A Comparative Study on the Influence of Cannabis Abuse on Memory Among Adolescents in Urban Bangalore

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ABSTRACT Cannabis, heroin, and Indian-produced pharmaceutical drugs are the most frequently abused drugs in India. In a comparative study of thirty - six adolescents, there were two groups were formed: abused/dependent group and normal group. Researchers compared cognitive performances using PGI Memory Scale, ten memory variables were measured. As a result of statistical analysis, Cannabis users were seen to perform significantly lower than non-users on eight variables. Cognitive deficits in cannabis users were found in remote memory, mental balances, attention and concentration, immediate, verbal retention for similar and dissimilar pairs, visual retention, recognition and overall dysfunctional rating. The results indicate the adverse effects of cannabis on the developing brain and reinforce concerns regarding the impact of early exposure.

INTRODUCTION

Substance abuse refers to the use of psychoactive substances, including alcohol and other illicit drugs in a harmful or hazardous manner. The NCPCR survey findings indicate the prevalence of a particular phenomenon in a purposive sample of child substance users and do not represent prevalence of a phenomenon in the entire child population. The survey covered around 4,000 substance-using children between 5-18 years across 26 states/3UTs. Nearly 69.8% respondents were from urban areas; 28% were currently studying in a regular school, 12.9% pursuing education through open school and rest were not studying. Girls comprised 4.2% of sample. (Dr Anju Dhawan, professor, National Drug Dependence Treatment Centre, AIIMS and principal investigator of the survey). The study was called 'Assessment of Pattern, Profile and Correlate of Substance Use among Children in India', commissioned by the National Commission for Protection of Child Rights (NCPCR) and conducted in 27 states by the National Drugs Dependent Treatment Centre of the All Institute of Medical Sciences (AIIMS).

The major finding of these studies is that alcohol was the common substance used (60-98%) followed by cannabis (4-20%). Alcohol was seen to be the most common substance used in rural population of Uttar Pradesh (82.5%) followed by cannabis (16.1%). Varma et.al. found that rates of current use of alcohol in Punjab were 45.9% in Jalandhar and 27.7% in Chandigarh whereas it was 28.1% in rural areas of Punjab. Shukla reported that 38.3% of the rural population in Uttar Pradesh was habitual substance users. In a study conducted in rural marijuana, is used as a community in Bihar prevalence of alcohol/drug use was found to be 28.8% of the study population.

Drug addiction is a psychological disorder that is chronic and causes compulsive drug seeking and use, in spite of the harmful consequences to the drug addict and others around them. Drug addiction is also considered a brain disease because the structure and functioning of the brain may be affected due to drug abuse. Cannabis, commonly known as psychoactive drug. Pharmacologically, the principal psychoactive constituent of cannabis is tetrahydrocannabinol (THC). The general idea supported by many studies is that using cannabis on a long term basis, causes cognitive decline. Majority of studies have suggested that cannabis users show more cognitive decline as compared to non-users of cannabis. Chronic abuse of cannabis leads to long lasting effects on oculomotor functioning notes some of the recent studies.

REVIEW OF LITERATURE

Squeglia et.al (2009) researched on adolescence which is a unique period in neurodevelopment. Thatcher et.al (2014) wrote on high risk individuals prior to substance use disorder (SUD) development regarding neurobiological characteristics. Hadland et.al (2015) studied and published on the rapidly evolving marijuana policy in the United States and other countries. Menard et.al (2015) and Siegel et.al (2014) published a study on strain theory perspective, which observes that adolescents exposed to violence are associated with both adolescent and adult illicit drug use. Hendershot et.al (2010) wrote a study on the increased rates of sexual risk behaviour and sexual transmitted diseases as a result of an association with marijuana. Kristjansson et.al (2012) examined the outcome expectancy, a central construct in models of addiction and relapse. Kong et.al (2013) researched on menthol cigarette and marijuana use among adolescents. Little et.al (2006) examined the changes in the adolescent deviance proneness and marijuana use association. Schweinsburg et.al (2008) studied that adolescents have a higher vulnerability to the neural influence of marijuana and the effects on neurocognitive functions as compared to adults.

Ammerman et.al (2014) wrote a paper on current epidemiology of marijuana, side effects of marijuana use, and effects of use on adolescent brain development. Kumar et.al (2013) studied the worldwide public health crisis that substance abuse and dependence has become. Trivedi et.al

(2013) examined the white matter integrity and cognitive performance in normal aging individuals. Wig et.al (2004) published their findings on long term heavy cannabis users. Cuzen et.al (2015) studied and published that abusing Methamphetamine affects brain structure and function. Sorg et.al (2012) studied on the craving and relapse of drug addiction. Shrivastava et.al (2011) review considers the short term and long term effects of cannabis on cognitive functioning. Weiland et.al (2015) recently researched on marijuana use and its association with volumetric and shape differences in subcortical structures, in a dose-dependent fashion. Pershad et.al (1980) studied the reemphasis of education which is a neglected variable that affects psychological test score.

METHODOLOGY

The sample consisted of two groups, the drug abuse/dependence group and normal group.

Based on the initial screening 18 adolescents were qualified and were included in the drug abuse/dependence group (12 males and 6 females). The normal group consisted of 18 normal/healthy adolescents (2 males and 16 females).

The tools used were:
1) The Adolescent Drug Involvement Scale (ADIS) was developed as a research and evaluation tool to measure level of drug involvement in adolescents. The higher the total score, the more serious the level of drug involvement
2) PGIMS is a neuropsychological test with 10 subtests which measures short term, intermediate and long term memories. Maximum Dysfunction Rating Score for each subtest is 3 and there are 10 subtests, so total Dysfunction Rating Score on PGIMS would be 3 x 10 = 30.

Independent sample t test was used to study the significant differences between the 2 groups.

RESULT AND DISCUSSION

Table1: Bar chart showing percentage of patterns of drug abuse in abuse/dependent adolescents
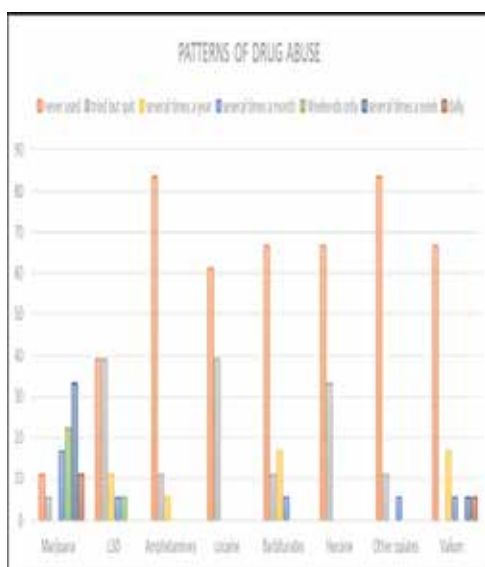
The above table shows the percentage of usage of different drugs by the abuse/dependent group. Analyzing the table, it can be understood that marijuana/cannabis is the

most abused by adolescents in the group and is frequently used several times a week. Apart from amphetamines, cocaine and heroin, other drugs were abused several times a month. Other than valium/other tranquilizers, all other drugs were tried and quit. This indicates the curiosity and experimentation in adolescence period.

Table 2: Tables showing t – values on memory variables

Memory Variable	Group	N	Mean	S.D.	't value'
Remote Memory Dysfunction	Abused/Dependence	18	0.67	0.97	2.92**
	Normal	18	0	0	
Recent Memory Dysfunction	Abused/Dependence	18	0.38	0.91	1.8
	Normal	18	0	0	
Mental Balance Dysfunction	Abused/Dependence	18	1.44	1.58	3.07**
	Normal	18	0.27	0.82	
Attention and Concentration Dysfunction	Abused/Dependence	18	1.38	1.33	4.41**
	Normal	18	0	0	
Delayed Recall Dysfunction	Abused/Dependence	18	0.66	1.28	1.72
	Normal	18	0.11	0.47	
Immediate Recall Dysfunction	Abused/Dependence	18	1.77	1.35	3.60**
	Normal	18	0.38	91	
Similar Pair Dysfunction	Abused/Dependence	18	0.11	0.47	0.04
	Normal	18	0	0	
Dissimilar Pair Dysfunction	Abused/Dependence	18	1.38	1.46	3.09**
	Normal	18	0.22	0.64	
Visual Retention Dysfunction	Abused/Dependence	18	0.44	0.84	2.20*
	Normal	18	0	0	
Recognition Dysfunction	Abused/Dependence	18	1.55	1.46	4.50**
	Normal	18	0	0	
Overall Dysfunction Rating	Abused/Dependence	18	9.83	5.17	7.06**
	Normal	18	1	1.18	

According to Table 2, significant differences were found between the two groups when it comes to Remote memory Dysfunction, Mental Balance Dysfunction, Attention & Concentration Dysfunction, Immediate Recall Dysfunction, Dissimilar Pairs Dysfunction, Visual Retention Dysfunction, and Recognition Dysfunction. The t- values were significant at 0.01 level. Apart from these variables visual retention dysfunction was found to be significant at 0.05 level.

A study by Rodgers et.al. (2003) reported that cannabis was associated with reports of 'here-and-now' cognitive problems in short-term and internally cued prospective memory. The abused/dependence group had significantly impaired abilities to perform simple tasks. The cannabis experience in the long run allows the body a respite from the tensions of imbalance, while exposing the confusions of the mind. So drug dependent adolescents tend to lose flexibility and become out of focus which can mainly affect scholastic performance. Prose recall has been found to be the best predictor of everyday memory performance and so findings are relevant to drug users' daily functioning. Significantly more number of short story intrusions and omissions occurred in abuse/dependence group. This again suggests the abuse group having difficulties in attention and concentration and so having trouble in verbal recall. The adolescent cannabis users learned fewer words across the three learning trials, recalled significantly fewer words in total over the three trials and after interference and a delay, forgot more words after interference and delay, and recognized fewer words than normals. Memory and learning impairments are among the most often reported behavioral effects of cannabinoids which are the ac-

tive ingredients of marijuana. Studies indicate that cannabis does have detrimental effects on hippocampus and so cannabis influence can lead to deterioration in visual retention. When intoxicated with marijuana, it leads to "high" or euphoria .The senses become heightened and lead to enhanced visual recognition. As the effect wears off, the senses lose the capacity to perform and therefore it becomes dependent on the drug. There was a significant difference in the scores of overall dysfunctional rating for abused/dependence group where t-value is significant at 0.01 level.

CONCLUSION

Drug abuse is one of the most common types of abuse that can be seen among adolescents. Adolescents at this age have a lot of developments and peer pressure plays an important role in their everyday activities. This often leads to use of drugs, alcohol and other illegal substances, in order to 'fit in' with the group. Cognitive functions develop very quickly at this age and drugs affect these functions, mainly memory. From this study, it has been proved that cannabis, one of the most commonly used drugs, affects the memory. Short-term memory is the main focus of this study. Certain major fields like attention and concentration, recognition and other such fields are influenced by drug abuse have been proved.

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