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The Quality of Sleep in Energy Drink Consumers and Non-Energy Drink Consumers among University Graduates

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ABSTRACT

Energy drinks are a group of beverages used by consumers to provide an extra boost in energy, promote wakefulness, provide cognitive and mood enhancement. The consumption of energy drinks has increased over the years in adults due to the effective advertising of the products' energizing capacity. The psychoactive stimulating substance called caffeine is the main ingredient of the drinks which is an addictive substance and can cause psycho-somatic problems in the users. These Caffeinated drinks, while enhancing wakefullness reduce the sleep quality of the consumer. Thus, this study with quantitative research design explores the quality of sleep among energy drink users (ED) and non- energy drink users (NED). The sample population for both the groups were selected from college-going adults. The Pittsburg sleep quality index (PSQI) with its five dimensions, namely, sleep latency (SL), subjective sleep quality (SQ), Sleep duration (SD), habitual sleep efficiency (SE), Sleep Disturbances (SDi), use of Sleeping Medications (SM), and daytime dysfunction (DD), was employed to assess global quality of sleep. These dimensions of both groups were compared with Mann-Whitney U test. Gender-based sleep quality difference in the ED group was also analyzed. The findings showed that consumers have experienced significant effects in some of the dimensions of sleep quality. Findings of the study can aid in psychoeducation, formulation of legal regulation, and baseline data for further research.

Keywords: *Energy Drink, Caffeine, Addiction, Quality of Sleep*

I. Introduction

Energy drink is a beverage very commonly available in the market. Its consumption rate is growing across the globe (Higgins & Higgins, 2010, Reissig, Strain, & Griffiths, 2009, Johnson, 2006). The potential consumers of energy drinks are adolescents and young adult (Fabiansson, Charlotte, & Stefan,2006; Penolazzi, Natale, & Leone;

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Russo, 2012; Heckman, et al., 2010; Reissig, Strain, & Griffiths, 2009). The European food safety authority (EFSA) found in 2011 that 68% adolescents and 30 % of adult consume energy drinks in European Union countries (Breda et al., 2014). In India there is no data available about its prevalence. Energy drink consumption is a new trend and phenomenon, so the dearth of an adequate definition is encountered. Energy drink is defined as a group of beverages used by consumers to provide an extra boost in energy, promote wakefulness, maintain alertness, and provide cognitive and mood enhancement (Ishak et al., 2012). The working definition of energy drink is that it is a beverage which has psychoactive addictive substance as an ingredient that can enhance energy level of the individual affecting cognitive functions and mood, but also have characteristic symptoms of addiction, namely dependence, abuse and withdrawal, resulting in bodily and behavioral pathological symptoms. Significantly energy drinks differ from soft drinks and sports drink based on the quantity of caffeine level. Energy drinks have a relatively higher level of caffeine than other drinks (Aranda and Morlock, 2006).

According to the Diagnostic Statistical Manual 5 (DSM-5), caffeine is psychoactive substance which has the potential of forming caffeine addiction. Caffeine addiction is one of the types of addictions classified by both the DSM and International Classification of Diseases (ICD 10). Energy drink is not known to be an addiction by its own merit but it largely comes under caffeine addiction though DSM has not labelled energy drink by name as an addictive drink. Caffeine being an addictive psychoactive drug, works in the brain as antagonist adenosine receptor. Thus, it creates a flight and fight situation causing changes in the brain and faster heart beat (Higgins & Higgins, 2010). It is generally considered safe and is used widely. DSM has identified that an intake of more than 250 mg of caffeine can result in intoxication (Saddock et al., 2015).

Caffeine is advertised to be useful in relieving fatigue and, in turn, enhancing performance. Most energy drinks contain about 80 mg of caffeine per 250 ml can, although some brands contain as much as 300 mg in 350 ml can (Fabiansson, Charlotte, & Stefan,2016; Bedi, Nidhi, Pooja, & Piyush, 2014; Krueger et al., 2011). The amount of caffeine contained in one can of any energy drink is not perceived to be very harmful to body, but more than 200 mg intake a day can harmfully affect the functional, affective, behavioural and physiological aspects of a human being. Caffeine toxicity, dependence and withdrawal symptoms are found in energy drink users (Ressig et al., 2008). Many studies have found caffeine users have susceptibility to other substances (Kendler et al., 2006). This is found in energy drink users too. Studies found that energy drink users are susceptible to Marijuana (Miller, 2008) alcoholic dependence (Arria, 2011) hazardous drinking (Patrick, 2013; Skewes, 2013). Energy drink has both positive and negative effects. A moderate intake is said to be beneficial. The energy drink improves mood and most of the cognitive functions. It also enhances the experience of the alcohol intoxication. A high level of intake of energy drink may cause side effects in the cardiovascular, hematologic, and gastrointestinal systems (Ishak et al., 2012). Insomnia, and other behavioral problems are also caused or precipitated or maintained by the use of energy drink.

It is high time to evaluate more closely the short- and long-term effects of energy drinks, as they are being marketed in huge quantities all over the world, to fully understand the psychological impact of these products. Seemingly, very few consumers have detailed knowledge of the potential harmful physiological and psychological effects (Ishak et al., 2012) while the market and the amount of consumption of energy drinks are increasing every year (Higgins & Higgins, 2010; Reissig, Strain & Griffiths, 2009). There are potential risks associated with the consumption

of these beverages and these may cause behavioral and negative impacts on mental health and well-being (Reissig., Strain & Griffiths, 2009). Very few published documents have recorded the potential risks associated with the consumption of these beverages

Energy drink is consumed as energy enhancing drink by most people. The growing use of energy drink in India by the youth is observed and so far, no research has been done in this area. One of the reasons for the consumption of energy drinks, and for that matter any caffeinated drinks, is to become hyper arousal. Its intake cause sleep disruption (Nordt et al., 2012). The population aged between 16 to 25 uses energy drink to get hyper arousal resulting a period of jolt followed by crash. Physiological effects reported are lack of sleep, high heart rate palpitation, jolt and crash, headache and vomiting. Research by Alsunni & Badar (2011) found that insomnia and increased urination are caused as an after effect of energy drink consumption. Only 36.7 % male and 14.28% female are free of such adverse effects. Malinauskas et al. (2011) research findings also point out jolt and crash episodes, irregular heart palpitation and head ache. Adverse physical effects such as heart palpitations, insomnia, headache and tremors, nausea and vomiting, and nervousness were also observed in this study (Bawazeer, & AlSobahi, 2013). The lack of sleep in the night due to the use of energy drinks and consequent fatigue resulting in day time sleep and probable functional and behavioural changes are serious concerns that demand attention. The aggressive promotion of energy drinks by various advertising agencies present them as boosting extra energy (Fabiansson, Charlotte, & Stefan,2006). The campaigns impress the youth and their parents who tend to believe that it is a harmless drink, just as any other soft drink (Reissig., Strain & Griffiths, 2009). Studies outside India have clearly stated its adverse side effects, and the World Health Organization (WHO) has declared it as a growing problem. The current study will give a realistic picture of arousal and sleep quality.

II. Method:

The aim was to assess and compare the quality of sleep in the energy drink consumer (ED) and non-consumer (NED) among college graduates. The study also had the aim to assess and compare the quality of sleep in both genders of ED group. Quality of sleep is measured under different sub domains namely subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The study aims to measure both subjective and objective quality of sleep.

The sample was selected through purposive sampling method. The participants were currently enrolled in the college and aged between 18 to 25, having no major psychological or physical illness and have proficiency and ability to communicate in English. A set of virtual questionnaires was included in the study. Apart from that, those participants who abstained from energy drink in the last one month for the ED group and participants who had not abstained from energy drink last six months for the NED group were excluded. Those participants who used other addictive substance with or without energy drink were also excluded. Out of 150 college students of Bangalore city aged between 18 to 25, both male and female consented to participate in the study N= 68 were ED and N= 82 were NED. Having failed to fulfill inclusion and exclusion criteria N= 20 from ED and N= 12 from NED were removed from sample after personal interview. The final sample consisted of 116 (ED= 48 & NED= 68).

Pittsburgh Sleep Quality Index (PSQI) was used for assessing the quality of sleep. It differentiates "poor" from "good" sleep quality by measuring seven areas (components): subjective sleep quality (SQ), sleep latency (SL), sleep duration (SD), habitual sleep efficiency (SE), sleep disturbances (SDI), use of sleeping medications (SM), and daytime dysfunction over the last month (DD). PSQI has been found to have good reliability, with Cronbach's =.83 and a test-retest reliability coefficient of .84. PSQI internationally has shown the measure to be high on both validity and reliability (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989).

Participants were personally contacted and obtained consent. On a virtual space the individual sleep quality data was obtained. The obtained data was cleaned and computed in order to statistically manage the data. The final data was computed with the help of SPSS 21. The descriptive statistics, Kolmogorov-Smirnov (K-S) test to check normality of data and variance analysis through Mann-Whitney U were computed. The obtained data was not normally distributed and therefore non parametric test Mann-Whitney U was preferred.

III. Result and Discussion:

Table 1; Descriptive statistics

Participants		Mean age	Sd	Male mean age	Female mean age	Quantity/week
ED	48	21.83	2.42	(N=26) σ = 22.26, ±3.20	(N=22) σ = 21.39, ±2.53	3
NED	68	21.21	2.46	(N=37) σ = 21.62, ±1.50)	(N=31) σ = 20.81, ±1.20	0
Total	116	21.52	3.56	(N=63) σ = 21.94, ± 2.35)	(N=53) σ = 21.11, ± 1.87)	

Graph1: *Sleep problem reported by ED users*

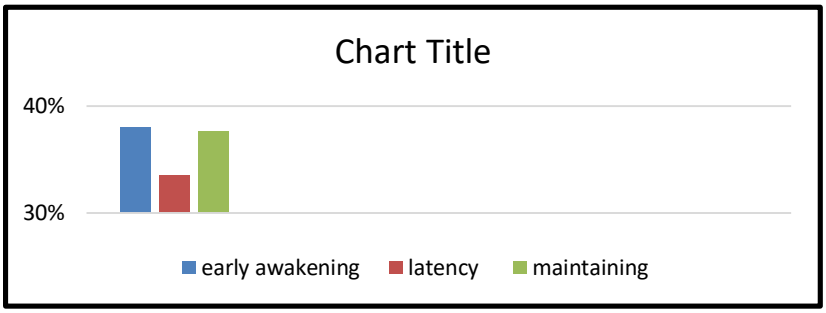

Table: 2 *Mann-Whitney U showing difference between ED and NED in sleep*

Groups	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)
Users	48	62.23	2987.00	1453.000	-1.084	.278
SL						
Non users	68	55.87	3799.00			
Users	48	59.50	2856.00	1584.000	-.303	.762
SQ						
Non users	68	57.79	3930.00			
Users	48	61.07	2931.50	1584.000	-.743	.457
SD						
Non users	68	56.68	3854.50			
Users	48	52.77	2533.00	1357.000	-2.061	.039*
SE						
Non users	68	62.54	4253.00			
Users	48	59.59	2860.50	1579.500	-.330	742

SDi						
Non users	68	57.73	3925.50			
Users	48	60.57	2907.50	1532.500	-1.270	.204
SM						
Non users	68	57.04	3878.50			
Users	48	47.43	2276.50	1100.500	-3.554	.000***
DD						
Non users	68	47.43	4509.50			
Users	48	57.24	2747.50	1571.500	-.342	.732
SGS						
Non users	68	59.39	4038.50			

*** p < .00, * p < .05. NOTE- Sleep Latency(SL), Sleep Quality (SQ), Sleep Duration(SD), habitual Sleep Efficiency (SE), Sleep Disturbances (SDi), use of Sleeping Medications (SM) , and Daytime Dysfunction over the last month (DD) and Sleep Global Score (SGS)

Table: 3 *Mann-Whitney U showing difference between male and female in sleep*

Variables	Gender	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Asymp. Sig. (2-tailed)
SL	male	26	19.96	519.00	168	2.613	.009
	female	22		29.86		657.00	
SQ	male	26	21.54	560.00	209	1.785	.074
	female	22		28.00		616.00	
SD	male	26	22.87	594.50	243	.942	.346
	female	22		26.43		581.50	

SE	male	26	23.77	618.00	267	.641	.521
	female	22		25.36		558.00	
SDi	male	26	18.10	470.50	119	3.816	.000***
	female	22		32.07		705.50	
SM	male	26	23.81	619.00	268	.703	.482
	female	22		25.32		557.00	
DD	male	26	23.71	616.50	265	.691	.489
	female	22		25.43		559.50	
SGS	male	26	19.19	499.00	148	2.882	.004***
	female	22		30.77		677.00	

*** p < .00, **p < .01. NOTE- Sleep Latency (SL), Sleep Quality (SQ), Sleep Duration (SD), habitual Sleep Efficiency (SE), Sleep Disturbances (SDi), use of Sleeping Medications (SM), and Daytime Dysfunction over the last month (DD) and Sleep Global Score (SGS)

The main aim of the study was to assess and compare the quality of sleep in ED and NED among college graduates. Further it also aimed at analyzing the quality of sleep between genders in the ED group. The sample selected through the purposive method in the view research aim consisted of 116 participants with mean age 21.52 (± 3.56). The mean age of ED was 21.83 (± 2.42) and NED was 21.21(± 2.46). ED group consisted of 26 males ($\sigma 2$= 22.26, ±3.20) and 22 females (σ = 21.39, ±2.53). NED group had 37 males (σ = 21.62, ±1.50) and 31 females (σ = 20.81, ±1.20). The ED group consumed average 3 drinks in a week.

The scores in table 2 indicated that there was no significant difference in the global score of sleep between users (ED) and non-users (NED). However, there was a significant difference in the sleep efficiency scores of ED and NED U (114) =1357.000 p = 0.039 and in the day time dysfunction scores of ED and NED U (114) = 1100.500, p = 0.000. These findings are suggestive of the fact that although the global sleep is not affected, certain domains of sleep are affected. Sleep efficiency, is understood as the measure of time spent asleep (total sleep time) to the amount of time spent in bed. Day time dysfunction is the measure of interference with the daily activities due to sleep debt in the night are affected.

In table 3 significant differences were found in the global sleep quality of male and female users. Female users are reported to be more affected by poor sleep quality. They are also found to have significant difference in sleep latency and sleep disturbance against their counter parts. Sleep latency is understood as the amount time taken to fall asleep after entering on bed to sleep.

Graph 1 is self-report of the clinical interview prior to the selection of the ED sample and it revealed that most of the people had problem with sleep. 38 % experienced early morning awakening, 37.58% had problem with maintaining sleep and 33.45% experienced difficulty in getting sleep. The findings from the sleep scale also validated this claim. It is obvious from Table 2 that sleep efficiency was significantly different in ED than in NED. Other studies also reported the problem of sleep due to consumption of energy drink. Review papers of Michael et al (2011), and Sanchez et al (2013) ED users experienced sleep problems. Insomnia was reported in the findings of Alsunni & Badar (2011) and Bawazeer & AlSobahi (2013). The findings of this study are largely consistent with findings of Mwape, Richard and David Mulenga (2019), Sanchez et al (2013), Lohsoonthorn et al (2013) and Lemma, et al (2012) that reported higher prevalence of poor sleep quality among college students. However, the findings are not conclusive about the poor sleep quality. Sleep efficiency and day time dysfunction due to poor sleep were the two domains that are affected to a significant level. The findings related to the sleep quality of male and female users are mostly consistent with previous studies. Studies found that female users are reported to have poorer quality of sleep than males. (Sanchez et al.2013 & Marco et al. 2011). Alsunni & Badar (2011) observed that only 36.7 % male and 14.28% female are free of such adverse effects. The reasons for poor sleep quality in female consumer than male consumer can be an area for further research.

IV. Conclusion

Energy drink, a common beverage with high quantity of caffeine that claims to enhance energy level of consumer immediately, is available easily everywhere in India. An increase in the consumption of energy drinks by students is observed. The most probable reason for such a hike in users is the media promotion of energy drinks as if they are energizers without any harmful effects. The psychoactive content like caffeine has proven to be harmful and therefore DSM-5 treats them under caffeine addiction. The objective of the present study was to find out sleep quality among energy drink (ED) users and non-energy (NED) drink users. There are a number of studies on energy drink in the west and a few in Asian countries. A dearth of data on energy drink consumption is found in India. The existing studies have found that it can cause poor quality of sleep. The present study's findings are largely validating previous findings as ED users experienced poor sleep efficiency and high day time dysfunction. The female ED suffer lower level of sleep quality in comparison to their male counterparts. However other areas such as Sleep Latency (SL), Sleep Quality (SQ), Sleep Duration (SD), Sleep Disturbances (SDi), use of Sleeping Medications (SM), and Sleep Global Score (SGS) are not significantly affected. Therefore, it cannot be conclusively stated that the sleep quality is significantly affected.

The study did not control the consumption quantity, time and the brand of energy drinks which are relatively important factors. Since the study was exploratory in nature, the scope was limited.

Although the population was free of mental illness and serious medical conditions, other physical or medical conditions were not controlled which can affect sleep quality. Alcohol mixed with energy drink (AMED) group was not considered separately due to lack of sample availability. AMED group can be further studied. The reasons for female ED users having more effect on sleep can be explored. Consumption quantity-controlled comparison is also a possibility for the future research.

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