ORGINAL ARTICLE

A STUDY OF THE RELATIONSHIP OF EPILEPSY WITH PSYCHOACTIVE SUBSTANCE DEPENDENCE IN A PRISON POPULATION

Pankaj Sureka*, Sandeep Govil**, Naveen Kumar Girdhar, Mukesh Kumar**, Vikas Singhal*****

***Department of Mental Health and Behavioural Sciences, MAX Healthcare and Super Speciality Hospital, Saket, New Delhi, India Pincode 110064; **Department of Psychiatry, Central Jail Hospital, Tihar, New Delhi, India Pincode 110064; ***Central Jail Hospital, Tihar, New Delhi, India, Pincode 110064.**

Abstract

Objective: **This study aimed to determine the prevalence of epilepsy in prisoners suffering from substance dependence and the relationship between onset of epilepsy and substance dependence in a prison population.** ***Methods:*** **The present cross-sectional study in a prison population was conducted in Central Jail (CJ), New Delhi, India over a period of 3 months. The convenience sample consisted of 900 subjects. The study group consisted of 450 prisoners taken from the de-addiction ward and the rest were placed in the control group. Physical examination and Mini Mental State Examination (MMSE) of subjects were done to make necessary exclusion. Assessment tools were applied in the order starting from MMSE, Basic Socio-demographic Performa, Present State Examination (PSE), and Addiction Severity Index (ASI).** ***Results:*** **The average ages of study and control subjects were 34.5 $\pm$ 2.3 years (mean $\pm$ standard deviation) and 35.6 $\pm$ 3.6 years respectively. Prevalence of epilepsy among substance using prisoners was 1.4 times higher than in non-substance using prisoners. Alcohol, opioid, and cannabis, either alone or in various combinations, were the most commonly used substances. Subjects suffering from epilepsy were likely to have higher chances of consuming three or more substances than those without problem of epilepsy. Study subjects suffering from epilepsy compared with those without epilepsy performed worse in all parameters. This is indicative of higher severity of psychoactive substance dependence.** ***Conclusion:*** **Findings of high prevalence rate of epilepsy and co-morbid substance dependence highlight the need for better screening among epileptic subjects for substance abuse at entry into prison for effective treatment while in custody, and at follow-up on release. Specialist addiction services for prisoners have a considerable impact in a well-planned intervention programme for prisoners with substance use and co-morbid epilepsy.** ***ASEAN Journal of Psychiatry, Vol. 15 (2): July – December 2014: 153-163.***

Keywords: Epilepsy, Substance Use, Prisoners

Introduction

Substance abuse is a pervasive problem that is taking an increasing toll on the world's population. Furthermore, a complex relationship between substance misuse and commitment of offence has been demonstrated in a variety of criminal justice and medical settings. Compared to normal population, in prisoners, there is a six-fold variation in

reported alcohol problems, and a two- to threefold variation in the prevalence of substance dependence [1]. In the case of female prisoners the difference with the general population is even more marked—female prisoners, have a two- to four-fold excess of alcohol dependence and at least a thirteen-fold increase in drug dependence [2].

In various studies, lifetime prevalence of substance use/dependence among inmates varied from 23 to 79% [3–6]. Problem of substance use/dependence is especially important because according to Sailas ES et al., an alarmingly high mortality rate in the population of young offenders is associated with substance abuse and psychiatric disorders [7].

Various estimates of prevalence for alcohol abuse and dependence ranged from 11.5- 30% in male prisoners [5] to 10-24% in female prisoners. While prevalence estimates of drug abuse and dependence varied from 10-50% in male prisoners [4-5,8] to 30-60% in female prisoners [1]. Among these substances in men, 42% had intravenous drug dependence [3] and 34% had cannabis use [8]. In women, prisoners cannabis was the most commonly used illicit drug, with 32% women reporting use at least once a week; 23% were identified as other drug dependent, opiate being the second most common drug [9].

There is a long history of criminological interest in epilepsy dating back to Cesare Lombroso. The idea that there is a relationship between some forms of epilepsy and some forms of aggressive behaviour has persisted into this century even though the phenomenon of epilepsy is better understood [10]. It was Lombroso's view (1911) that there are three main kinds of criminal – the insane criminal, the born criminal, and the epileptic criminal, and that all three kinds stem from an 'epileptoid base' [11]. Henry Maudsley (1873) did not take such a wide sweeping view of epilepsy but emphasized that it should always be considered in aggressive crimes, especially homicide, suicide, and arson. He felt that sudden violent crimes committed in 'blind fury' were frequently due to an epileptic process [12]. Hill & Watterson (1942), for example, have shown that there is a relationship between disturbed cerebral rhythms and antisocial behaviour [12]. In addition, Hill & Pond (1952) have shown that many murderers also have abnormal EEGs; in fact 18 of their series of 105 cases were definitely epileptic [13]. However, according to Whitman S et al., the epilepsy group in comparison with a group of prisoners without epilepsy was not convicted of more serious or more violent crimes [14]. Miura H et. al (2005) found that the juvenile delinquents as compared to other adolescents were more likely to have a history of head trauma, Epilepsy or electroencephalographic abnormality [15]. Historically, definitions of seizures and epilepsy had been intermingled and used inconsistently [16-17]. Subsequently, the International League against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE) came to consensus definitions for the terms epileptic seizure and epilepsy. An epileptic seizure is a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain. Epilepsy is a disorder of brain characterized by an enduring predisposition to generate epileptic seizures and by the neurobiologic, cognitive, psychological, and social consequences of this condition. The definition of epilepsy requires occurrence of at least one epileptic seizure [18].

The prevalence of epilepsy among prisoners in various studies varied from 7.1 to 12 per 1000 [19-22] which is much higher than 3.74-4.47 per 1000 [23 – 24] in general population. Majority of epileptic were young men [21] with half of them being under the age of 25 [19]. There was a considerable regional difference in prevalence of epilepsy in both prisoners as well as general population. Epilepsy is twice more common in inmates than in the French population of same age group [25]. King LN et al. found point prevalence of seizure disorder of 1.9% among the Illinois prison and jail population. This estimated prevalence of seizure disorders is approximately three times higher than among middle class non prisoner populations [26]. In Rochester MN, prevalence of epilepsy was 2.4%, four times higher than the prevalence among men aged 20 to 39 yrs [14]. Actual prevalence of Epilepsy among prisoners is likely to be even higher as not all institutionalized epileptic offenders will be found in prisons. Some will be sent to mental

hospitals and a few will find their way to the special hospitals.

However, not all authors agreed with these findings: Fazel S. et. al. stated that prevalence of epilepsy in general prison populations is about 1% which is similar to the prevalence rate in general populations. They also drew the conclusion that the available epidemiological evidence provides no good support for the alleged link between epilepsy and criminality [27]. Clement R et al. found among people in custody a very high rate of alcohol use (86.5%) and cannabis use (24.7%), but low rate of epilepsy (2.9%) [28].

A study by Tittensor P et. al.[29] focused on treatment aspect of epilepsy in prison population. Critical review of seizure disorder diagnosis reduced prevalence of Epilepsy in the prison population, with diagnosis of epilepsy being confirmed only in 57.9% of those prisoners previously considered to have the condition by Prison Healthcare Services. The study pointed towards poor management of these cases with finding that out of 26 prisoners who were thought to have epilepsy, in 61.5% cases, diagnosis had not been made by epilepsy specialists; 73.1% had uncontrolled seizures; only 19.2% had computed tomography, none had magnetic resonance imaging. At review, 30.8% of prisoners were thought to require neuroimaging, 19.2% cardiac investigations. 53.8% of those prisoners confirmed as having Epilepsy had not had a medical review in the past 12 months.

There has been a steadily growing interest in the prevalence of epilepsy in persons dependent on substance and the effect of these on the development and consequences of epilepsy. Lifetime prevalence of epileptic seizures is reported in 8.63% of patients treated for substance abuse (9.2% in alcohol abusers, 12.5% in opioid abusers) [30]. In a study by Tartara A et al. the prevalence of seizure in patients who are dependent to alcohol is about 9.9%. This concurrent epilepsy may be present because of genetic predisposition, secondary to alcohol use, or may have existed before the onset of substance dependence [31]. Though, high prevalence rate of both substance dependence and Epilepsy has been established in prison population but authors did not come across any study which specifically studies prevalence of Epilepsy in prison population suffering from substance dependence or compares prevalence rate from those inmates who are not suffering from substance dependence. The study in this direction will help prison health planners throughout the globe in planning the need of medical facilities for management of epilepsy, especially in substance using inmates.

The objectives of this study are (i) to evaluate the prevalence of Epilepsy in prisoners suffering from Substance Dependence; (ii) to study the relationship between Epilepsy and type of Substance Dependence in a prison population and; (iii) to determine the relationship of onset of Epilepsy and Substance Dependence in a prison population.

Methods

The present study was conducted in Central Jail (CJ), New Delhi, which is the largest prison setting in South East Asia. At any point of time, around 12,000 prisoners reside in Central Jail, New Delhi. The study was carried out over a period of 3 months and the convenience sample consisted of 900 prisoners, out of which 450 prisoners belonged to the study group and the rest were in the control group. The inclusion criteria for study subjects were: (i) age between 18-65 years; (ii) male prisoners; (iii) prisoners diagnosed as substance dependent by ICD-10 criteria, and (iv) prisoners who are willing to give informed consent. Exclusion criteria for study subjects were: (i) prisoners with co-morbid severe physical illness (like hepatic encephalopathy, severe debilitating illness) that might hamper the assessment process, (ii) prisoners with severe cognitive deficits that might hamper assessment process, (iii) prisoners with MMSE score of less than 23; (iv) prisoners who were found to be uncooperative for the interview for study purposes, as per the clinical judgement of the researchers, (v) prisoners in the high risk prisoner's wing due to security reasons, and these included psychopathic killers, serial murderers, terrorists, and foreign espionage agents, (vi) prisoners with acute psychiatric manifestations and (viii) inability to speak sufficient English or Hindi.

The inclusion criteria for control subjects

includes: (i) age between 18-65 years; (ii) male prisoners, (iii) at no point in lifetime, subject can be diagnosed as substance dependent by ICD-10 criteria; and (iv) prisoners willing to give informed consent. The exclusion criteria for control subjects includes: (i) prisoners with co-morbid severe physical illness (like hepatic encephalopathy, severe debilitating illness) that might hamper the assessment process; (ii) prisoners with severe cognitive deficits that might hamper assessment process; (iii) prisoners with MMSE score of less than 23; (iv) prisoners who were found to be uncooperative for the interview for study purposes, as per the clinical judgement of researchers; (v) prisoners in the high risk prisoner's wing. These included psychopathic killers, serial murderers, terrorists, and foreign espionage agents, (vi) prisoners with acute psychiatric manifestations, and (vii) inability to speak sufficient English or Hindi.

Instruments used in the study

Basic socio-demographic performa was used to document socio-demographic characteristics of subjects. *The Mini-Mental State Examination (MMSE)* was used to rule out cognitive deficits in study subjects [32]. *The Present State Examination (PSE)* was used to rule out presence of psychiatric disorder in subjects [33]. *Addiction Severity Index (ASI)* assesses severity and pattern of substance dependence in study subjects [34]. The ASI is a semi-structured interview designed to address seven potential problem areas in substance-abusing patients: medical status, employment and support, drug use, alcohol use, legal status, family/social status, and psychiatric status. Using ASI an interviewer can gather information on recent (past 30 days) and lifetime problems in all of the problem areas. Though its major use has been with adults seeking treatment for substance abuse problems, it has been used with psychiatrically ill, homeless, pregnant, and prisoner populations [35].Where relevant, additional information from clinical records and staff observations were incorporated in the assessment process.

Assessment procedure: The study was cross sectional in nature, carried out over a period of 3 months. Prior to the start of study, protocol of the study which was based on Declaration of Helsinki (sixth revision) was presented before Ethical Committee of Central Jail Hospital. This committee works independent of researcher or any undue influence. Prisoners fulfilling study criteria were included in the study after obtaining informed consent. Physical examination and MMSE of all subjects were done to make the necessary exclusion. Assessment tools were applied after one week of admission in the order starting from MMSE, Basic Socio-demographic Performa, PSE and ASI. Confidentiality and privacy were maintained during the assessment process. Coding system was used so that participants could not be identified from their responses.

In the current study, a case of epilepsy was defined as 1) a hospitalization with an epilepsy ICD-9 code (ICD-9: 345.xx "epilepsy and recurrent seizures" or 649.4x "epilepsy complicating pregnancy, childbirth, or the puerperium") in the primary or secondary diagnostic position (diagnoses coded as 345.6x "infantile spasms" were excluded); or 2) two outpatient encounters with an epilepsy ICD-9 code in the primary diagnostic position. Individuals were counted as an incident case only once during the research period. If an epilepsy case (as defined above) had an encounter with ICD-9: 780.39 "other convulsions" prior to any of the case defining encounters, the date of the first "other convulsions" encounter was considered the incident date of his/her epilepsy. This determination was based on the coding practices that are standard for coding seizures and epilepsy. Epilepsy is generally coded when seizures occur on more than one occasion (e.g., after a first seizure episode generally coded by ICD-9: 780.39) [10]. An individual did not qualify as an epilepsy case if his/her medical record contained only the ICD-9 code 780.39. This specific code was used only to assign the incident date.

Assessment of subjects was done after one week of admission to rule out substance withdrawal seizure as withdrawal from alcohol or sedative-hypnotics like benzodiazepine and barbiturate can cause seizure [37]. Assessment of subjects for study purpose was independent of treatment for Epilepsy or substance dependence. For treatment of epilepsy and substance dependence, specialists of both

medicine and de-addiction are present in CJH. During assessment, if authors came across any information which might have helped in better treatment of patient, then those details were provided to the respective treating team. The data was analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive (frequency and percentage) and inferential statistics (Chi-square test and t-test) were used to interpret the data.

Results

The socio-demographic profile of subjects is provided in Table 1 and 2. Overall 900 male prisoners were included in the study and interviewed. The average age of study subjects was 34.5+/-2.3 years, which was similar to the average age of control subjects of 35.6+/-3.6 years. Majority of both study as well as control subjects were married, illiterate Hindu individuals who were either unskilled or semi-skilled, living in urban nuclear family, with monthly family income of less than 5000 Indian rupees. Using t-test, in the case of age of subjects, z for 95% CI= 1.96, the value of $p>0.05$ is considered not significant.

Table 1. Socio-demographic profile of subjects

Number of study subjects= 450 Number of control subjects= 450		**Mean+SD age of study subjects in years= 34.5+/- 2.3**		**Mean+SD age of control subjects in years= 35.6+/- 3.6**	
		Frequency of study subjects (Total= 450)	**Percentage of study subjects**	**Frequency of control subjects (Total= 450)**	**Percentage of control subjects**
Age	20-30	180	40	172	38.2
	30-40	168	37.3	162	36
	40-50	59	13.1	55	12.2
	50-60	29	6.4	36	8
	>60	14	3.1	25	5.6
Education	Illiterate	287	63.8	281	62.4
	Primary	77	17	79	17.6
	matriculation	48	10.75	54	12
	Higher secondary	27	6	25	5.6
	Graduate & above	11	2.45	11	2.4
Occupation	Unemployed	78	17.3	79	17.6
	Unskilled	192	42.7	191	42.4
	Semiskilled	107	23.8	106	23.6
	Skilled	59	13.1	61	13.6
	Student	14	3.1	13	2.9
Marital status	Married	227	50.4	231	51.3
	Unmarried	149	33.1	151	33.6
	Separated/ Divorced	54	12	52	11.6
	Widowed	20	4.4	16	3.6

Table 2. Socio-demographic profile of subjects (continue)

		Frequency of study subjects (n=450)	**Percentage of study subjects**	**Frequency of control subjects (n=450)**	**Percentage of control subjects**
Family type	Nuclear	310	141.1	311	69.1
	Joint	122	55.3	124	27.6
	Extended nuclear	18	8.2	15	3.3
Religion	Hindu	239	53.1	234	52

	Muslim	193	42.9	196	43.6
	Sikh	14	3.1	16	3.6
	Christian	4	0.9	4	0.9
Residence	Rural	34	7.6	40	8.9
	Urban	416	92.4	410	91.1
Income	<5000	320	71.1	318	70.7
	5000-10000	99	22	103	22.9
	>10000	31	6.9	29	6.4

In the statistical analysis of socio-demographic data no statistically significant difference was found between study and control subjects (Table 3).

Table 3. Relationship of socio-demographic and clinical variables in study subjects (250) with control subjects (250)

	χ^2 **value**	**df**	***p*-value**
Age	4.288	4	0.368
Education	0.519	4	0.972
Occupation	0.084	4	0.999
Marital Status	0.53	3	0.912
Family type	0.291	2	0.865
Residence	0.53	1	0.467
Income	0.152	2	0927

(χ^2 = Chi-square test, df = degree of freedom)

Table 4 depicts that among study subjects, 14.4% suffered from epilepsy which was 1.4 times higher than 6% prevalence in control subjects. The difference between the two groups was statistically significant (χ^2 = 15.696, df= 1, p value= 0.000074). Forty six percent of the study population had started using substance between 20 to 30 years of age. Forty eight percent of the study subjects had been using substance for more than 10 years and 17.2% of these subjects have developed dependence on various psychoactive substances.

Table 4. Substance use characteristics

Frequency of epilepsy in study subjects= 65 (14.4%)		**Frequency of epilepsy in control subjects = 27 (6%)**	
	Years	**Frequency of study subjects (n=450)**	**Percentage of study subjects**
Age of onset of substance use	10-20	165	36.7
	20-30	207	46
	30-40	63	14
	40-50	15	3.3
Duration of substance use	0-5	72	16
	6-10	162	36
	11-15	117	26
	16-20	81	18
	>20	18	4
Duration of substance dependence	0-5	164	36.4
	6-10	209	46.4
	11-15	70	15.6
	16-20	7	1.6

Table 5 shows that in both groups (i.e. study subjects with or without epilepsy), alcohol, opioid and cannabis either alone or in various combination are most commonly used substance. Subjects suffering from epilepsy are likely to have higher chances of consuming three or more substances than those without problem of epilepsy.

Table 5. Prevalence of various psychoactive substance use/ dependence in study subjects

Psychoactive substance	Frequency in study subjects suffering from epilepsy (n=65)	Percentage of study subjects suffering from epilepsy	Frequency in study subjects not suffering from epilepsy (n=385)	Percentage of study subjects not suffering from epilepsy (n=385)
Alcohol dependence	1	3.1	30	7.8
Cannabis dependence	0	0	29	7.5
Opioid dependence	1	4.6	36	9.4
Benzodiazepine dependence	0	1.5	6	1.6
Other substance dependence	0	0	7	1.8
Alcohol & Cannabis dependence	2	7.7	41	10.6
Alcohol & Opioid dependence	3	10.8	43	11.2
Alcohol & Benzodiazepine dependence	3	10.8	29	7.5
Alcohol & other substance dependence	1	3.1	13	3.4
Cannabis & Opioid dependence	2	6.1	30	7.8
Cannabis & Benzodiazepine dependence	1	1.5	14	3.6
Cannabis & other substance dependence	0	1.5	5	1.3
Opioid & Benzodiazepine dependence	0	1.5	16	4.2
Opioid & other substance dependence	1	1.5	5	1.3
Benzodiazepine & other substance dependence	0	Nil	1	0.3
Alcohol, Opioid & Cannabis dependence	3	10.8	31	8.1
Alcohol, Cannabis & Benzodiazepine dependence	2	9.2	26	6.7
Alcohol, Cannabis & Other substance dependence	3	4.6	Nil	Nil
Cannabis, Opioid & Benzodiazepine dependence	6	9.2	10	2.6
Cannabis, Opioid & other substance dependence	1	1.5	1	0.3
Opioid, Benzodiazepine & other substance dependence	1	1.5	1	0.3
Polysubstance dependence	6	9.2	11	2.9

Table 6 depicts that among study subjects with epilepsy, majority i.e. 57% had onset of epilepsy after onset of substance dependence which points towards possible contribution of substance dependence to onset of epilepsy.

Table 6. Temporal relation between onset of epilepsy (n=65) and psychoactive substance dependence

Onset of epilepsy	Frequency in study subjects with epilepsy	Percentage in study subjects with epilepsy
Before onset of substance dependence	28	43
After onset of substance dependence	37	57

According to Table 7, study subjects suffering from epilepsy compared with those without epilepsy perform worse in all parameters indicative of higher severity of psychoactive substance dependence.

Table 7. Severity of psychoactive substance dependence on ASI subscales

No.	ASI subscale	Mean score and Std. Deviation in study subjects suffering from epilepsy (n= 65)	Mean score and Std. Deviation in study subjects not suffering from epilepsy (n= 385)	t value	*p* value
1	Medical status	0.729 +/- 0.036	0.517 +/- 0.14	12.13	<0.0001
2	Employment/ support status	0.622 +/- 0.12	0.487 +/- 0.056	14.61	<0.0001
3	Alcohol use	0.542 +/- 0.081	0.410 +/- 0.006	31.64	<0.0001
4	Drug use	0.673 +/- 0.203	0.372 +/- 0.02	28.44	<0.0001
5	Legal status	0.829 +/- 0.018	0.543 +/- 0.112	20.52	<0.0001
6	Family/ social relationships	0.778 +/- 0.09	0.571 +/- 0.06	236.91	<0.0001
7	Psychological status	0.360 +/- 0.071	0.218 +/- 0.132	8.46	<0.0001

During the course of the study, no subject had to be excluded due to severe physical illness or cognitive deficit which might have hampered assessment. In total, 12 study subjects developed substance withdrawal seizure (10 due to alcohol withdrawal and 2 due to benzodiazepine withdrawal) but did not satisfy study criteria of epilepsy. No study subject during the course of study developed barbiturate withdrawal seizure.

Discussion

The present study compares prisoners having problem of substance disorder with those not having problem of substance disorder, with regards to prevalence of epilepsy. The rationale to include only male prisoners in the study was based on the fact that substance use in general population is known to occur more frequently in men than women [29]. Thus, it was considered more appropriate to include homogenous sample with adequate size for statistical analysis. In the current study prevalence rate of 14.4% in study subjects and 6% in control subjects is much higher than the findings of earlier studies with epilepsy prevalence in prisoners being 0.5 to 1% [5,9,19-21,27]. However, few studies earlier also had found epilepsy rate in prisoners of 12-17% [19,37]. The prevalence of alcohol dependence of 59.8% in the current study is much higher than earlier studies' finding of alcohol abuse and dependence rate of 11.5 to 30% in male prisoners.[1,5]. Still higher prevalence rate of 69.2% was present in study subjects suffering from epilepsy. Other drugs also showed similar higher rates of consumption.

In Table 4, epilepsy prevalence in study subjects was 1.4 times higher than in control subjects. However, as the authors have not come across any past study specifically comparing substance using with non-substance using prison population, no comparison with past literature can be made.

Findings of Table 6 along with the fact that substance using prisoners who developed

epilepsy had more severe pattern of substance use and use of multiple substances simultaneously points towards the possibility of substance dependence contributing to onset of problem of epilepsy. However, sample size being small and drug use pattern being heterogeneous in nature, it was beyond the scope of this study to draw conclusion on relation of onset of epilepsy with onset and pattern of individual substance use. This issue can be better addressed in a future study with larger sample size and focus on specific type of substance use. One of the main limitations of the study was non-availability of electro-encephalogram (EEG) pattern in some cases, no sub classification of type of seizure was made.

Conclusion

In this prison hospital sample of 900 prisoners, the following conclusions were drawn. Alcohol, opioid, and cannabis are the most commonly used substances. Nearly 14.4% of these cases suffer from epilepsy and prisoners suffering from dual problem of substance use and epilepsy have increased severity of substance dependence, and are more likely to use more than one substance. The findings of the current study was consistent with earlier findings of drug abuse being more frequent in patients suffering from Epilepsy than general population. Epileptic patients seem to be more sensitive to these substances [38]. A possible reason of higher severity of dependence in study subjects suffering from epilepsy as compared to those not suffering from epilepsy could be psychoactive substance like recent heroin use being an important risk factor for seizure development [39].

This highlights the need for screening for substance abuse and dependence at entry into prison, effective treatment while in custody, and follow-up on release. Specialist addiction services for prisoners have the potential to make a considerable impact. Not only more detailed and longitudinal studies are needed to understand these relations in a better perspective, but also a well-planned intervention programme for prisoners with substance use and epilepsy co-morbidity is much needed.

Also to develop effective strategies for management of substance using prisoners with epilepsy it is imperative that the phenomenon of co-occurrence of epilepsy in substance dependence be studied for its extent, pattern, associated socio-demographic as well as clinical factors and the impact of epilepsy on the course of substance use and vice-versa.

Acknowledgement

We gratefully acknowledge the help provided by Central Jail staff, especially Ms. Vimla Mehra (Director General, CJ). The Office of Director General granted permission to publish this paper but it should be emphasized that the opinion expressed belong to us and do not necessarily imply official agreement.

References

1. Fazel S, Bains P, Doll H. Substance abuse and dependence in prisoners: a systematic review. Addiction, 2006, 101, 181–191.

2. Kessler RC, McGonagle KA, Zhao S, Nelson C, Hughes M, Eshleman S, et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Results from the National Comorbidity Survey. Arch Gen Psychiatry, 1994;51: 8–19.

3. Saman Zamani, Marziyeh Farnia. Patterns of Drug Use and HIV-Related Risk Behaviors among Incarcerated People in a Prison in Iran.J Urban Health, 2010; 87(4): 603–616.

4. Griffiths P, Nilson M, Carpentier C, Merino PP. Treating drug users in prison—a critical area for health promotion and crime reduction policy. Lisbon: European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), 2003.

5. Gunn J., Maden A, Swinton M. Treatment needs of prisoners with psychiatric disorders. BMJ, 1991, 303: 338-41.

6. Armiya'u AY, Audu MD, Obembe A. A study of psychiatry morbidity and co-morbid physical illness among convicted and awaiting trial inmates in Jos prison. J Forensic Leg Med, 2013; 20(8): 1048-51.

7. Sailas ES, Feodoroff B, Lindberg NC. The mortality rate in the population of young offenders sentenced to prison and its association with psychiatric disorders: a register study. Eur J Public Health, 2006; 16(2): 193-7.

8. Maden A., Swinton M, Gunn J. Drug dependence in prisoners. BMJ, 1991;302:880.

9. Maden A, Swinton M, Gunn J. Women in prison and use of illicit drugs before arrest. Br. Med J, 1990, 301:1133.

10. Maudsley H. Body and Mind. London press; 1873.

11. Lombroso C Crime: Its Causes and Remedies. Trans. H P Horton. London press; 1911.

12. Hill D & Watterson D. J. Neurol. Psych iat., 1942, 5 (47).

13. Hill D & Pond D A. J Ment. Sci. 1952, 98(23).

14. Whitman S, Coleman TE, Patmon C. Epilepsy in prison: elevated prevalence and no relationship to violence. Neurology, 1984; 34(6): 775-82.

15. Miura H, Fujiki M, Shibata A. Influence of history of head trauma and epilepsy on delinquents in a juvenile classification home. Psychiatry Clin Neurosci 2005; 59(6): 661-5.

16. Seino M. Classification criteria of epileptic seizures and syndromes. Epilepsy Research. 2006; 70S:S27-S33.

17. Thurman DJ, Beghi E, Begley CE, et al. Standards for epidemiologic studies and surveillance of epilepsy. Epilepsia. 2011;52 (Suppl.7):2-26.

18. Fisher RS, van Emde Boas W. Epileptic seizures and epilepsy: definitions proposed by the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE). Epilepsia. 2005; 46(4):470-2.

19. Gunn J C. The Prevalence of Epilepsy Among Prisoners.Pr-oc. roy. Soc. Med, 1969, 4(62),60-62.

20. Gunn J.C. Proceedings of the Royal Society of Medicine, 1970, 62,60.

21. Gunn JC., Fenton G. Epilepsy in prisons: A diagnostic survey. BMJ, 1969,4,326-28.

22. Price W H and Whatmore, P B. British Medical Journal, 1967, 1, 533.

23. Gudmundsson, G. Acta Neurologica Scandinavica, 43, Suppl. No. 25. College of General Practitioners, British Medical Journal, 1966,2, 416.

24. College of General Practitioners, British Medical Journal, 1960,2, 416.

25. Durand E, DeBeaureaire C. Legal aspects of temporal lobe epilepsy in prisoners. Rev Neurol (Paris) 2001; 157 (1): 87-8.

26. King LN, Young QD. Increased prevalence of seizure disorders among prisoners. JAMA, 1978, 239(25): 2674-5.

27. Fazel S., Vassos E, Danesh J. Prevalence of epilepsy in prisoners: systematic review. BMJ, 2002; 324(7352): 1495.

28. Clement R, Gerardin M, Vigneau VC. Medical, social and law characteristics of intoxicant's users medically examined in police custody. J Forensic Leg Med, 2013; 20(8): 1083-6.

29. Tittensor P, Collins J, Grunewald RA. Audit of healthcare provision for UK prisoners with suspected Epilepsy. Seizure, 2008; 17(1): 69-75.

30. Mattoo SK, Singh SM, Bhardwaj R. Prevalence and correlates of epileptic seizures in substance abusing subjects. Psy. & Clinical Neurosciences, 2009; 63: 580-82.

31. Tartara A, Manni R, Mazzella G. Epileptic seizures and alcoholism. Clinical and pathogenic aspects. Acta Neurol. Belg., 1983; 83: 88-94.

32. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state": a practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res, 1975; 12: 189-198.

33. Wing JK, Cooper JE, Sartorius N. Measurement and classification of psychiatric symptoms. An instruction manual for PSE and catego program. Cambridge University Press; 1974.

34. McLellan AT, Luborsky L, Cacciola J. New data from the Addiction Severity Index: reliability and validity in three centers. J. Nerv. Ment. Dis, 1985, 173(7), 412-23.

35. McLellan, A.T., Luborsky, L., O'Brien, C.P. An improved diagnostic instrument for substance abuse patients: The Addiction Severity Index. Journal of Nervous & Mental Diseases 1980, 168, 26-33.

36. Galanter M, Kluber HD. The American Psychiatric Publishing Textbook of substance abuse treatment (4th ed.), United States of America: American Psychiatric Publishing Inc., 2008, 58, 274-6.

37. Barkley GL. New inclusion terms for 345.7 and posttraumatic seizure code. ICD-9-CM Coordination and Maintenance Meeting. March 12, 2009. http://www.cdc.gov/nchs/ppt/icd9/att1BarkleyMar09.ppt. Accessed March 12, 2013.

38. Najafi MR, Sonbolestan SA, Sonbolestan F. The prevalence of Substance Abuse among the Epileptic patients of Isfahan. Shiraz E-Medical Journal, 2011; 12(3).

39. NgS, Brust JCM, Hauser WA. Ilicit drug use and the risk of new onset seizures. Am J Epidemiol, 1990. 132: 47-57.

Corresponding author: ***Pankaj Sureka, Visiting Consultant, Department of Mental Health and Behavioural Sciences, MAX Healthcare and Super Speciality Hospital, Saket, New Delhi, India.***

Email: pankajsureka17@gmail.com

Received: 9 August 2013 Accepted: 8 January 2014