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Original Research Article

Evaluating substance use in an urbanizing town of mid hills of Northern India

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ABSTRACT

Background: Substance use is emerging as a major cause of morbidity and mortality across the world. Solan, a fast urbanizing town of India has witnessed mushrooming of industries and educational institutes. A surge in the persons booked under the Narcotic Drug and Psychoactive Substance Act 1985 led us to look into the determinants of the substance use in this region.
Methods: We undertook a cross sectional study of one year secondary data analysis of 750 substance users screened at the de-addiction centre of Solan Hospital. The data mining was done by the cluster analysis technique. SPSS 16 and STATA 13 software were employed.
Results: Mean age of users was 31 years with dominance of males (89.20 %), two third of total users were married, 75% were unemployed, 42% had upper school level education. About 60 and 38% were using cannabis and chitta (a synthetic opioid) respectively. Only 2% were consuming tobacco and alcohol. 62% of substance users had the fear of legal action and 44% had no family history of substance use. 39% had only single parent, 54% had started substance use under peer pressure and duration of use varied between 6 to 24 months. Alcohol and cannabis were used more in urban and rural areas respectively. 63 and 70% had family history and experience of peer pressure respectively.
Conclusions: Cluster analysis has generated substance specific socio-demographic determinants of substance use which would help in planning appropriate substance use alleviation strategies.

Keywords: Cannabis, Chitta, Cluster analysis, De-addiction, Secondary data, Substance use

INTRODUCTION

Globally smoking, alcohol and illicit drug use kills 11.8 million people each year which is more than the number of deaths from all cancers.[1] Health target 3.5 of Sustainable Development Goals 2030 aims at monitoring the progress in advancing treatment coverage for substance use disorders. 1.5% of global disease burden is attributed to alcohol and illicit drug addiction. The substance abuse i.e. the harmful and hazardous use of psychoactive substances including alcohol and illicit drugs is emerging as a big public health challenge worldwide. Therefore, policies have been put in place which influence the levels and patterns of substance use and related harm and can significantly reduce the public health problem attributable to substance use. Substance use especially in the adolescent age group/young people is often associated with experimental substance use in the initial point of time and this is further determined by many individual personality traits such as impulsivity, sensation seeking, genetic variations like single nucleotide polymorphisms in the fatty acid amide hydrolase (FAAH) gene.[2-4] Certain variables like age at inception of regular substance use, the type of substance of dependence, depression, both state and trait anxiety

affect suicidal tendency, borderline personality behaviour, anger, hostility and aggression. There may exists a relation of educational, employment and marital status with the substance abuse.[5] Characteristics such as negative affect, impulsivity and childhood trauma determine the risk of dissociation and behaviors' such as suicide attempt or self-mutilation.[6] Traits such as impulsivity act as a temperamental vulnerability factor for substance abuse.[7] Impulsivity and sensation seeking personality traits highly determine the substance abuse especially in the age group attending the universities or colleges.[8]

In India 14.6% of population (between 10 and 75 years of age) uses alcohol whereas use of any form of cannabis was 2.8% in the population and 2.1% of the country's population used opioids.[9] In Himachal Pradesh, a small state in North Western Himalayas in India the total violent crime rate of 25.6%, 18.5% crime rate registered under the Narcotic Drugs and Psychotropic Substance (NDPS) Act 1985 of the country, 5.7% for the possession of drugs for personal use and consumption, 12.8% for possession of drugs for trafficking and 54% crime rate for liquor and drugs related acts present an alarming picture.[10] Moreover, this assumes more weight in the context of the state population being only 0.57% of the whole country and with a high literacy rate of 83.78%. Solan is one of the fastest growing districts of the state of Himachal Pradesh with mushrooming of industries and educational institutes in the region.[11] Various challenges associated with migratory population dynamics surface in this district. One of them in the recent past has been the growing menace of substance use and drug trafficking. The police recorded a large number of cases booked under the NDPS Act 1985. This led us to undertake the present study with the objectives of assessing the pattern and the determinants of substance use in Solan district, so as to plan interventions for its alleviation from the region.

METHODS

Design and study participants

It was a retrospective hospital record based descriptive epidemiological study of 750 substance users who had been screened at the District Level De-addiction center of district Hospital of Solan. Situational analysis of the secondary data of the screening conducted in the year 2019 was undertaken.

Statistical analysis

The statistical tools such as SPSS 16.0 and STATA 13.0 were used for analyses of the results. Descriptive epidemiology was employed enumerating the demographic attributes (age, sex, socio-economic status, marital status, education, locality, single parent and occupation) and social determinants related to drug addiction (Number of drug consumption, number of relapse, fear of legal action, family history, peer pressure, duration of substance use and single substance use) using the frequencies, mean, standard deviation and the range. Chi-square test was used to test the significance of measure of association between the substance use and other attributes.

The secondary data was analyzed with Cluster analysis technique. Cluster analysis aims at the detection of natural partitioning of sample. In other words, it group observations that are similar into homogenous subsets. These subclasses may reveal patterns related to the phenomenon under study. A distance function is used to assess if the similarity between the sample respondents and a wide variety of clustering algorithms based on different concepts is available. Similarity measures are first computed between observations, and between clusters once observations begin to be grouped into clusters. Several metrics, such as Euclidean distance, correlation, or mutual information was used to compute similarity in the present study.

Hierarchical cluster analysis (HCA) was used to identify the number of cluster by hierarchical configuration-a tree called a dendrogram. After identification, K-means algorithm (or K-medoids, depending on the statistic applied) was applied for clustering which is an iterative method that starts with k cluster centers chosen by HCA. All observations were then associated to the closest cluster center and new centers were computed as the mean of the observations of a given cluster. The observations were grouped with respect to the new centers iteratively until convergence; that is, no difference occurred in the next iteration. The Chi-square test was also used to test the significance of measure of association between clusters and other attributes. p value of less than 0.05 was assumed to be significant.

RESULTS

Table 1 provides the demographic features of the drug addicts (n=750). The mean age of the drug addicts was 31 years with the range of 13 to 62 years. Males dominated the substance user's population with 89.20 per cent and the two third of total users were married. More than 65 per cent of the respondents belonged to upper middle and lower middle class and around 63 per cent of the drug addicts were residing in the urban areas. 75 per cent of the substance users were unemployed and semi-skilled and about 42 per cent had studied between high and senior secondary school education.

The substance use determinants such as type of substance use, less than 3 types of substance use, number of relapse, fear of legal action, family history, single parent, peer pressure and the duration of substance use have been illustrated in table 2. The table inferred that about 60 per cent of the substance users had the addition of cannabis and about 38 per cent had it for chitta (a synthetic opioid of recent emergence). Only 2 per cent of the substance users were consuming tobacco and alcohol. It was also

found that around 54 per cent of the users were consuming less than 3 types of substance. It was observed that more than two episodes of relapse had been experienced by more than 80 per cent of substance users. About 62 per cent of the users had the fear of legal action. Around 44 per cent of drug addicts had no family history of the substance use. It was also evinced that 39 per cent of respondents had only single parent and about 54 per cent had started substance use under peer pressure. Duration of substance use of about 60 per cent of drug addicts varied between 6 to 24 months.

Table 1: Demographic features of drug addicts (n=750).

Parameters	Mean (SD)	Range
Age	31 (9)	13-62
Gender frequency percent		
Female	81	10.80
Male	669	89.20
Marital status		
Single	236	31.47
Married	495	66.00
Divorced	19	2.53
Socio economic status		
Upper	64	8.53
Upper middle	191	25.47
Lower middle	305	40.67
Upper lower	164	21.87
Lower	26	3.47
Locality		
Urban	470	62.67
Rural	280	37.33
Occupation		
Student	96	12.8
Unemployed	351	46.8
Semi-skilled	223	29.73
Skilled	67	8.93
Home-maker	13	1.73
Educational status		
Illiterate	25	3.33
Under matric	262	34.93
10-12th	317	42.27
Graduate and post graduate	146	19.47

Table 3A and 3B infer the substance use wise detail of demographic features and the substance use characteristics (n=750). The table illustrated that age range of the all the substance users was very wide and maximum female respondents were consuming alcohol (100%) followed by chitta (17%) which varied significantly. Statistically significant 27 per cent of chitta and 35 per cent of cannabis users were single and there was also dominance of the lower middle class in all the substance use categories except for alcohol. Most of the substance users were residing in the urban area ($p<0.001$). However, statistically significant 48 per cent of cannabis users were from rural background. 28 to 50 percent of the substance users of all types were the semi-skilled persons and more than half of cannabis users were unemployed ($p<0.001$). Educational profile wise observations inferred statistically significant 28 per cent of chitta users being the graduates of various study streams.

Table 2: Description of the pattern and the determinants of substance use in Solan (2019).

Characteristic	Frequency	Percent
Substance use		
Chitta	288	38.40
Cannabis	450	60
Tobacco	10	1.33
Alcohol	2	0.27
Less than 3 type of substance use		
Yes	403	53.73
No	347	46.27
Number of relapse		
1	148	19.73
2	302	40.27
3	279	37.2
4	21	2.80
Fear of legal action		
Yes	461	61.47
No	289	38.53
Family history		
Yes	424	56.53
No	326	43.47
Single parent		
Yes	291	38.80
No	459	61.20
Peer pressure		
Yes	407	54.27
No	343	45.73
Duration of substance use		
< 6 months	93	12.40
6 to 12 months	237	31.60
1 to 2 years	219	29.20
2 to 5 years	146	19.47
>5 years	55	7.33

These substance users were not restricted to one or two substance use as it was clear from the table that only half of the population of chitta and cannabis addicts were consuming less than three substances which was significantly different from other as $p<0.01$. It was also observed that more than 50 per cent of respondents from all substance use had experienced more than one relapse and the cannabis users (about 89%) had experienced the maximum relapses significantly. Seventy four per cent of the chitta addicts significantly had the fear of legal action and around 63 per cent had family history of substance use also ($p<0.05$). Half of the respondent of tobacco and alcohol only had a single parent and 70 per cent of

tobacco addicts had experienced the peer pressure too. A significant proportion of substance users (36 and 100 per cent of chitta and alcohol respectively) had abused these substances for 6 to 12 months and another 29 per cent of cannabis and 50 per cent of tobacco users had abused them for about 1 to 2 years ($p<0.1$).

Table 3A: Substance use wise description of demographic features of the users.

Substance use (number of respondents)	Mean age (range)	Female (%)	Marital status	Socio-economic status	Locality	Occupation	% graduate and above
Chitta (288)	32 (14-56)	17	27 % single	Lower middle 37%, upper middle 35%	79% urban	39% unemployed, 33% semi-skilled	28
Cannabis (450)	31 (13-62)	5	35 % single	Lower middle 43%	52% urban 48% rural	52% unemployed, 28% semi-skilled	14
Tobbacco (10)	36 (21-61)	70	80 % married	Lower middle 60%, upper middle 40%	90% urban	30% unemployed, 30% semi-skilled	20
Alcohol (2)	46 (32-60)	100	100 % married	Upper middle 100%	100% urban	50% semi-skilled, 50% skilled	Nil
Chi-square (p value)		77.15 (0.000)	8.32 (0.216)	66.96 (0.000)	60.25 (0.000)	47.45 (0.000)	74.16 (0.000)

Table 3B: Substance use wise description of demographic features of the users.

Substance use (number of respondents)	Proportionate population consuming less than 3 substance use	% population experiencing more than one relapse	% population having fear of legal action	% population having family history	% population only have single parent	% population only having experienced any peer pressure	Proportionate population and Duration of substance use
Chitta (288)	½	67.71	74	63	39	52	36%: 6-12 months
Cannabis (450)	½	88.67	53	54	39	56	29 %: 1-2 year
Tobacco (10)	1/10	70	60	40	50	70	50 %: 1-2 year
Alcohol (2)	Nil	50	50	Nil	50	Nil	100%: 6-12 months
Chi-square	12.89 (0.005)*	89.34 (0.000)	32.73 (0.000)	11.35 (0.01)	0.64 (0.886)	4.22 (0.238)	20.09 (0.06)

*Figures in parentheses indicates p values.

Table 4A and 4B depicted the description of cluster membership using Ward's algorithms. Of the 4 clusters, several described groups of patients with substance use such as cannabis, chitta, alcohol and tobacco. Results revealed that cluster I and II was dominated by young population as compared to other with higher percentage of male and female respectively. In respect of marital status, cluster I, III and IV comprised of substance users who were married and cluster II had significant number of unmarried persons. It was also evinced that mostly married population was found in all the clusters with more than 80 per cent except for cluster II which was dominated by singles with 69 per cent of the population. Lower middle class was found dominated in all clusters except for cluster IV. Cluster membership was also significantly influenced by locality ($p<0.05$) and occupation ($p<0.01$) of the population. In cluster III and IV, less than 30 per cent of the users lived in the urban areas. Main occupation of the users also varied among different clusters with highest 47 per cent of student population in cluster II. Education status indicated that more than 24 per cent of the graduates were found in cluster II and III. More than 50 per cent of the population of cluster I, III and IV were consuming more than 3 substances.

Table 4A: Description of subgroups of patients through cluster analysis using Ward's Minimum variance method.

Cluster	Number of patients	Mean age (Range)	Proportionate male (M) and female (F) between clusters	Dominance of marital status with-in cluster	Socio-economic status with-in cluster	% urban population with-in cluster
I	311	31 (27,35)	42.45M, 33.33F	80% married	Lower middle (40%) and upper lower (25%)	40%
II	246	22 (13, 26)	32.59M, 34.57F	69% single	Lower middle (41%) and upper middle (26%)	40%
III	40	53 (47, 62)	5.08M, 7.41F	90% married	Lower middle (48%) and upper middle (23%)	28%
IV	153	40 (36, 46)	19.88M, 24.69F	88% married and most divorced	Upper middle (25%) and lower middle (20%)	29%
Chi-square (*p* value)			3.09 (0.378)	268.25 (0.000)	8.93 (0.709)	9.5 (0.034)

Table 4B: Description of subgroups of patients through cluster analysis using Ward's Minimum variance method.

Cluster	Occupation between cluster	% graduate and above	Proportionate population consume less than 3 substance use	% population more than one relapse	% population only have single parent	Substance use
I	44 % Semi-skilled	17%	½	81	40	63 % Cannabis
II	47 % Students	24%	3/5	85	37	64 % Cannabis
III	10% Skilled	28%	2/5	73	55	50 % Chitta
IV	46 % Home makers	16%	½	74	34	52 % Cannabis and 46 % Chitta
Chi-square	28.69 (0.004)*	13.48 (0.142)	4.57 (0.206)	17.47 (0.004)	6.37 (0.095)	18.67 (0.028)

**Figure under parentheses indicates p values*

Number of relapse was one the key characteristics of the cluster membership which indicated that more than 80 per cent of the users had experienced more than one relapse in their lifetime. In the cluster III, more than 50 per cent of the users were having a single parent. Among different clusters, consumption of the substance use was also found significant ($p<0.05$) with maximum 50 per cent of chitta users in the cluster III. Cannabis use was dominant in the cluster I and II with 63 and 64 per cent, respectively. In cluster IV, both cannabis and chitta were being consumed by 52 and 46 per cent of the users, respectively.

DISCUSSION

The present study inferred the young age, primarily the males and those who were unemployed were the ones abusing one or the other type of substance. Abuse of cannabis and chitta was observed more in the substance users as compared to the consumption of tobacco and alcohol. The youth getting involved in these practices and high cost of opioids is an area of concern in Indian context as the young population forms the major chunk of total population and that the poverty is already prevalent in the country. The present study also evinced that in the context of alcohol usage, all the females were consuming it. Again keeping in view the prevalent poor reproductive and child health status in India, the women folk getting into alcohol abuse is alarming. Similar high usage of alcohol has also been documented in studies by Erol et al and Hoggatt et al.[12,13]

Cannabis and chitta was being used more by unmarried persons and those belonging to lower middle class. Bhat et al. also has reported the higher abuse of the opioids in the unmarried persons and persons belonging to lower socio economic strata.[14] Similar findings have been reported by Warrington et al.[15] Strangely chitha was also being abused by persons who were well educated. Bonyani et al. also documented in their study the higher

use of opioids amongst the persons who were highly educated.[16]

Abusers of alcohol were predominantly residing in urban areas whereas the cannabis was being consumed more in rural areas. The rural economy is a major contributor in India's development. But with the growing menace of cannabis, it may gradually be getting weaker. Williams et al.[17] also reported the higher use of such substance in the rural background. The present study had inferred that almost half of the substance users were having no family history of substance use and had the fear of legal consequences of this malpractice but still were abusing more than 3 types of substance at a time. Single parenting and peer pressure also determined the substance use. Majority of the substance users had experience for than two relapses in their lifetime. Similar social determinants of health affecting substance use has been studied by Bessie et al, Siddike et al.[18,19] The cluster analysis employed in the present study has elaborated the substance specific social determinants leading to its misuse. This can in future provide us the pinpoint approach for planning interventions for taking care of these determinants.

CONCLUSION

Cluster analysis is data mining technique which was used to identify discrete group of substance users with specific combinations of type of substance being used. These clusters help to develop the specific strategy for each cluster by de-addiction centres aiming at improving health of the drug users.

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