

Patterns of Caffeine Use and Validation of Assessment in Psychiatric Population: An Implication in Primary Care Setting

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ABSTRACT

Background: Caffeine use and abuse is a concern among treatment seekers for psychological problems. This aspect has not been documented in an Indian context as well as its relevance in primary care setting. The aim of the present study was to explore and compare the caffeine intake and prevalence in Indian psychiatric patients and healthy subjects. **Materials and Methods:** Caffeine analysis in urine samples was carried out using a gold technique, gas chromatograph and mass selective detectors. This analytical technique is highly sensitive for identification of unambiguous compound. Two hundred and forty-three subjects having psychiatric disorders, along with forty-two healthy subjects were included in the study. They were assessed by using structured interview for caffeine use and screened for substance dependence as well. **Results:** One hundred twenty-eight subjects had history of substance use along with other comorbid psychiatric problems. The mean of caffeine values was 1459 ± 1140 ng/mL, whereas 42 subjects in control group (male 26, female 16) in the age group of 21-60 years had the mean caffeine levels of 1023 ± 788.8 ng/mL. The caffeine use was significantly higher ($P \geq 0.84$) in the subjects with psychiatric problems in comparison to the healthy subjects. **Conclusions:** It implies the need to enable and sensitize the primary care physicians in screening and educating treatment seekers with psychiatric morbidities for the management of caffeine use.

Keywords: Caffeine, gas chromatograph mass spectrometer, psychiatric problems, primary care physicians

Introduction

Caffeine is the most frequently ingested unregulated pharmacologically active substance in most of the countries.

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Received: 25-04-2020

Revised: 10-06-2020

Accepted: 08-07-2020

Published: 30-10-2020

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_698_20

^[1,2] In a survey of 162 current caffeine consumers in the United States, it was found that 30% of them met the DSM-IV criteria for substance dependence.^[3] Its consumption seems to be high among patient seeking consultation for psychological issues. It was also reported^[4] that psychiatric patients had a slightly higher consumption (31% ≥ 5 cups coffee a day = ccd, average 8.4 ccd) in comparisons to control group (21% ≥ 5 ccd, average 6.5 ccd). Psychiatric inpatients consume more caffeine (910 mg) than the general population (610 mg).^[5] When the pattern of use of caffeine was checked among patient seeking outpatient treatment for anxiety and panic disorders, the mean consumption was 6.7

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How to cite this article: Sharma P, Shivhare P, Marimutthu P, Sharma MK, Murthy P. Patterns of caffeine use and validation of assessment in psychiatric population: An implication in primary care setting. J Family Med Prim Care 2020;9:5252-5.

ccd (including tea in coffee-equivalent) in 79 anxiety patients; 35% of them used more than 8 ccd ($m = 11.3$ ccd),^[6] whereas among 140 unipolar type I, type II, and bipolar depression, a mean caffeine consumption of 415 mg/day was reported. Among the mixed states of unipolar II and bipolar, depressed patients had a high consumption of 991 mg ($n = 22$)^[6] per day. When comparison made for 63 schizophrenics with 12^[7] nonpsychiatric, but otherwise undefined chronic patients. The schizophrenics found to be drinking more caffeine than other psychiatric groups.^[7]

Other study documented the high use among cases with neurosis.^[8] Another review revealed^[9] a higher caffeine consumption in psychiatric inpatients^[4] but found no difference in consumption with other patients or healthy people.^[10] But if we look at the caffeine's effects from a biochemical perspective, it seemed that craving for caffeine is caused by its role as an adenosine receptor blocker and it prevents adenosine signaling sleep and promoting drowsiness in the brain. It can be addictive, causing withdrawal symptoms, and constant use can build up a tolerance in individuals.^[11] Coffee's use results in a temporary increase in metabolism, increased wakefulness, attention, and clear-thinking, whereas higher caffeine consumption leads to anxiety, muscle spasms, rambling or disorientation, or, at even higher doses, muscle convulsions, hallucinations, and death.^[12] According to Sevy,^[13] the general anxiety patients found to have higher noradrenaline and MHPG-plasma levels and less alpha2-adrenoreceptors than depressed or healthy people. The anxiety and panic patients are especially sensitive to the noradrenergic stimulating effects of caffeine due to higher reactivity and raised catecholamine levels.^[4] The involvement of adenosine in anxiogenic effects of caffeine is underlined by many authors. The serotonergic activity has an anxiogenic potential in man and animal. Caffeine increases brain tryptophan, serotonin, and 5-HIAA levels.^[14] As caffeine elicits greater anxiety in panic patients than m-CPP, a pure serotonergic agonist, it may imply that in anxiety both adrenergic and serotonergic systems are involved.^[15] Research done till date did not indicate any particular trend; however, it definitely indicated that anxiety and panic patients^[4,11] are more sensitive and reactive to coffee and caffeine.

There is no data available for pattern of tea/coffee usage among psychiatric groups. There is a need to understand the pattern of caffeine use among psychiatric inpatients in an Indian context. The study will also have an implication for management of caffeine among users with psychiatric morbidities in a primary care setting.

Material and Methods

All chemicals used for caffeine analysis were of analytical grade. Bulk solvents and routine chemicals were procured from SISCO research laboratory (Mumbai, India). Caffeine standard and diphenylamine were procured from Sigma Aldrich, USA.

Instrument

Caffeine quantification in urine samples was done using 7890A Gas chromatograph and 5975C Mass selective detectors (GC-MSD) from Agilent Technologies, Santa Clara, USA. GCMSD is the gold standard technique for confirmation testing of abused substance analysis and is still widely used for this purpose.

Sample

Two hundred forty-three consecutive subjects from inpatient and outpatient setting of a tertiary clinical setting and 42 health controls from the community were selected. The mean age of the sample was 40.6 ± 14.2 years. The power of sampling was $\geq 80\%$. These subjects had the current history of using caffeine. The uncooperative subjects due to medical or psychiatric comorbidities were excluded from the study. The Institute Ethic approval and patient consent were obtained prior to the initiation of the study. This research was a part of clinical work for which Ethics permission was obtained in 25 -07-2013.

Analytical Procedure

For caffeine quantification, 5–10 mL of urine was collected in previously labeled leak-proof sterile plastic urine containers. Samples were first assessed for adulteration using adulteration strips (ABON, INC) for creatinine, specific gravity, nitrite, glutaraldehyde, pH, and oxidant/pyridinium chlorochromate sample clearing passing the adulteration test were subjected to multi-drug screening (cannabis, morphine, benzodiazepines, cocaine and amphetamine) by commercial test kits (Alfa Scientific, USA) according to the specifications of the manufacturer.

The analytical procedure to quantify caffeine concentration in urine was done using GCMSD, and was validated according to ISO17025. The urine samples' analysis was preceded by a calibration process, also known as a standard curve, a general method for determining the concentration of a substance in an unknown sample by comparing the unknown to a set of standard samples of known concentration. Caffeine quantification in urine samples was done 7890A GC and 5975C Mass selective detectors (GC-MS) from Agilent Technologies. Chromatographic separation was achieved on DB-1, (15 m \times 0.25 mm I.D., 0.25 μ m) fused-silica capillary. The carrier gas was helium, and analysis was carried out at a constant pressure of 15 psi. To facilitate separation, the initial column temperature was set at 90°C and the final column temperature was set at 300°C. The temperature on the injector port was set at 275°C.^[16]

Results

The mean age of the sample was 40.6 ± 14.2 years.

Table 1 shows that female psychiatric patients got higher use of caffeine, whereas male in control group got higher use of caffeine.

Table 2 shows that 114 substance users got higher level of caffeine use 2108.64 ± 2693.74 ng/mL. Thirty-three subjects with bipolar affective disorder had caffeine levels 1662.82 ± 4279 ng/mL, while subjects with psychosis ($n = 30$) had caffeine mean values 866.7 ± 596 ng/mL. Twenty-three subjects with schizophrenia had mean caffeine levels 888.2 ± 538.8 ng/mL. Subjects with mood disorder ($n = 17$) had caffeine values 715.0 ± 354.8 ng/mL. Twenty-six subjects with no other specific diagnosis got the mean caffeine values 954.7 ± 592.8 ng/mL [Table 2]. Healthy control group (male 26, female 16) were aged 21–60 years and had mean caffeine levels of 1023 ± 788.8 ng/mL.

Discussion

The present study documented that mean use of caffeine was more among female psychiatric subjects, whereas it was more among male subjects in the normal healthy control [Table 1]. Among psychiatric group, the use of caffeine was high among substance users followed by subjects with bipolar affective disorder, healthy control, and subjects with no specific diagnosis [Table 2]. It was in corroboration with available literature.^[2,4,6] However, other authors did not find a correlation between caffeine consumption and levels of anxiety and depression. Even after shifting to decaffeinated products, no significant changes in anxiety or depression were reported.^[8] The low correlation was observed^[3] between the severity level of caffeine dependence and alcohol dependence. They did not find any relationship between caffeine and nicotine dependence. Others studies also failed to report any association between substance dependence and caffeine use.^[9]

Table 1: Mean of urinary caffeine levels

Sex	Number	Caffeine Mean \pm SD (ng/mL)
Subjects		
Male	235	1842 \pm 2478
Female	8	3107 \pm 2927
Controls		
Male	26	758 \pm 243
Female	16	771 \pm 192

Table 2: Caffeine concentration in various groups

Characteristic	Value
Caffeine use	243
≥ 3 times/day	198
≥ 5 times/week	45
Urine caffeine values	
Substance use ($n=114$)	2108.64 \pm 2693.74 ng/mL
Bipolar Affective Disorder) mania ($n=33$)	1662.82 \pm 4279.23 ng/mL
Psychosis ($n=30$)	866.7 \pm 596 ng/mL
Schizophrenia ($n=23$)	888.2 \pm 538.80
Mood disorder ($n=17$)	715.0 \pm 354.80
No specific diagnosis (26)	954.7 \pm 592.80
Healthy controls (42)	1023 \pm 788.80

Studies recommended screening of caffeine consumption among psychiatric patients, especially on neuroleptics.^[12,17] The caffeine consumption found to be higher among treatment seekers for psychological problems.^[13] Caffeine use has been linked with specific disorders such as anxiety disorders, sleep disorders, and eating disorders, and there is a possible association with schizophrenia. There is a dearth of empirical data for the pattern of caffeine use among subjects with mania or hypomania condition.

A nonsignificant trend ($P < 0.10$) of caffeine use was observed for alcohol user.^[17] The review of studies demonstrated that high caffeine intake was associated with psychotic and manic symptoms or exacerbation of previous psychotic symptoms.^[18] Research suggested that excessive caffeine intake might hamper the recovery of patients with bipolar disorder or manic-type mood episodes. The researchers also observed the association of depression, anxiety, conduct disorder, and attention deficit hyperactivity disorder with coffee consumption.^[19,20]

This study documents the high usage of caffeine in subjects seeking treatment for substance use in comparisons to other psychiatric groups. But it was the lowest in subjects with no specific diagnosis. Though studies documented the role of biological factors, i.e., higher noradrenaline- and 3-methoxy-4-hydroxyphenylethyleneglycol (MHPG)-plasma levels, higher reactivity and raised catecholamine levels, and the role of adenosine, there is a need to understand the psychological reasons for caffeine use. These reasons can be addressed during the inpatient group or individual treatment program. The study has limitations in the form unavailability of information about the usage history of types of caffeine product as well as the history of the last usage.

Conclusions

The study highlights that more attention should be paid to caffeine use, which seems to be strongly, although generically, related to different psychiatric disorders. The screening of caffeine use and its psychological effects goes unnoticed among the treatment seekers in a primary care setting. The rapid progression of caffeine uses across age group suggests that comprehensive efforts should be directed toward the prevention of the consumption of this substance. Primary care physicians have a role in the early screening and managing caffeine use among treatment seekers with substance use and other psychiatric morbidities.

Acknowledgement

This work was supported by Centre for Addiction Medicine and all experiments were carried out at Drug Toxicology Laboratory at National Institute of Mental Health and Neurosciences, Bangalore, India.

Financial support and sponsorship

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Conflicts of interest

There are no conflicts of interest.

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