The Relation between Cigarette Smoking and the Quality of Sleep: A Cross Sectional Study

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Abstract:

Background: Cigarette smoking has been found to have detrimental effects on almost all bodily organs, leading to the development of various illnesses and compromising the overall health of individuals who engage in this behavior. Cigarette smokers have worse sleep quality in comparison to the broader population. There is evidence to suggest that cigarette smoking is linked to sleep disruption, particularly in terms of extended sleep onset latency (SOL). The correlation between diminished sleep quality and heightened nicotine dependency has been seen among those who smoke cigarettes. The primary objective of this investigation is to investigate the impact of cigarette smoking on the overall quality of sleep.

Aims and Objectives: The objective of this study is to investigate the correlation between cigarette smoking, as measured by the Fagerstrom Test for Nicotine Dependence, and the quality of sleep, as assessed by the Pittsburgh Sleep Quality Scale, among those who are bystanders of patients hospitalized in Government Medical College, Kozhikode.

Materials and Methods: This is a hospital based cross sectional study conducted in 220 bystanders, who were current smokers, of patients admitted in Government Medical College, Kozhikode and their Fagerstrom Test for Nicotine Dependence and Pittsburgh Sleep Quality Scale were obtained. Patient's Fagerstrom Test for Nicotine Dependence and Pittsburgh Sleep Quality Scale are calculated. Qualitative variables were expressed in percentages, and quantitative variables were expressed in mean and standard deviation. Associating selected variables were statistically tested using Chi-square test.

Results: Among 220 subjects, 124 cigarette smokers had low nicotine dependence, 84 cigarette smokers had low to moderate nicotine dependence, 8 had moderate nicotine dependence and 4 had high nicotine dependence. While only 33.06% of cigarette smokers with low nicotine dependence showed poor sleep quality, all of the cigarette smokers with high nicotine dependence showed poor sleep quality.

Conclusion: Sleep disruption is a significant factor to consider alongside other ramifications of smoking, since it has the potential to contribute to the development of cardiovascular and cerebrovascular ailments, which in turn can lead to difficulties in concentration, impaired memory, mood disorders, and a decline in overall quality of life. Therefore, the study demonstrates the significance of smoking cessation.

Keywords: Fagerstrom Test; Nicotine Dependence; Pittsburgh Sleep Quality Scale; Smoking Cessation.

Introduction

In contrast to individuals who do not engage in cigarette smoking, those who do partake in this behavior exhibit a higher propensity for encountering sleep-related issues, including sleep disordered breathing, sleep apnea, insomnia, and diminished sleep quality. These issues manifest through disruptions in sleep patterns, such as reduced sleep durations, prolonged time to fall asleep, heightened daytime sleepiness, and increased challenges in sustaining sleep. [1-5] inadequate sleep quality has been identified as a significant risk factor for the development of chronic illnesses, including but not limited to depression, obesity, diabetes, and cardiovascular disease. [6-8] Cigarette smoking is likely to worsen these diseases to a greater extent. Therefore, the investigation of the correlation between the quality of sleep and the act of smoking cigarettes holds significant implications for several chronic health issues. Currently, there is a dearth of studies examining the association between sleep qualities and smoking behavior. Comprehending this

association is vital in formulating inventive healthcare therapies and, therefore, enhancing smoking cessation results.

The Fagerstrom Test for Nicotine Dependence (FTND) can be utilized to evaluate the severity of addiction. It has earned a reputation for being highly reliable in assessing and measuring nicotine addiction levels. FTND places significant emphasis on key criteria of addiction, such as heavy tobacco use, tolerance to nicotine, and experiencing withdrawal symptoms. [9,10]

The Pittsburgh Sleep Quality Index (PSQI) is a self-report questionnaire designed to evaluate sleep quality over a one-month period. It has been widely adopted and applied across various populations. In addition to the potential impact of smoking on sleep quality, research has indicated that sleep quality can also influence smoking behaviors. [11,12] This study focuses on how cigarette smoking affects the quality of sleep.

Aims and Objectives:

To find out the relation between cigarette smoking using Fagerstrom Test for Nicotine Dependence and the quality of sleep using Pittsburgh Sleep Quality Scale among bystanders of patients admitted in Government Medical College, Kozhikode.

Materials and Methods:

The study was conducted as a hospital based Cross Sectional study on bystanders of patients admitted in Government Medical College, Kozhikode who are current smokers at Department of Pulmonary Medicine in Government Medical College, Kozhikode. The research was accepted by the Ethical Committee and complete informed written consent was acquired from the patients.

Inclusion criteria:

- Aged between 18-60 years.
- Cigarette smoker smoked more than 100 cigarettes during Lifetime and Smoked during last 28 days.

Exclusion criteria:

- Less than 18 and above 60 years of age
- Non-current smokers
- History of mental illness or substance abuse
- Working on night shifts
- Pregnancy and lactation
- Clinical diagnosis of severe lung disease or severe sleeping disorders
- Sleep disturbance due to pain and causes other than smoking.

Sample size calculation: As per the article ―impaired sleep quality and sleep duration in smokers – results from the German Multicenter Study on Nicotine Dependence‖ by Stefan cohrs and et al, Sample size was calculated by using the formula $N = 4pq/d2$ $P = 31.7$ (percentage of the global score of heavy smokers) $Q = 100-p = 100 - 31.7 = 68.3$ $D = 20\%$ of $p = 20 * 31.7/ 100$ $N = 220$ Hence the sample size is 220.

All the subjects who are cigarette smokers and giving consent for the study, was recruited consecutively till the sample size was attained.

Methodology

All consecutive current smokers, who were bystanders of patients, admitted in Government Medical College, Kozhikode and satisfying inclusion and exclusion criteria were enrolled to study. After obtaining informed written consent, details of the subject were collected using a semi structured proforma. Relevant history was also taken.

Patient's Fagerstrom Test for Nicotine Dependence pack per year, cigarettes per day and Pittsburgh Sleep Quality Scale were calculated. As per Fagerstrom Test for Nicotine Dependence, a score of 1-2 was considered as low dependence, 3-4 as low to moderate dependence, 5-7 as moderate dependence and above 8 as high dependence. As per pack per year, cigarette smokers were classified as light smoker with score of 0.1-20, moderate smoker with score of 20-40 and heavy smoker with score more than 40. As per cigarette per days, cigarette smokers were classified as mild smoking with score less than 20 and heavy smoking with score equal to or more than 20. As per Pittsburgh Sleep Quality Scale, a global score of more than or equal to 5 was considered to have poor quality sleep.

Statistical analysis:

The acquired data were recorded in a Microsoft Excel spreadsheet 2019, and subsequent analysis was conducted utilizing the Statistical Software for Social Sciences (SPSS) version 10. Data was presented in form of percentages, frequencies and descriptive statistics (mean and standard deviation). Qualitative data was analyzed using chi square test. A p-value of less than 0.05 was considered significant.

Results

Out of 220 current smokers, 60 (27.3%) were in the age group 51-60 years followed by 59 (26.8%) in 18-30 years, 54 (24.5%) in 31-40 years and 47 (21.36%) in 41-50 years. The mean age was 39.21 + 12.61 years with minimum age 18 and maximum age 60. All of the subjects (220) were males. No females were obtained as current smokers.

Table 1: Distribution of current smokers according to FTND and Global PSQI Score

Variables		N	%
FTND	Low dependence	124	56.4
	Low to moderate dependence	84	38.2
	Moderate dependence	08	3.6
	High dependence	04	1.8
Global PSQI Score	Good Sleep Quality	94	42.7
	Poor Sleep Quality	126	57.3

Table 2: Distribution of current smokers according to different parameters

Variables	Subjective sleep quality score (N, %)	Sleep latency score (N, %)	Sleep duration score (N, %)	Sleep efficiency score (N, %)	Sleep disturbance (N, %)	Daytime dysfunction (N, %)
0	83 (37.7%)	93 (42.3%)	104 (47.3%)	106 (48.2%)	114 (51.8%)	95 (43.2%)
1	51 (23.2%)	52 (23.6%)	43 (19.5%)	32 (14.5%)	44 (20.0%)	49 (22.3%)
2	39 (17.7%)	45 (20.5%)	38 (17.3%)	41 (18.6%)	32 (14.5%)	38 (17.3%)
3	47 (21.4%)	30 (13.6%)	35 (15.9%)	41 (18.6%)	30 (13.6%)	38 (17.3%)

Association of pack per year with subjective sleep quality, sleep efficiency, sleep disturbance and daytime dysfunction was found to be statistically significant ($p<0.05$).

Table 3: Association of different sleep parameters with pack per year

Pack per year	Subjective sleep quality score (N, %)				Sleep latency score (N, %)				Sleep duration score (N, %)				Sleep efficiency score (N, %)				Sleep disturbance (N, %)				Daytime dysfunction (N, %)			
	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3
Light smoker	81	45	31	36	87	44	35	27	98	35	32	28	101	28	32	32	109	36	23	25	91	41	34	27
Moderate smoker	2	5	8	10	6	8	0	2	6	7	6	6	5	4	8	8	5	8	8	4	4	8	4	9
Heavy smoker	0	1	0	1	0	0	1	1	0	1	0	1	0	0	1	1	0	0	1	1	0	0	0	2
P-value	0.008 (S)				0.079 (NS)				0.118 (NS)				0.031 (S)				0.004 (S)				0.001 (S)			

S- Statistically Significant, NS- Non-Significant. Among 193 light smokers, 102 (52.8%) had poor sleep quality and all the heavy smokers had poor sleep quality, which was statistically significant **(p=0.002)**.

Table 4: Pack per year Vs Global PSQI score

Pack per year	Global PSQI score		P-value
	Good sleep quality	Poor sleep quality	
Light smoker	91	102	**0.002 (S)**
Moderate smoker	03	22	
Heavy smoker	0	02	

S- Statistically Significant

Table 5: FTND vs. sleep variables

FTND	Subjective sleep quality score (N, %)				Sleep latency score (N, %)				Sleep duration score (N, %)				Sleep efficiency score (N, %)				Sleep disturbance (N, %)				Daytime dysfunction (N, %)			
	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3
Low dependence	70	27	14	13	66	30	18	10	78	24	14	8	83	20	14	7	86	23	9	6	74	28	11	11
Low to moderate	13	22	23	26	25	18	25	16	25	17	21	21	23	9	24	28	28	17	20	19	20	20	23	21
Moderate	0	1	1	6	2	3	1	2	1	2	1	4	0	2	2	4	0	4	2	2	1	1	1	5
High dependence	0	1	1	2	0	1	21	2	0	0	2	2	0	1	1	2	0	0	1	3	0	0	3	1
P-value	0.000 (S)				0.003 (S)				0.000 (S)				0.000 (S)				0.000 (S)				0.000 (S)			

S- Statistically Significant. Among 124 cigarette smokers with low dependence, 41 (33.06%) had poor sleep quality and among 4 cigarette smokers with high dependence, all of them had poor sleep quality **(p=0.000)**.

Table 6: FTND Vs Global PSQI score

FTND	Global PSQI score		P-value
	Good sleep quality	**Poor sleep quality**	
Low dependence	83	41	**0.000 (S)**
Low to moderate dependence	11	73	
Moderate dependence	0	08	
High dependence	0	04	

S- Statistically Significant

Discussion

In present study, based on FTND, subjects were classified into low dependence, low to moderate dependence, moderate dependence and heavy dependence. Sleep quality of the subjects were measured using Pittsburgh Sleep Quality Index which consisted of 19 items that assess various aspects of sleep, resulting in the calculation of seven component scores and one composite score. These component scores encompassed subjective sleep quality, sleep latency (the time it takes to fall asleep), sleep duration, habitual sleep efficiency (the percentage of time spent asleep while in bed), sleep disturbances, use of sleeping medication, and daytime dysfunction. Each item in the PSQI was weighted on a scale of 0 to 3.

In this study, based on pack per year, heavy smokers were found to have poor subjective sleep quality, decreased sleep efficiency, disturbed sleep, use of sleep medication, presence of daytime dysfunction and overall poor sleep quality as indicated by global PSQI score. This is similar to the findings of Hu et al [13] except for sleep latency. Pack per year does not show any association with sleep latency and hence differs from the study conducted by Wetter and Young [14], Philips and Danner [15] and Kaneita et al [16].

Based on FTND, cigarette smokers with high dependence were found to have poor subjective sleep quality, poor sleep latency, decreased sleep duration, poor sleep efficiency, and increased sleep disturbance, increased use of sleep medication, increased daytime dysfunction and poor sleep quality. Same results were obtained from Cohrs et al [1] except for daytime dysfunction. The relevance of reduced sleep duration to the health issues of smokers cannot be overstated. Over the past decade, the medical community has recognized the pivotal role of sleep disturbances, particularly the decrease in sleep duration, in the development of numerous physical and mental disorders, as well as mortality. A recent meta-analysis, which encompassed 16 studies with a staggering 1.3 million participants, unequivocally concluded that a shortened duration of sleep is significantly associated with an elevated risk of death (Cappuccio et al) [17]

In a study conducted by Amagai et al, [18] it was observed that individuals who had a short sleep duration of less than 6 hours, which was found in 33.2% in our study, experienced an increased mortality risk. In particular, among men, this shorter sleep duration was associated with a mortality risk that was up to 2.4 times higher when compared to those who slept for 7-7.9 hours.

Furthermore, studies such as Doll et al [19] have indicated that the reduction in mortality risk following smoking cessation may be partially due to improvements in sleep quality and increased sleep duration. Zhang et al [20] also support this notion by demonstrating parallel improvements in sleep quality and duration following smoking cessation.

It is important to note that while these studies provide valuable insights into the relationship between sleep duration and health outcomes, they do not establish causation and further research is necessary to explore the complex interactions between sleep, smoking, and associated mortality risks.

Limitations of the study: This study has some limitations like it was conducted only in one centre on relatively small sample size. All the subjects were males, hence this study is not applicable for females and objective sleep quality measures such as polysomnography was not used.

Conclusion

Sleep disruption is a significant factor to consider in relation to the adverse effects of smoking, since it has the potential to contribute to the development of cardiovascular and cerebrovascular illnesses, which in turn can lead to impaired concentration, reduced memory function, mood problems, and a decline in overall quality of life. Therefore, the study demonstrates the significance of discontinuing smoking.

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