A Study on the Cognitive Dysfunctions in Chronic Smokers

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Introduction

Around 2 billion people worldwide use tobacco products, mostly in the form of cigarettes, with tobacco smoking related diseases resulting in 4 million deaths per year.[1]

Tobacco abuse is responsible for fifty percent of all the malignancies in males and one-fourth of all malignancies in females in India. Tobacco use is also a risk factor for cardiovascular disorders and respiratory diseases. Tobacco chewing is partly responsible for the high rates of Oropharyngeal cancers in our country. Forms of tobacco chewing include pan (piper betel leaf filled with sliced areca nut, lime, catechu, and other spices chewed with or without tobacco) *pan masala* or *gutkha* (a chewable tobacco containing areca nut), and *gulmanjan* (finely powdered tobacco rubbed on the gums as tooth paste).

Types of Tobacco Smoking Products

a) Bidis
b) Cigarettes
c) Cigars, Cigarillos And Little Cigars
d) Hookah

Chemistry and Toxicology of Cigarette Smoke and Biomarkers of Exposure and Harm

Cigarette smoke contains more than 7000 chemicals, including at least 69 known carcinogens and many other toxicants implicated in major diseases, and because the potency of toxicants and mechanisms of action differ, reducing concentrations of individual toxicants might have only a negligible effect on disease risk from smoking.

Fowles and Dybing (2003) suggested an approach to identify the chemical components in tobacco smoke with the greatest potential for toxic effects. They considered the risk for cancer and cardiovascular disease. Using this approach the researchers found that 1,3-butadiene was associated with the most significant cancer risk. Acrolein and acetaldehyde were potential respiratory irritants; and cyanide, arsenic, and the cresols were the primary sources of cardiovascular risk.

Effects of Tobacco Smoke

Chronic smoking has been associated with abnormalities in brain morphology, neuroche-mistry, cerebral blood flow as well as neurocognition.

Smokers compared to nonsmokers had decreased anterior cingulate prefrontal and orbital frontal cortex gray matter volume and less gray matter density. Either gray matter volume or density was also decreased in the thalamus, cerebellum, and substantia nigra. Lifetime exposure to tobacco smoke correlated with decreased frontal, temporal, and cerebellar volumes. [2] It appears that chronic cigarette smoking has similar effects on human brain morphology and neurocognition as chronic alcohol use disorders. [3]

De Bry et al (2008) showed that initiation of cigarette use is associated with higher levels of nicotine dependence. The model proposes that the neurotoxic effects of tobacco are most pronounced when smoking begins during early adolescence, a period of major neurodevelopment sub serving inhibitory control.[4]

Sabia et al. (2012) conducted a study to examine the association between smoking history and cognitive decline in the transition from midlife to old age. Study was conducted on 44 to 69 years of age and showed that in comparison to non smokers, middle aged male smokers experienced faster cognitive decline in global cognition and executive function.[5]

Wagner et al. (2012) examined neurocognitive function associated with chronic nicotine use. A total of 2163 healthy participants participated in a population based case control design. The main outcome measures were six cognitive domain factors derived from a neuropsychological test battery. Results demonstrated small but significant deficits in smokers for visual attention (P <0.0001) and cognitive impulsivity (P<0.0006), while verbal episodic memory, verbal fluency, verbal working memory and Stroop interference did not differ between groups. In conclusion, this study confirmed subtle and specific cognitive deficits in non deprived smokers.[6]

Aims and Objectives
1. To study the cognitive dysfunctions in chronic smokers
2. To compare the cognitive dysfunctions in chronic smokers with cognitive functions in those who have never smoked.

Methodology
The present study entitled "A Study On The Cognitive Dysfunctions in Chronic Smokers" was conducted at Department of Psychiatry, Index Medical College, Hospital & Research Centre, Indore (M.P.)

Relatives of the patients attending the psychiatry outpatient department constituted the study population, among which 40 subjects who met the operational definition of chronic smokers were taken as cases and 40 subjects who have never smoked as controls. The study was conducted from April 2016 to September 2016.

Socio – Demographic profile of study sample

	Study Sample Data
Total Number	80
Sex Male Female	 60 20
Age groups 31-40 41-50 51-60	 38 27 15
Married Unmarried	57 13

Inclusion Criteria
1. Heavy cigarette smokers- who smoke more than twenty cigarettes per day for at least 5 consecutive years
2. Persons with age between 30-60 years
3. Persons who were Graduate and able to read and understand English
4. Persons who consented for the study

Exclusion Criteria
1. Persons who smokes substances other than cigarette/hookah
2. Persons with any chronic medical co-morbidities
3. Persons with previously diagnosed psychiatric disorders

4. Persons suffering from neuro degenerative diseases and with family history of neuro degenerative diseases in first degree relatives.

Relatives of the patients who have never smoked and who met all other inclusion and exclusion criteria constituted the control group of the study. A written informed consent was obtained from all subjects and the questionnaires were explained to them in their vernacular language.

Procedure

The study was approvd by the ethical committee of the institution.

The socio demographic and clinical variables were recorded in specific proforma prepared for this clinical study. All the subjects and controls underwent a thorough clinical examination to rule out psychopathology and medical disorders if any. Assessment of Nicotine dependence was done as per Fagerstrom scale score. The cognitive functions of the subjects in the clinical sample, and relatives in the control group were assessed using the following instruments.

a) Standardized mini mental status examination (SMMSE)
b) Trail making test B(TMT-B)
c) Digit symbol substitution test (DSST)

Statistical Analysis

a) p Value

Results

The sample of the study comprised of 40 subjects of chronic smokers and 40 age matched relatives of the patients.

On dividing the patients according to age group, maximum subjects were in 30-40 years age group that is 38 (47.5%), major part of both cases and control group, followed by subjects in the age group of 41-50 years 27 (33.75%), and remaining 15 (18.75%) subjects in 51-60 years age group. Out of 80 subjects 60 (75%) were males and rest 20 (25%) were females. On comparing the religions of subjects, 65 (81.25%) belonged to

Hindu religion while 15(18.75%) were Muslims. Out of 80 subjects 57 (71.7%) were married in both. Cases had 40 subjects who were married and 17 were married in the control group. 19 (24%) subjects were unmarried. Remaining four were widowers. 60 (75%) were living in a nuclear family while 20 (25%) had a joint family.

Types of products smoked were compared amongst the cases. It was found that 15 (37.5%) smoked cigarettes, 10 (25%) smoked *bidis*, 8 (20%) smoked both *bidis* and cigarettes and 7 (17.5%) smoked other tobacco preparations like hookah etc. 20 cases (50%) have been smoking for more than 10 years, 10 cases (25%) have been smoking for 5-10 years and the remaining 10 cases (25%) have been smoking for 1-5 years.

On applying Fagerstrom scale on the smokers, 28 cases (70%) were found to have high dependence and 12 cases (30 %) were found to have moderate dependence.

On applying the Standardized Mini Mental Status Examination (SMMSE) no significant difference between cases and control on total score was found. (p=.060>0.05). The mean score attained by the cases was 27.7 and by the control group was 28.37. Score below 24 indicates cognitive deficit.

Significant difference found between cases and control group in time taken to complete Trail Making Test B (p=0.014<0.05) with mean time being 380.67 seconds

There is a significant difference between the two groups in time taken to complete the Digit Symbol Substitution Test (p=0.026<0.05)

Discussion

Tobacco smoking is a major public health problem. With advancing age chronic smoking is related to abnormal decline in reasoning, memory and global cognitive function. This study is an observational, cross sectional, case control study comparing cognitive functions of chronic smokers and non smoker relatives of the patients in psychiatry outpatient department.

Majority of samples are Hindu married males. Study shows statistical significance in the

domains of attention, concentration and recall where as the total SMMSE does not show cognitive impairment. SMMSE is less than ideal in evaluation of mild cognitive impairment and is biased towards verbal items and does not adequately measure other cognitive functions like ability to attend to relevant input, ability to solve abstract problems, psychomotor speed and visuospatial ability.[7]

Statistically significant difference was found on TMT-B and DSST between the cases and controls indicating cognitive impairment in Chronic Smokers. TMT-B is more sensitive to cognitive dysfunctions than SMMSE hence its use helps to detect subtle cognitive decline.[8] DSST is a time test of attention, psychomotor performance and perceptual organization. Earlier studies have utilized this test on a frequent basis.[9]

Limitation of the Study

Population of the study is a selected one which does not represent the general population. The size of the sample is small. The study carried out is a cross sectional, observational case control study. The subjects were assessed on one occasion only. The assessment is not blind due to study constraint therefore rater bias is possible. Despite its limitations, the present study confirms significant cognitive impairment in chronic smokers without brain damage and dysfunction.

Conclusion

We conclude that in adult patients with chronic smoking there is a significant cognitive impairment.

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