Association between smoking and obstructive sleep apnea in adult and aged male population – A survey based study

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ABSTRACT
Smoking is defined as the process where a person inhales smoke either from burnt paper or electronic cigarette with or without containing tobacco. There are various drugs and substances which can be abused in the form of smoking. In the earlier days smoking cigarettes were branded as an healthy lifestyle. One such deteriorating effect of smoking could be OSA abbreviating to obstructive sleep apnea. Obstructive sleep apnea can be defined as the obstruction of the airway either completely or partially during the sleep. India being a country with a huge population of smokers has inadequate public health awareness. The aim of the study is to analyse if there is any association between smoking and obstructive sleep apnea. Our study is a survey based study among the Indian population. No ethical approval was required from the study due to the self volunteering of the participants. Sample size of this study was n=100. Pre tested questionnaire containing questions based on smoking, sleep patterns derived from Berlin's & STOP BANG questionnaire. Questionnaire was circulated online among 100 participants above the age of 18 using Google Forms. The results were first imported to Excel then to SPSS software for further analysis. The present study population had male participation of 57%, and female participation of 43%, 59% of the study population were not aware of obstructive sleep apnea, 75% of the participants declared that they are not addicted to smoking yet 25% are addicted, 96% of the participants population found the study to be useful. The present survey study concluded that there may be an association between smoking and obstructive sleep apnea in the adult and aged population.

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INTRODUCTION
Smoking is defined as the process where a person inhales smoke either from burnt paper or an electronic cigarette with or without containing tobacco. (Kyriakoudes, 2006; Proctor, 2012; Kannan and Thenmozhi, 2016). Smoking has been practiced since 3000-5000 BC. There are various drugs and substances which can be abused in the form of smoking. In the earlier days smoking cigarettes were branded as an healthy lifestyle. (Behera and Malik, 1987; Neufeld, 2005; Jindal, 2006; Choud-
As the generation progressed the various harmful effects of smoking was discovered yet the need for smoking kept on increasing and became an addiction worldwide. \cite{Rani2003, Benowitz2010, Hafeez2016, Baumeister2017} All over the world, there are many chronic and acute smokers and it has reached to a point where not only smokers affect themselves but also to the people around them while smoking turning others into a passive smoker. \cite{Cao2015, Samuel2015, Menon2016}

One such deteriorating effect of smoking could be OSA abbreviating to obstructive sleep apnea. Obstructive sleep apnea can be defined as the obstruction of the airway either completely or partially during the sleep. \cite{Spicuzza2015, Pratha2016, Osman2018} Obstructive sleep apnea may cause many physiological disturbances and may lead to myocardial infarction, day time sleepiness, thyroid disturbances, diabetes, gastroesophageal reflux disease. \cite{Fogel2004, Punjabi2008, Motamedi2009, Sriram2015, Keerthana2016} Obstructive sleep apnea may also induce depression, lack of concentration, impaired judgement & memory, increased irritability, and cognitive dysfunction. \cite{Lavie2000, Huang2018}

There have been various studies enumerating the maleficent effects of smoking & passive smoking. \cite{Smith2003, Jones2008, Saulyte2014} One such deteriorating effect of smoking

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{pie_chart_gender.png}
\caption{Pie Chart depicting the frequency distribution of gender.}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{bar_chart_smoking.png}
\caption{X axis shows different age groups and y axis shows the number of participants.}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{bar_chart_smoking_gender.png}
\caption{X axis shows different types of smoking and y axis shows the number of participants.}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{bar_chart_smoking_type.png}
\caption{Type of smokers among male and female gender.}
\end{figure}

There have been many studies done previously to find out the association between smoking & sleep apnea but they had their limitations such as smaller population, self reported data from patients are not always accurate, no proper history of smoking was obtained thus leading to inconclusive evidence. \cite{Phillips1995, Thejeswar2015, Lin2017} India being a country with huge population of smokers has inadequate public health awareness. \cite{Garg2012} No study has been done in Indian population, there is a need to conduct this study to create a better awareness among the population to enumerate the various harmful effects of smoking. The aim of the study is to analyse the association between smoking and obstructive sleep apnea among adult and aged male population.

\section*{Materials and Methods}

\subsection*{Study setting and sampling}
This survey based study evaluated the responses of
participants who took part in the online based survey. This survey based study did not require any ethical approval as the participants of the survey were self willing. The study population included participants age ranging from 18-65, who were categorized based on their gender, type of smoking and their sleeping habits and pattern.

Data Collection

Our study is a survey based study among the Indian population. No ethical approval was required from the study due to the self volunteering of the participants. Sample size of this study was n=100. Pre tested questionnaire containing questions based on smoking, sleep patterns derived from Berlin’s & STOP BANG abbreviating to S-snoring, T-tiredness, O-Observation of snoring by others, P-pressure related medical history, B-body mass index greater than 35, A-age older than 50, N-neck size larger and G-gender questionnaire. (Thurtell, 2011; Teng et al., 2018). Questionnaire was circulated online among 100 participants above the age of 18 using Google Forms. The results were first imported to Excel then to SPSS software for further analysis.

Statistical analysis

Data was obtained using Google Forms (An online survey application) and was then exported to (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.) for further statistical analysis. With the obtained data frequency & descriptive tests were done.

RESULTS AND DISCUSSION

The present study population had male participation of 57%, and female participation of 43% [Figure 1]. 59% of the study population were not aware of obstructive sleep apnea, 75% of the participants declared that they are not addicted to smoking yet 25% are addicted, 96% of the participants population found the study to be useful. Majority of the participants were male 57% and female participation 43%.

It is evident that the smoking population is high in India. (Mini and Thankappan, 2016) From the results of the survey the gender distribution was 57% Male and 43% Female. [Figure 1] Out of which when asked about the type of smoking 31% were Active smokers, 12% Past smokers and 57% Passive smokers,
Figure 7: Majority of the participants (78%) have tried to avoid smoking followed by 22% who haven’t tried smoking. Females were found to be the most passively smoking population and the results were significant when chi square test was performed. [Figure 2] This shows that in the given population the percentage of passive smokers is almost double that of Active smokers in India. Using chi square analysis p=0.007 (p <0.05 considered statistically significant). (Priya and Lando, 2014) also did studies and found similar findings.

Figure 8: (72%) of the participants felt they slept better if they avoided smoking followed by 28% who did not feel better when they avoided smoking.

When the age of the participants were assessed it is evident that 86% of them belonged to the 18-29 Age group followed by 30-34 age group and 40-49 age group both of the latter were 6% [Table 1]. This represents the increased smoking habits in young adults this finding is similar to (N Breslau et al.) whose study were based on the perception of smoking in young adults. (Breslau and Peterson, 1996)

When asked about the addiction of smoking 75% responded that they are not addicted, it a positive finding. 18-29 the young adult age group had the
Table 1: Young adult population of age.

<table>
<thead>
<tr>
<th>Age range</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-29</td>
<td>88</td>
<td>88.0</td>
<td>88.0</td>
<td>88.0</td>
</tr>
<tr>
<td>30-39</td>
<td>6</td>
<td>6.0</td>
<td>6.0</td>
<td>94.0</td>
</tr>
<tr>
<td>40-49</td>
<td>4</td>
<td>4.0</td>
<td>4.0</td>
<td>98.0</td>
</tr>
<tr>
<td>50-59</td>
<td>2</td>
<td>2.0</td>
<td>2.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

The age is ranging from 18-28 were the most participated age group (88%) followed by 30-39 age group (6%), 40-49 age group (4%) and the least participated age group of aged population 50-59 (2%).

most addicted (69%) and as well as the the non addicted participants (19%) with respect to smoking, and this supports the findings of (M Reddy et al.), whose study assessed the willingness to quit smoking.[Figure 3] (Reddy, 2018). Using Chi square analysis p=0.007 (p <0.05 considered statistically significant).

When questioned regarding the awareness of obstructive sleep apnea, was asked, majority of the participants (59%) were not aware of any such term out of the 41% who were aware of obstructive sleep apnea, the young adult age group (18-29) had the highest proportion (37%).This denotes that the current overall population is not well aware of obstructive sleep apnea.[Figure 4] Using chi square analysis p=0.006 (p<0.05 considered statistically significant).

In a study conducted by (Sohan lal solanki et al.) it was found that there was deficit of knowledge regarding obstructive sleep apnea among Anaesthesiologists and expecting from a common population is less likely to occur: (Solanki et al., 2019)

Regarding the tiredness & fatigue after sleeping 23% of the study population felt tired almost everyday & 40% felt rarely or never. In the population who felt always tired could be due to the morphological changes brought up by the obstructive sleep apnea leading to difficulty in breathing thus affecting the oxygen supply.[Figure 5] (Krishna and Babu, 2016; Subashri and Thenmozhi, 2016; Nandhini et al., 2018). Figure 5, 19% who felt tired 3-4 times a week,10% of the participants felt tired 1-2 times a week and 8% of the participants felt tired 1-2 times a month.

27% of the participants accepted that they snore,60% responded negatively & 13% didn't know whether they snore or not. [Figure 6] 75% of the respondents have tried to avoid smoking and 72% of the participants felt they slept better if they avoided smoking. The reason could be the reduction of inflammation of the respiratory lining mucosa which changes the morphology of the airway thus enhancing the breathing of the individual.[Figures 7 and 8] (Seppan et al., 2018; Johnson, 2019; Sekar, 2019)

Comparing the previous 3 Figures ,It is depicted that the smokers sometimes feel fatigued after sleep and when avoiding smoking they felt better.This adds to study of (Vidyakrishnan et al.) where they studied about the association of smoking with sleep apnea & Sleep disturbance. (Krishnan et al., 2014)

When asked about the high blood pressure status and the Body Mass Index (greater than 33 kg/m²) 79%, 11% females had a history of blood pressure when compared to males (10%) was slightly higher [Figure 9], Using chi square analysis p=0.048 (p value <0.05 considered statistically significant) & 75% responded negatively with respect to BMI greater than 33.[Figure 10] Majority of the participants(75%) had BMI less than 34 Kg/m² followed by (25%) who had more than 34 Kg/m²BMI.

Overall,there has been many studies such as of (Kim et al.,Yaffe K et al.,) and many others where they associate smoking with narrowing of nasopharyngeal tube, association of BMI with the structural morphology,association of BMI with sleep apnea, Association of Blood pressure with sleep apnea. It is evident and coinciding with our study that smoking is no directly associated with obstructive sleep apnea. But could be an independent risk factor. (Yaffe, 2011; Kim, 2012)

Sleep apnea as mentioned above could cause various impairments of physiologic & cognitive systems. Hence proper public awareness is much needed.

Few studies such as (Wetter Dw et al.,Hoffsten V)contradicts to the fact and depicts smoking is not a risk factor; this could be due to their size of the population, and better control groups. (Wetter, 1994; Hoffstein, 2002)

The association of smoking and obstructive sleep apnea is inconclusice it may or may not be associated.The survey was found to be useful for 96% of the participants which denotes a positive feedback.
and awareness among the participants of the survey. [Figure 11]

Consensus
The evidence of the present study adds to the consensus and can be utilised for other confirmatory studies relating smoking and sleep apnea.

Limitations
Our study has few limitations such as smaller sample size, and the present study does not include all ethnic groups of the population and participant reported details are not always accurate.

Future scopes
Studies with larger population and well defined cohort study may be done.

CONCLUSIONS
The present survey study concludes that there may be an association between smoking and obstructive sleep apnea in the adult and aged population. Further public health awareness is to be implemented by the government and as well practitioners regarding smoking and is most required at this moment.

Conflict of Interest
The authors declare that they have no conflict of interest for this study.

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