
Energy Drink Consumption Among Medical and Dental Students at the University of Port Harcourt, Nigeria

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Abstract

Background: Energy drink(ED), said to step up alertness, and improve mental and physical performance is rapidly becoming popular especially among young people. This study was to determine the health effect of energy drink among medical and dental students at the University Port Harcourt, Nigeria.

Methodology: This descriptive cross-sectional study was carried out among 344 consenting medical and dental students of the University of Port Harcourt, Nigeria in 2018. Respondents were selected via a multistage sampling technique and had pre-tested, close ended, structured, self administered questionnaires applied. Data was analyzed using SPSS and presented in tables.

Results: The sex distribution was male (51%) and female (49%.) with the mean age of 22.9 ± 4.2 years. From the study, 87.8% of respondents had consumed ED at least once (life-time prevalence) and 80.1% of respondents were current consumers of ED (point prevalence). Only 26.5% had a good knowledge, while 51.7% had a positive attitude towards ED consumption.

Conclusion: There was a high prevalence of ED consumption among medical and dental students of the University of Port Harcourt. It is recommended that there be increased education and government control with regards to assess and consumption of energy drinks.

Keywords: Energy drinks, students, health

INTRODUCTION

Energy drinks (ED), are non-alcoholic fortified beverages which contain added nutritional supplements like sweeteners and sugar derivatives (i.e. glucuronolactone and ribose), herbal extracts (i.e. Guarani, ginseng and ginkgo biloba), amino acids (which may include instil, niacin, pantheon and B-complex vitamins) and stimulants such as caffeine (methylxanthine-containing), yohimbine and taurine.^{1,2}ED is also referred to as beverage containing multiple ingredients which have similar yet distinct deliberate effect on the neurological and/or psycho-physiological efficiency. Medical and Dental students are persons following a course of study leading to qualification as a Doctor of Medicine and Dental Surgeon respectively.³ Following the enrolment, the process of studying medicine and dentistry is associated with a variety of stressors, tedious physical and mental participation, all for the purpose of developing expertise in the knowledge expected of a medical doctor or dental surgeon⁴. In today's fast-paced world,

people need vigour to keep up with their demanding schedules and activities. They sleep less and work more thus, naturally require energy substitutes. For the medical and dental student who believe so much in the trend of *all work and no play*, the urge of energy drink consumption will become an almost inevitable resort. These students often turn to ED to get through long nights spent preparing for exams or turning in an assignment.⁵

There are limited findings about ED in Nigeria. However, ED started to make its way to fame as early as the 1970s in Europe and Asia. Then it spread to the United States of America (USA) in the 1990s, and to the other parts of the world over the next decade after that.⁵ There is a forecast for all regions of the world to experience strong growth until 2020.^{5,6} In 2011, the European Food Safety Authority (EFSA) commissioned data for ED in 16 countries of the European Union and they found out that 68% of adolescents (aged 10-18years), 30% of adults, and 18% of children (<10years) consumed ED. Among adolescents, consumption varies from 48% in Greece to 82% in Czech Republic. Among children, consumption varied from 6% in Hungary to 40% in Czech Republic. The average consumption was 21 in adolescents and 0.491 in children. The major determinants of ED consumption from several studies include influence by friends, advertisement, curiosity, enjoying leisure time, boosting energy for struggling, staying awake for long hours,⁶ enjoyable flavour, need for energy, to reduce fatigue, to enable them drive for longer time, and for studying or doing a major project.^{5,9} While one of the deterrents was the cost of these EDs, as many of their consumers report that they are quite expensive.⁷

Energy drinks are touted to step up alertness and improve mental and physical performance.⁸ This marketing strategy of ED companies have been quite effective and appealing to its consumers especially the youths,^{9,10} Since majority of students in the university, (medical and dental students inclusive) are youths, there is the likelihood of increased consumption among this group. Caffeine being the major component in the energy drink is known to produce the effects that make the drink 'desirable' has its consumption increased, and thus abuse of caffeine is inevitable.¹¹ This is followed by the aggressive marketing and poor awareness on the consequences of high caffeine intake. With caffeine being one of the major components of ED, it is vital to know the impact it has on the body. The major benefits of energy drink as reported by the consumers include production of energizing effects being strongest 30-60 minutes after consumption and sustained for at least 90 minutes. Caffeine has been found to be the primary constituent responsible for these effects and it has been proven that low doses of caffeine (12.5-100mg) improve cognitive performance and mood as well as improve alertness which are all benefits that are appealing to the students especially medical students. Maurine has been seen to enhance some physiological functions like retinal and neurological development, osmoregulation, modulation of cellular calcium levels and immune functions.¹² These benefits may be the major reasons for its frequent usage among medical students. Among the several potential benefits of consuming energy drink speculated, the ability to stay awake for longer time was stated by majority of the consumers.¹³⁻¹⁶

Despite its benefits, caffeine has been found to have detrimental health consequences which include diuresis and natriuresis, reduction in insulin sensitivity, increasing mean arterial blood pressure, disturbances and increase in heart rate. Caffeine consumption may also be associated with palpitations, anxiety, sleep problems, dehydration. Also, when the sleep pattern of a

teenager is frequently disrupted, it can lead to increasing incidence of risk-taking behaviour. Then for the sugar containing energy drinks which can contain as much as 25-50g of sim In 2011, the European Food Safety Authority (EFSA) commissioned data for ED in 16 countries of the European Union. They found out that 68% of adolescents (aged 10-18years), 30% of adults, and 18% of children (<10years) consumed ED. Among the adolescents, consumption varies from 48% in Greece to 82% in Czech Republic. Among children, consumption varied from 6% in Hungary to 40% in Czech Republic. The average consumption was 21 in adolescents and 0.491 in children. Despite all these, there have been limited rigorous studies carried out in Europe on the risks associated with the increase in ED consumption, particularly among young people.²² While in America, it has also been noticed that next to multivitamins, ED are the most popular dietary supplement consumed among teenagers and young adults,²⁵ and about 30% of them consume ED on a daily basis. Males between 18 and 34 years consume the most ED, and almost one-third of teens between 12-17 years drink them regularly.²⁶⁻²⁸ Consuming ED also increased safety concerns as within 2007 and 2011, the overall number of ED related visits to the accident and emergency unit in the U.S doubled, with the most significant increase in the people aged 40 and older.^{22,29}

As energy drink consumption continues to grow worldwide and most especially among teenagers and young adults, it is important to critically examine the health effects of these beverages on the population. Emerging evidence has linked ED consumption with a number of negative health consequences such as chronic headaches, central nervous system, cardiovascular, gastrointestinal, and renal system dysfunction which include nervousness, irritability, tremors, muscle twitching, disturbed sensation, palpitations, arrhythmias, and depression.³⁰ Thus seeing that the medical and dental student are the future 'life-saver', their own life has to be preserved for the fulfilment of the mandate that will be placed on them. Hundreds of various brands of EDs are currently streaming the market, with caffeine content varying from 50mg to an alarming 505mg per can or bottle, with no or lax regulations such as content labelling and health warnings even in the U.S.³¹⁻³³ This lack of regulatory oversight has resulted in aggressive marketing of EDs targeted primarily at young adults for performance-enhancing, psychoactive, improving cognitive and stimulant drug effects, whereas, studies supporting these claims are limited, in fact, several adverse health effects have been related to ED.³⁴

Also, the regulation of caffeine containing beverages has been difficult generally, probably because of the widespread and long-term use of beverages such as coffee and tea in which caffeine is a natural constituent.³⁵ Despite this, several countries have put measures in place to regulate the labelling, distribution, and sale of ED that contain significant quantities of caffeine. For instance, the European Union requires that ED have a "high caffeine content" label. Norway restricts the sale of Red Bull to pharmacies, while France (recently) and Denmark banned the sale of Red Bull altogether.³⁶ Canada requires labels indicating that Red Bull should not be mixed with alcohol and that maximum daily consumption should not exceed two 8.3oz. cans.²² In Kuwait, Red bull was banned for children under 16years, as it was associated with the deaths of two members of the national team squash following heart attack.²⁷ This study was to determine the prevalence and health effects of energy drink consumption among medical and dental students in the University of Port Harcourt.

METHODOLOGY

Study Area/Population: This study was carried out in the University of Port Harcourt, a Federal University located in the Niger-Delta (South-South) region of Nigeria, at Choba Obio/Akpor Local Government Area (LGA) of Rivers state. It is found 20Km North-west of Port Harcourt. It covers about 4000 hectares of land, and the geographic coordinates are Long. 4.9°N and Lat. 6.9°E.^{70,71}The University was established in 1975 first as a College, then conferred with the 'University' status in 1977. It has 3 Campuses where academic, administrative and residential buildings are located; Abuja Campus being its main campus, Delta and Chua Campuses being its annex campuses. It is bounded by 3 communities, Alou, Chua, and Alachua, the East/West road and the University road cross each other at the East/West junction which places each campus in a different quadrant. It has a population of about 44,500 Undergraduate and 10,500 post-graduate students.⁷²It currently has twelve (12) Faculties. The study involved only level 200 to level 600 medical students. in the selected faculties above.

Inclusion Criteria: All male and female medical and dental students from 200 to 600 levels of the University of Port Harcourt but excludes other categories of students including foreign students from other universities or countries undergoing their clinical postings at the University of Port Harcourt.

Study Design/ Sample Size: This was a descriptive cross sectional study and applying sample size for mean (including allowance for non-response), a total of 378 calculated respondents was arrived at.

Sampling Method: Multistage Sampling method was used for this study - the study population of 625 was stratified into medical and dental students. From the records, medical students were 514 and dental students were 111. Therefore, the sample size was proportionately allocated to each of the strata. In the third stage, the dental and medical students were further stratified into 5 levels of study each, i.e. 200, 200, 400, 500, and 600 respectively. Then selection of respondents from each of the level of study by simple random sampling method of balloting using the class list as a sample frame.

Study Instrument: A pre-tested close ended, structured self-administered questionnaire which consisted of six sections probed socio-demographics, family and social history, past medical history, Knowledge of ED among medical and dental students and level of consumption of ED.

Data management: Data was collected with 2 trained assistants who administered the questionnaires over 2 weeks on consenting students on week days after school from 4.00pm daily. Data were entered into Statistical Package for Social Sciences (SPSS) and descriptive statistics i.e. mean, median, and standard deviation while Chi-square test was used for inferential statistics at a confidence interval of 95, and p value set at ≤ 0.05 . Data were presented in tables.

Ethical Consideration: Approval for this study was obtained from the Ethics Committee of the University of Port Harcourt Teaching Hospital. A signed informed consent was sought for and obtained from each respondent. And all the respondents were informed that the study was voluntary and that they could opt out of the study at any time. Also, participants were assured that confidentiality will be maintained during and after data collection and that information given would be used for research purposes only.

Study Limitations: Some respondents were skeptical about answering questions pertaining to recreational drug use, as they albeit erroneously thought that they would be reported or arrested, but they were reassured that the data collected was strictly confidential, and for academic purposes only.

RESULTS

Data for this study was collected by administering 378 self-administered questionnaires and 344 questionnaires were retrieved. However, after data cleaning involving removal of questionnaires with incomplete responses for key variables, 340 questionnaires were considered suitable for analysis. This gave a response rate of 90%. The results of the analysis are presented here under the following sections.

Table1: Socio-demographic characteristics of respondents

| Socio-demographics | Frequency (n) | Percentage (%) |
|---------------------------------|----------------------|-----------------------|
| Age (years) n = 340 | | |
| 15-20 | 105 | 30.9 |
| 21-25 | 154 | 45.3 |
| 26-30 | 70 | 20.6 |
| ≥31 | 11 | 3.2 |
| Mean age=22.9 ± 4.2 | | |
| Sex (n = 341) | | |
| Male | 174 | 51.0 |
| Female | 167 | 49.0 |
| Department(n = 341) | | |
| Medicine | 286 | 83.87 |
| Dentistry | 55 | 16.13 |
| Level (n = 343) | | |
| 200 | 79 | 23.03 |
| 300 | 48 | 13.99 |
| 400 | 70 | 20.41 |
| 500 | 76 | 22.16 |
| 600 | 70 | 20.41 |
| Marital Status (n = 341) | | |
| Single | 331 | 97.07 |
| Married | 10 | 2.93 |
| Religion (n = 341) | | |
| Christianity | 337 | 98.83 |
| Others | 4 | 1.17 |

Table 2: Family and social history of respondents

| Variable | Frequency | Percentage (%=100) |
|---|-----------|-----------------------|
| Family History of Mental Illness (n=339) | | |
| Yes | 12 | 3.54 |
| No | 327 | 96.46 |
| Alcohol Consumer/User (n=343) | | |
| Yes | 96 | 27.98 |
| No | 247 | 72.02 |
| Recreational Drug Use(n=342) | | |
| Yes | 20 | 5.85 |
| No | 322 | 94.15 |
| History of Past Mental Illness (n=342) | | |
| Yes | 59 | 17.25 |
| No | 283 | 82.75 |
| Mental Illness Associated with ED Intake (n=275) | | |
| Yes | 5 | 1.8 |
| No | 270 | 98.2 |

Table 3: Respondents Knowledge of Energy Drinks

| Level of Knowledge | Frequency (n=344) | Percentage (%) |
|--------------------|-------------------|----------------|
| Good Knowledge | 91 | 26.5 |
| Fair Knowledge | 196 | 57.0 |
| Poor Knowledge | 57 | 16.5 |
| TOTAL | 344 | 100.0 |

Table 4: Respondents attitude to Energy Drink consumption

| Attitude | Frequency (n=321) | Percentage (%) |
|-------------------|-------------------|----------------|
| Negative Attitude | 155 | 46.3 |
| Positive Attitude | 166 | 51.7 |

Table 5: Respondents level of consumption of Energy Drinks

| Consumption of ED | Frequency | Percentage (%) |
|---------------------------------|-----------|----------------|
| Ever Consumed ED (n=344) | | |
| Yes | 302 | 87.8 |

| | | |
|--|-----|------|
| No | 42 | 12.2 |
| Currently Consume ED(n=302) | | |
| Yes | 242 | 80.1 |
| No | 60 | 19.9 |
| Quantity Consumed per sitting (Cans)n=242 | | |
| 1 | 210 | 87.8 |
| 2 | 30 | 12.4 |
| ≥ 3 | 2 | 0.8 |

Table 6: Consumption of Energy Drinks with other mood altering substances among respondents

| Variable | Frequency(n) | Percentage (%) |
|---|--------------|----------------|
| Consume ED with other substances (n=266) | | |
| Yes | 85 | 32.0 |
| No | 181 | 68.0 |
| Substance Used (n=85) | | |
| Alcohol | 7 | 8.3 |
| Cigarette | 6 | 7.1 |
| Food | 60 | 70.6 |
| Tramadol | 2 | 2.3 |
| Marijuana | 3 | 3.5 |
| Snacks | 4 | 4.7 |
| Others | 3 | 3.5 |
| Total | 85 | 100.0 |

Table 7: Health Effects of Energy drinks among respondents

| Variable | Frequency | Percentage (%) |
|----------|-----------|----------------|
|----------|-----------|----------------|

Observed Health Effect (n=302)

| | | |
|-----|-----|------|
| Yes | 242 | 80.1 |
| No | 60 | 19.9 |

Health Effects Reported*

Ranked Order

| | |
|-------------------------|-----|
| Boosts Energy | 242 |
| Mental Alertness | 197 |
| Stay Awake Longer | 174 |
| Increases Urination | 146 |
| Causes Insomnia | 116 |
| Causes Anxiety | 81 |
| Causes Palpitation | 81 |
| Increases Stress | 68 |
| Decreases Concentration | 65 |
| Causes Weight Gain | 54 |
| Causes Dental Decay | 41 |
| Causes Depression | 37 |
| Causes Suicidal Ideas | 17 |

* Multiple responses

Table 8: Relationship between observed health effect and quantity of ED consumed per sitting

| Variable | Observed n=242 | Health Effect | Total | X ² | df | p-value |
|---------------------------------------|-------------------|------------------|-------|----------------|----|---------|
| Quantity of ED Consumed (Cans) | Yes | No | | | | |

| | | | | | | |
|----|-----------|------------|-----------|-------|---|-------|
| 1 | 66(31.4%) | 144(68.6%) | 210(100%) | 1.169 | 2 | 0.557 |
| 2 | 7(23.3%) | 23(76.7) | 30(100%) | | | |
| ≥3 | 1(50%) | 1(50%) | 2(100%) | | | |

Table 8 above shows that there is no statistically significant relationship between the quantity of ED consumed and the occurrence of health effects, p-value>0.05.

Table9:Relationship between age, gender, department, level of study and knowledge of Energy Drinks of respondents

| Variable | Knowledge | | | Total | X ² | df | p-value |
|------------------------------|----------------|----------------|----------------|------------|----------------|----|---------|
| | Good Knowledge | Fair Knowledge | Poor Knowledge | | | | |
| Age n=340 | | | | | | | |
| 15-20 | 30 (28.6%) | 56 (53.3%) | 19 (18.1%) | 105 (100%) | 10.55 | 6 | 0.229 |
| 21-25 | 31 (20.1%) | 95 (61.7%) | 28 (18.2%) | 154 (100%) | | | |
| 26-30 | 26 (37.1%) | 35 (50%) | 9 (12.9%) | 70 (100%) | | | |
| ≥31 | 3 (27.2%) | 7 (63.6%) | 1(9.1%) | 11 (100%) | | | |
| Gender n=341 | | | | | | | |
| Male | 47 (27%) | 106 (60.9%) | 21 (12.1%) | 174 (100%) | 4.945 | 2 | 0.084 |
| Female | 42 (25.1%) | 90 (53.9%) | 35 (21%) | 167 (100%) | | | |
| Department n= 341 | | | | | | | |
| Medicine | 74 (25.9%) | 165 (57.6%) | 47 (16.4%) | 286 (100%) | 0.261 | 2 | 0.878 |
| Dentistry | 16 (29.1%) | 30 (54.5%) | 9 (16.4%) | 55 (100%) | | | |
| Level of study n= 343 | | | | | | | |
| 200 | 24 (30.4%) | 47 (59.5%) | 8 (10.1%) | 79 (100%) | 11.348 | 8 | 0.183 |
| 300 | 16 (33.4%) | 22 (45.8%) | 10 (20.8%) | 48 (100%) | | | |
| 400 | 12 (17.1%) | 45 (64.3%) | 13 (18.6%) | 70 (100%) | | | |
| 500 | 16 (21%) | 47 (61.8%) | 13 (17.2%) | 76 (100%) | | | |
| 600 | 23 (32.9%) | 34 (48.5%) | 13 (18.6%) | 70 (100%) | | | |

Table 10:Relationship between age, gender, department, level of study, knowledge and attitude towards ED consumption by respondents

| Variable | Positive Attitude | Negative Attitude | Total | X ² | df | p-value |
|------------------------------|-------------------|-------------------|------------|----------------|----|---------|
| Age n=272 | | | | | | |
| 15-20 | 39 (46.4%) | 45 (45.7%) | 84 (100%) | 8.111 | 3 | 0.044 |
| 21-25 | 77 (61.1%) | 49 (38.9%) | 126 (100%) | | | |
| 26-30 | 33 (61.1%) | 21 (38.8%) | 54 (100%) | | | |
| ≥31 | 7 (87.5%) | 1 (12.5%) | 8 (100%) | | | |
| Gender n=274 | | | | | | |
| Male | 91(63.6%) | 52 (36.4%) | 143(100%) | 4.909 | 2 | 0.027 |
| Female | 66 (50.1%) | 65 (49.6%) | 131(100%) | | | |
| Department n= 274 | | | | | | |
| Medicine | 139 (59.9%) | 93 (40.1%) | 232(100%) | 3.137 | 2 | 0.077 |
| Dentistry | 19 (45.2%) | 23 (54.8%) | 42 (100%) | | | |
| Level Of Study n= 274 | | | | | | |
| 200 | 33 (50%) | 33 (50%) | 66 (100%) | 6.781 | 4 | 0.148 |
| 300 | 25 (67.6%) | 12 (32.4%) | 37 (100%) | | | |
| 400 | 32 (58.2%) | 23 (41.8%) | 55 (100%) | | | |
| 500 | 42 (66.6%) | 21 (33.3%) | 63 (100%) | | | |
| 600 | 26 (49.1%) | 27 (50.9%) | 53 (100%) | | | |
| | | | 53 (100%) | | | |
| Knowledge n=344 | | | | | | |
| Goodknowledge | 72 (79.1%) | 19 (20.9%) | 91 (100%) | 9.683 | 2 | 0.008 |
| Fair knowledge | 176 (89.8%) | 20 (10.2%) | 196(100%) | | | |
| Poor knowledge | 54 (94.7%) | 3 (5.3%) | 57 (100%) | | | |
| | | | 57 (100%) | | | |

DISCUSSION

Energy Drinks are becoming popular among young people, and with increasing report of some adverse effects especially when taken in excess or combination with other illicit substances, have become a focus for more research. Findings showed that 26.5% had a good knowledge, 57.0% had a fair knowledge, and 16.6% of respondents had a poor knowledge of Energy Drinks respectively. This was poor relative to the expectations for medical and dental students, since they were into a profession that dealt with health. This was consistent with findings³⁰ from studies in Saudi Arabia which revealed poor knowledge as among more than half of the students seen did not know that ED contained caffeine, and about 70% of both male and female did not know that ED contained herbs. However, a larger number of them knew that ED contained sugar, and many female students and less than half male students knew ED could have adverse health effect.²⁷ These findings differed from a study conducted among medical students in Lublin, Poland, which suggested that the knowledge of the contents, mechanism of action, the effects and side effects of ED was relatively high and more among the male than female respondents, but this seems not to reflect in their pattern of ED consumption as the frequency of ED consumption both as a combination with other substances and on their own among these respondents, was still high.³⁶

In another study conducted among the medical students of Marmara University Medical College, Istanbul, Turkey, it was discovered that though the respondents consumed ED, their knowledge of its ingredients and health risks was unsatisfactory especially, as they were to-be-doctors and were expected to be more knowledgeable than the general public on health issues as this so as to educate the public.³⁴ Majority of respondents wrongly thought that ED were the same as sports drinks, others mistook coca cola to be an energy drink, while a large proportion believed ED to be alcoholic beverages, showing that a lot of misconceptions about ED exists amongst medical students, which is in consistence with other studies, as a study done in 2014 in Saudi Arabia and Egypt respectively revealed that most of the male students (about 70%) and fewer female students (about 37%) viewed EDs to be sport drinks, while 65.2% of the male students and 69.8% of the female students knew that ED differed from soft drinks.²² Which showed a misconception or a deficiency of knowledge about energy drinks.

This study revealed that 166 respondents (51.7%) had a positive attitude towards ED while 155 respondents (46.3%) had a negative attitude towards ED. This is not in consonance with the study reviewed on attitudes of adolescents towards ED, as study done in Saudi Arabia in 2014, showed that adolescents have a negative attitude towards caffeine although they continue to consume ED because they are unaware of the side effects of consuming large dose.^{15,22} It was also shown that there was a significant association between age of respondents and their attitude towards ED as more students between the ages of 21-25 years seemed to have a positive attitude towards ED consumption than students of other age brackets, this may be due to the fact that majority of respondents fell within this age bracket. There was also a significant association between the gender of respondents and their attitude towards ED as more males seemed to have a positive attitude towards ED consumption than females while more females had negative attitude

towards EDs and their consumption than males, but no association was established between the departments or level of study and attitude of students towards ED. Knowledge was seen to affect the attitude of respondents towards ED as the lesser the knowledge, the more positive attitude towards ED was shown. A significant proportion of respondents thought EDs were expensive but this did not affect their attitude toward ED or reflect in their level of consumption.

Findings from the study revealed that of the 344 respondents, 302 of them (87.8%), had ever consumed ED, and out of these, 242 respondents (80.1%) were current consumers of ED, while 42 of them (12.2%) had never taken ED before, hence the point prevalence of ED consumption among medical and dental students from this study was 80.1%, which is higher than that obtained from other studies,²⁷ while the lifetime prevalence was 87.8%. Majority of the current consumers took only one can per sitting (87.8%), while 12.4% of the them took two cans per sitting, only a small percentage of them (0.8%) took more than two cans per sitting, these findings were not too far from that discovered in a study done in Nigeria, Ibadan, in 2014 on ED consumption, which showed that majority (74.6%) of respondents had ever taken ED prior to the study, 42.4% consumed at least one can in a week and 52.1% consumed one can at a sitting.²⁰

The combination of EDs with other substances is becoming a trend as seen in recent studies, and this is really burdensome as most of the substances used are harmful when taken alone, not to talk of being combined with EDs which have caffeine and other stimulants whose effects are not fully known. Alcohol combined with EDs is more hazardous compared to using either of them,²⁴ though the neurobiological mechanisms that explain the interaction between alcohol and EDs are not clear, it was found in an animal study that chronic alcohol and EDs mixture consumption may cause inflammation, oxidative stress, and cell death in the temporal cortex and hippocampus of the brain of rats.²⁵ This study showed that of all respondents, 30.9% consumed EDs with other substances and out of these, 8.3% combined ED with alcohol, 7.1% combined ED with smoking of cigarettes, 2.3% combined ED with tramadol, 3.5% combined ED with weed (Cannabis) while a majority took ED with food. Although, alcohol and recreational drug use as individual entities were not shown to be associated with ED consumption. These findings were in keeping with other studies that revealed that students in medical school combined EDs with other substances.³⁶ In Europe, University of Lublin, Poland, the data gotten from the study on ED consumption showed a relatively infrequent mixing of ED with other substances and consumption of any of the listed substances (Alcohol, Cigarette, Designer Drugs, Coffee, & Medication), together with ED, was declared by 26.25% of those surveyed we declared an ED consumption. Coffee and alcohol were stated as being consumed most frequently together with ED.³⁰

From the study, it was revealed that 242 (80.1%) students experienced some beneficial and some harmful effects of consuming ED, while 60 (19.9%) did not observe any health effect whatsoever. Of all respondents, 272 of them reported to have their energy boosted, 197 experienced mental alertness, and 174 stayed awake longer after consuming ED, which seem to be beneficial effects especially for the medical and dental students. Also, 146 of respondents experienced increased urination, 116 respondents reported insomnia, 81 of them reported anxiety, 81 reported to experience palpitations, 68 of them reported increased stress, 65 respondents experienced decrease concentration, 54 of them experienced weight gain, 41 of them reported

dental decay, 37 of them experienced depression, and 17 of them had suicidal ideas, as a result of ED consumption which are negative effects. In fact, a proportion of students (1.8%) reported past mental illness that was associated to ED and ultimately had negative attitude towards the drinks and their consumption. These findings are consistent with other studies,^{28,34,36} for instance, a study done in 2014, by Universities in Saudi Arabia and Egypt, revealed that about 31.6% of regular users of ED experienced adverse effects such as palpitation, insomnia and frequent maturation.

It was also reported that as a result of consumption of caffeinated beverages (of which ED is) sudden death among apparently healthy person occurred although in rare cases.²² Though these health effects were observed, it was not found to be significantly related to the quantity of cans consumed per sitting statistically, as p-value was >0.05 . It would have been expected that as the students' age and level of study increased, their level of knowledge of issues that pertain to health such as these would increase but this was not the case as it was shown that the age and level of study of respondents were not related to their level of knowledge statistically, hence did not influence their level of knowledge of ED. More male males (27%) seemed to have a good knowledge of ED than females (25.1%), this was not in consistence with most studies that showed more knowledge among females than males and with increasing level of study.^{34,36}

Majority of respondents had never read the nutrition label of ED to know its content, as findings from result show, that of all respondents 55.2% (190) admitted not to have read the nutrition label on ED while only 44.8% (154) had ever read the nutrition label on ED, which showed a poor attitude towards their health as they were less concerned of what they took into their bodies and its effects. This finding was similar to that discovered in a study conducted in 2015 in Taiwan, among undergraduates', of which half of the ED users had never read the nutrition label to know the content of what they drank. This discovery will buttress the fact already established by other studies on the poor knowledge of the ingredient and possible side effects.³¹ And this will further establish the fact that the 'warning notes' on some these ED are not read by majority of its consumers

This study revealed that there was a statistically significant relationship between the age of respondents and their attitude towards ED ($p\text{-value}<0.05$), as positive attitude was seen to increase with increasing age. This is however not consistent with a study done in Thailand which showed respondents 21-30 years having a more positive attitude towards ED products than respondents who were older in age (31-40).³⁶ There was also a statistically significant association ($p<0.05$) between the gender of respondents and their attitude towards ED as more males (63.6%) than females (50.1%) exhibited a positive attitude towards the drinks. Knowledge was also seen to be significantly related statistically with attitude having a $p\text{-value}<0.05$, as the less knowledge participants had about ED, the more positive their attitude was towards ED, while the higher the level of knowledge, the more the participants tended towards a negative attitude to the drinks. There was a statistically significant relationship between the age of respondents, department and level of study and current consumption, all with $p\text{-values}<0.05$, as the higher the age, the higher the proportion of current consumers.

In this study, and as the level of study increased, the proportion of current consumers were seen to increase, a finding similar to that discovered in the study done in 2014, in Saudi Arabia, which showed that ED consumption increased as educational level and class increased.²³ While there was no statistically significant relationship between the gender, knowledge, and attitude of respondents and current consumption of ED, more males (71.3%) than females (68.9%) were seen to consume ED, and this was in consistence with findings from a study conducted in Turkey, Marmara University Medical School in 2011, which showed a relatively high frequency of ED consumption among the respondents (51.4%) with more male students consuming EDs than females.²⁸

More dental students (85.5%) than medical students (67.5%) were current ED consumers, although the ratio of medical to dental students was quite high (5:1) and this may have been effect of over representation. Other factors such as friends' opinion and opinion of the public were seen to influence ED consumption, as some of the respondents took EDs because their friends took them or because of the public opinion of what EDs does to the body. Also examinations were another factor that influenced ED consumption, as a fraction of the participants admitted to using them only during examinations.

Conclusion

There is a high prevalence of ED consumption among medical and dental students of the University of Port Harcourt especially among the males. It is recommended that there be increased health education among these students on the inherent dangers of abuse of energy drinks just as relevant government regulatory agencies should intensify their oversight of prevention and control.

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APPENDIX

QUESTIONNAIRE ON THE PREVALENCE AND HEALTH EFFECTS OF ENERGY DRINK CONSUMPTION AMONG MEDICAL AND DENTAL STUDENTS IN THE UNIVERSITY OF PORT HARCOURT

SECTION A

Socio-demographics (Please tick inside the box provided)

- 1. Age(years): 15-20 21-25 26-30 31-35 >35
 - 2. Gender : Male Female
 - 3. Department : Medicine Dentistry
 - 4. Level of study : 200 300 400 500 600
 - 5. Marital Status : Single Married Seperated Divorced
 - 6. Religion : Christianity Islam Others(sp)
- sp= specify

SECTION B

Family, Social & Past Medical History

- 1. How many children are there in your family? 1 2 3 4 5 Other(sp).....
- 2. Is there a history of mental disorder in your family? Yes No
- 3. Do you take alcohol? Yes No

4. Do you take recreational drugs (cocaine, cannabis, tramadol, codeine)? Yes No
5. Have you had any psychological/mental condition (depression, anxiety disorder, psychosis) in the past? Yes No
6. Was the psychological condition related to energy drink consumption? Yes No

SECTION C

Knowledge of Energy Drinks among Medical Students

1. Have you heard about Energy drinks? Yes No

2. If yes to 1 above, what is the source of your information?

a. Television. Yes No

b. Radio. Yes No

c. Social Media/Internet (Facebook, Twitter, Whatsapp, Instagram). Yes No

d. Supermarkets/Restaurants. Yes No

e. Friends. Yes No

3. What are Energy drinks?

| | YES | NO |
|---|-----|----|
| a. They are non-alcoholic fortified beverages that contain added nutritional complements like sweeteners, sugar derivatives, herbal extracts, amino acids, B complex vitamins, and stimulants such as caffeine. | | |
| b. They are usually carbonated beverage that typically contains caffeine and other ingredients (such as taurine and ginseng) intended to increase the drinker's energy | | |
| c. They are drinks that contain both alcohol and caffeine. | | |
| d. They are the same as Sport drinks. | | |

What does energy drink do/contain?

| | YES | NO |
|-------------------------------------|-----|----|
| a. Boosts energy | | |
| b. Improves mental alertness | | |
| c. Improves athletic performance | | |
| d. Keeps one awake for long hours | | |
| e. Contains high levels of caffeine | | |
| f. Contain some herbs | | |
| g. Can affect sleep pattern | | |

| | | |
|---------------------------|--|--|
| h. Can cause addiction | | |
| i. Can cause heart attack | | |
| j. Arouses one sexually | | |

5. What brands of energy drink do you know?

Red Bull Bullet Black Bullet Power Horse Lucozade Boost
 Monster Matador Energy Others (sp).....

6. Have you ever read the nutrition label on the body of an energy drink? Yes No

SECTION D

Attitude of Medical Students toward Energy Drink Consumption

1. Have you taken energy drink before? Yes No
2. What is your reason for taking energy drink?

| | YES | NO |
|---|-----|----|
| a. Helps me stay awake for longer time | | |
| b. Helps boost my energy | | |
| c. Helps me concentrate better while studying | | |
| d. People say it does the above | | |
| e. My friends take it | | |

3. Do you like or enjoy energy drinks? Yes No

4. If yes to 3 above, what do you like about it?

| | YES | NO |
|---|-----|----|
| a. The flavour/taste is good | | |
| b. It reduces fatigue | | |
| c. Helps me stay awake for longer studying time | | |

5. What do think about energy drinks? Good Bad

6. Do you think energy drinks are expensive? Yes No

SECTION E

Energy Drink Consumption among Medical Students

1. How often do you take energy drink?
 - a. Once in a day. Yes No
 - b. More than once in a day. Yes No
 - c. Three times a week. Yes No
 - d. Others (sp)
2. How many cans do you take in one sitting
 - a. One can. Yes No
 - b. Two cans. Yes No

- c. More than two cans. Yes No
- 3. Do you take energy drinks with other substances? Yes No
- 4. If yes, which of these?
 - a. Alcohol. Yes No
 - b. Cigarette. Yes No
 - c. Food. Yes No
 - d. Tramadol. Yes No
 - e. Others (sp)

SECTION F

Health Effects of Energy Drinks On Medical Students

1. After taking energy drink which of these do you experience?

| | YES | NO |
|--|-----|----|
| a. Energy boost | | |
| b. Mental alertness | | |
| c. Staying awake for longer time | | |
| d. Decreased concentration | | |
| e. Anxiety | | |
| f. Insomnia (inability to sleep) | | |
| g. Increased stress | | |
| h. Depression | | |
| i. Suicidal ideas | | |
| j. Dental decay | | |
| k. Palpitation (feeling your heart beat) | | |
| l. Increased urination | | |
| m. Weight gain | | |