 (28)  
No: 36 (72)  

Which cigarette would you hate to give up?  
The first in the morning: 19 (38)  
Any other: 31 (62)  

How many cigarettes a day do you smoke?  
10 or less: 30 (60)  
11-20: 11 (22)  
21-30: 4 (8)  
31 or more: 5 (10)  

Do you smoke more frequently in the morning?  
Yes: 12 (24)  
No: 38 (76)  

Do you smoke even if you are sick in bed most of the Day?  
Yes: 27 (54)  
No: 23 (46)  

**TOTAL SCORE**  
1-2= low dependence: (19) 38%  
5-7= moderate dependence: (18) 36%  
3-4= low to moderate dependence: (9) 18%  
8+= high dependence: (4) 8%  

Table 2: Fagerstrom Test for Nicotine Dependence of Smokers

Descriptive statistics for the variables of the Pittsburg Sleep Quality Index are presented in table 3. Based on the Pittsburg Sleep Quality Index (PSQI) to assess the sleep quality of the diabetic smokers and nonsmokers, the Non nicotine dependent diabetic populations were better sleepers by 2% than the Nicotine dependent diabetic population. However, smokers were found to have increased complaints of coughing and snoring that disturbs their sleep significantly when compared to the non-smokers (p <0.05).
|   |   | Less than once a week | Once or twice a week | Three or more times a week |   |
|---|---|----------------------|----------------------|---------------------------|---|
|6. | Wake up in the middle of the night or early morning | Not during the past month | 4(8) | 5(10) | 0.000 |
|   |   | Less than once a week | 2(4) | 2(4) |   |
|   |   | Once or twice a week | 6(12) | 4(8) |   |
|   |   | Three or more times a week | 38(76) | 39(78) |   |
|7. | Have to get up to use the bathroom | Not during the past month | 6(12) | 4(8) | 0.000 |
|   |   | Less than once a week | 2(4) | 2(4) |   |
|   |   | Once or twice a week | 4(8) | 4(8) |   |
|   |   | Three or more times a week | 38(76) | 40(80) |   |
|8. | Cannot breathe comfortably | Not during the past month | 45(90) | 46(92) |   |
|   |   | Less than once a week | 0(0) | 2(4) | 0.000 |
|   |   | Once or twice a week | 2(4) | 2(4) |   |
|   |   | Three or more times a week | 3(6) | 0(0) |   |
|9. | Cough or snore loudly | Not during the past month | 39(78) | 47(94) |   |
|   |   | Less than once a week | 3(6) | 2(4) | 0.000 |
|   |   | Once or twice a week | 4(8) | 1(2) |   |
|   |   | Three or more times a week | 4(8) | 0(0) |   |
|10. | Feel too cold | Not during the past month | 46(92) | 42(84) |   |
|   |   | Less than once a week | 3(6) | 4(8) | 0.000 |
|   |   | Once or twice a week | 1(2) | 4(8) |   |
|   |   | Three or more times a week | 0(0) | 0(0) |   |
|11. | Feel too hot | Not during the past month | 47(94) | 50(100) |   |
|   |   | Less than once a week | 1(2) | 0(0) | 0.000 |
|   |   | Once or twice a week | 2(4) | 0(0) |   |
### Table 3: Pittsburgh Sleep Quality Index for smokers and non-smokers.

| Question                                                                 | Not during the past month | Less than once a week | Once or twice a week | Three or more times a week | p-value |
|--------------------------------------------------------------------------|----------------------------|-----------------------|----------------------|----------------------------|---------|
| 12. Have bad dreams                                                      | 36(72)                    | 6(12)                 | 4(8)                 | 4(8)                       | 0.000   |
| 13. Have pain                                                            | 26(52)                    | 7(14)                 | 6(12)                | 11(22)                     | 0.000   |
| 14. Other restlessness while you sleep, describe.                        | 42(84)                    | 2(4)                  | 1(2)                 | 5(10)                      | 0.000   |
| 15. Trouble staying awake while driving, eating meals, or engaging in social activity | 13(26)                    | 24(48)                | 12(24)               | 1(2)                       | 0.000   |
| 16. Problem to keep up enthusiasm to get things done                     | 11(22)                    | 21(42)                | 16(32)               | 2(4)                       | 0.000   |
| 17. Overall subjective sleep rating                                      | Very good: 6(12)          | 20(40)                | 19(38)               | 5(10)                      | 0.008   |
| Fairly good: 20(40)                                                     | 27(54)                    | 13(26)                | 8(16)                |                             |         |
| Fairly bad: 19(38)                                                      |                           | 13(26)                | 8(16)                |                             |         |
| Very bad: 5(10)                                                         |                           |                       |                      |                             |         |
| 18. Global PSQI score                                                    | <5 (good sleepers): 13(26) |                       |                      | 37(74)                     | 0.000   |
| ≥5 (poor sleepers): 36(72)                                               |                           |                       |                      |                             |         |
Descriptive statistics for the variables of Epworth Sleepiness Scale and the comparison of the daytime functioning between the two groups is presented in table 4. Based on the Epworth Sleepiness Scale indicator (ESS) to assess the level of daytime functioning in the study population, the diabetic non-smokers had better daytime functioning by 4% when compared to the diabetic smokers. But the excessive day time sleepiness was found to be higher level among Smokers [56%] than non-smokers [32%].

| SL. No. | Situation                         | Chance of dozing | Smokers (%) | Non-smokers (%) | Moses test: observed group span-Sig [1-Tailed] p value |
|--------|-----------------------------------|------------------|-------------|-----------------|------------------------------------------------------|
| 1.     | Sitting and Reading               | Would never doze | 27(54)      | 32(64)          |                                                      |
|        |                                   | Slight chance of dozing | 6(12) | 7(14) | 0.000 |
|        |                                   | Moderate chance of dozing | 15(30) | 9(18) | 0.000 |
|        |                                   | High chance of dozing | 2(4)  | 2(4)  | 0.000 |
| 2.     | Watching TV                       | Would never doze | 28(56)      | 31(62)          |                                                      |
|        |                                   | Slight chance of dozing | 8(16) | 5(10) | 0.000 |
|        |                                   | Moderate chance of dozing | 10(20) | 13(26) | 0.000 |
|        |                                   | High chance of dozing | 4(8)  | 1(2)  | 0.000 |
| 3.     | Sitting inactive in a public place | Would never doze | 9(18)       | 10(20)          |                                                      |
|        |                                   | Slight chance of dozing | 40(80) | 34(68) | 0.001 |
|        |                                   | Moderate chance of dozing | 1(2)  | 6(12) | 0.001 |
|        |                                   | High chance of dozing | 0(0)   | 0(0)   | 0.001 |
| 4.     | As a car passenger for an hour without a break | Would never doze | 9(18)       | 12(24)          |                                                      |
|        |                                   | Slight chance of dozing | 4(8)  | 9(18) | 0.000 |
|        |                                   | Moderate chance of dozing | 14(28) | 11(22) | 0.000 |
|        |                                   | High chance of dozing | 23(46) | 18(36) | 0.000 |
| 5.     | Lying down to rest in the afternoon when circumstances permit | Would never doze | 3(6)        | 3(6)            |                                                      |
|        |                                   | Slight chance of dozing | 15(30) | 16(32) | 0.056 |
|        |                                   | Moderate chance of dozing | 25(50) | 29(58) | 0.056 |
|        |                                   | High chance of dozing | 7(14)  | 2(4)  | 0.056 |
| 6.     | Sitting and talking to             | Would never doze | 45(90)      | 46(92)          |                                                      |
The PSQI parameters are computed and analyzed by Non Parametric Moses test. The behavior pattern of smokers and Nonsmokers was found not to be significant in getting up in the morning only [p>0.05] but highly significant in all other behavioral patterns [p<0.05]. When the Epworth Sleepiness Scale was computed and analyzed by Moses test, lying down to rest in the afternoon when circumstances permit alone was not statistically significant [p >0.05] and all other parameters were found significant [p<0.05]. The significance level of both non-smokers and smokers are tabulated in Tables 3 and 4.

**DISCUSSION:** Factors affecting the quality of life of people with Diabetes Mellitus are varied. One among which is the disturbances in their sleep pattern. There is evidence to show sleep disorders such as OSA, insomnia, short or long-term sleep duration and restless legs syndrome are potential risk factors for insulin resistance, glucose intolerance, type 2 diabetes mellitus and metabolic syndromes.
A significant proportion of Type 2 diabetics have reduced sleep and there is a definite association between glycemic control and both quality and quantity of sleep. Nicotine use among diabetics might further affect their quality of life.

But in the present study in which the sociodemographic profile of the two groups is comparable, the sleep pattern and the level of daytime functioning between the nicotine dependent diabetic group and the nicotine non-dependent diabetic group differs significantly in the time of going to bed, time to sleep, hours of sleep, time taken to fall asleep, waking up in the middle of sleep, breathing problem, pain in the leg, and afternoon nap and cough or snore [p<0.05].

Whereas no significance is noticed in getting up early in the morning [p>0.05]. In this study, 92% of the smokers belonged to the low to moderate dependence category as per the Fagerstrom test. And the reason for the low level of nicotine dependence in the study population may be due to the awareness among the people about the ill effects of smoking and the legislative measures that had decreased the levels of smoking by reducing the production of tobacco, the sale of tobacco products and by prohibiting smoking in public places.

A study conducted by Osme et al also revealed that there was no significant difference in the proportion of individuals with symptoms of anxiety (p = 0.072) or depression (p = 0.657) in Diabetic Smokers when compared to the Diabetic non-smokers or the non-diabetic smokers and also the Fagerström scores showed no significant correlation with the scores obtained on the subscale of anxiety (p = 0.735) or depression (p = 0.364). The prevalence of depression and anxiety among smokers with and without diabetes and non-smokers Type 2 Diabetes mellitus is similar.

The presence of symptoms of anxiety or depression is similar between patients who are dependent and not dependent on nicotine. But Breslau et al demonstrated in young adults positive associations between nicotine dependence and major depression, obsessive compulsive type disorders, phobias, and anxiety disorders, as well as alcohol and illicit drug use.

The current study is likely to be the first study to report about the sleep pattern and its impact on daytime functioning between the diabetic smokers and the diabetic non-smokers. Since the population in this study is small, Moses test was employed to find out the significance level of parameters among two groups.

LIMITATIONS: This study was conducted in a single area and is a single centered study. Males alone included as smoking behavior present in males alone in the study area.

CONCLUSION:

1. On comparing the diabetic smokers and the diabetic nonsmokers at the time of going to bed, time to sleep, hours of sleep, time taken to fall sleep, waking in the middle of sleep, breathing problem, pain in the leg and afternoon nap and cough or snore they differ significantly [p <0.05].
2. Other components of Pittsburg Sleep Quality Index (PSQI) assessing the sleep quality and the Epworth Sleepiness Scale (ESS) assessing the daytime functioning did not differ significantly between the diabetic smokers and the diabetic non-smokers [p>0.05].
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**ORIGINAL ARTICLE**

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