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Original article

Awareness on Digital Drug Abuse and its Applied Prevention among Healthcare Practitioners in KSA

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Abstract

Digital drug abuse, also known as I-dosing, has recently emerged as a danger to Middle Eastern teenagers through different media channels. This study aimed to investigate the level of knowledge of digital drug abuse among health practioners in KSA, explore their attitude towards it and describe the possible preventive policies, if any, and their experience of any medicolegal implemented awareness strategies to combat this phenomenon.

A cross-sectional survey was used to gather data. An open-ended questionnaire with two parts containing open ended questions was developed, validated, pretested, and randomly distributed to 200 voluntary participating healthcare practitioners of both sexes (n = 200) attending a continuous medical education seminar in May 2015 held in Medina. Ethical approval and an informed written consent was obtained.

Participants were males (65%) and females (35%) with different professional degrees. The knowledge of I-dosing of digital drugs was 30%. The source of this knowledge was through media (96%) and through receiving inquiries concerning this topic (71.9%). Only 14.7% of participants knew the mechanism of action of digital drugs. However, 65% of the participants thought digital drugs are real threats. From the participants, 16.9% were approached by an awareness program concerning this issue. This study concluded an urgent need for a well designed awareness program directed at medical practitioners and social communities in KSA.

Keywords: Forensic Sciences, Digital Drugs, I-Dosing, Teenage, Abuse, Prevention, Healthcare Practitioners

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1. Introduction

Digital Drug abuse, also known as I-dosing, has recently been approached as an urging topic endangering Middle Eastern teenagers through different media channels. This approach raised a lot of discussion and speculations among health practitioners, especially toxicologists and psychiatrists. The tremendous role played by media in introducing this phenomenon as a hidden threat to the Arab world and the Middle East region raised a lot of fear among concerned parents who conveyed their worries, inquiries and suspicions to their family physicians [1-8]. As an unknown form of abuse, digital drug abusing is introduced using electronic devices that are widely distributed among teenagers and are easily available through online purchasing.

I-dosing, scientifically known as "binaural beat", is an auditory illusion perceived when two different pure-tone sine waves, both with frequencies less than 1500 Hz having an inter-wave difference less than a 40 Hz, are presented to a listener dichotically through each ear [9-10]. When a listener uses a headphone, he can notice the minimal difference in frequencies of perceived tone and subsequently tones the brain waves to this frequency producing the desired effect [11].

Normally, the human brain deals with rhythmic beats as electrical impulses or brain waves. The digital drug theory is to control these brain waves by synchronizing them with designated binaural beats, which is the same theory applied to the action of many medications known as biofeedback [11].

Binaural-beat is perceived in the inferior colliculus of the midbrain and the superior olivary complex of the brainstem, where auditory signals from each ear are integrated and precipitate electrical impulses along neural pathways

التوعية بشأن تعاطي العقاقير الرقمية والوقاية منها بين ممارسي الرعاية الصحية في المملكة العربية السعودية

المستخلص

يعد تعاطي المخدرات الرقمية المعروفة أيضاً بـ (i-dosing) من الموضوعات التي تم تناولها مؤخراً بوصفها موضوعاً يهدد المراهقين بالشرق الأوسط من خلال وسائل الإعلام المختلفة. هدفت هذه الدراسة إلى التحقق من المستوى المعرفي حول تعاطي المخدرات الرقمية بين الممارسين الصحيين في المملكة العربية السعودية، واستكشاف موقفهم تجاهها، ووصف السياسات الوقائية الممكنة إن وجدت، وخبراتهم حول أي من استراتيجيات التوعية الطبيه والقانونية التي تطبق بهدف مكافحة هذه الظاهرة.

أجريت دراسة استقصائية مستعرضة لجمع البيانات، حيث تم تطوير استبيان مكون من قسمين وتم التحقق من صحته، وتوزيعه عشوائياً على 200 (ن = 200) من ممارسي الرعاية الصحية من كلا الجنسين يحضرون ندوة التعليم الطبي المستمر والتي عقدت في مايو 2015 في إدارة صحة المدينة المنورة بعد الحصول على موافقة اللجنة الأخلاقية، وموافقة المشاركين خطياً. ولقد بينت النتائج التي استندت على مشاركة 65% الذكور و 35% من الإناث من مختلف التخصصات الطبية أنّ 96% استقوا معرفتهم من خلال وسائل الإعلام وأنّ 71.9٪ تعرضوا لأسئلة واستفسارات بخصوص هذا الموضوع . ولقد عرف 14.7% فقط كيفية عمل المخدرات الرقمية. فيما اعتقد 65% من المشاركين أن المخدرات الرقمية تشكل تهديدات حقيقية. وبينت الدراسة أن 16.9% قد حضروا برامج توعية خاصة بهذا الأمر. وخلصت الدراسة إلى ضرورة الحث على إقامة برامج توعية موجهة إلى الأطباء الممارسين والمجتمع في المملكة العربية السعودية تبين خطورة المخدرات الرقمية و كيفية الحماية من انتشارها والتعامل معها.

الكلمات المفتاحية: علوم الأدلة الجنائية، المخدرات الرقمية، المراهقين، التعاطي، الوقاية، الممارسين الصحيين.

through the reticular formation up the midbrain to the thalamus, auditory cortex, and other cortical regions [12-14].

Brainwaves vary in response to environmental stimuli including sound and music. The level and form of response, to some extent, is dependable on individual perception, which leads to changes in the cognitive and emotional state, known as "brainwave entrainment" [13-14].

Auditory driving denotes the suggested ability of a repetitive rhythmic auditory stimuli to 'drive' neural electric activity to entrain what is mainly seen in the upper theta, lower alpha band in electroencephalogram (EEG). Humans rarely hear frequencies below 20 Hz, which is exactly the range of Delta, Theta, Alpha, and low to mid Beta brainwaves [9,14].

Digital drugs are prone to lead to psychological addiction which is rather harder to treat in comparison to physical addiction [11]. One of the purposed investigations to diagnose I-dosing is to measure the EEG readings while listening to the binaural beats. Significant evidence has shown that I-dosing precipitates auditory driving with self-reported subjective experience of emotional and cognitive state [15-18].

Rhythmic patterns developed by percussion, especially drumming, temper autonomic arousal by neural oscillations entertainment. They affect arousal ergo-tropically and tropho-tropically. These auditory excitations were proved to modulate immune function, help relaxation, improve mood, and help to decrease stress [19-28].

I-Doser, a term which refers to an online internet application for purchasing audio contents, claimed to simulate specific mental states through the use of binaural beats, and some of them are named after prohibited recreational drugs [1-15].

There is an increasing need to explore knowledge regarding sources, exposure, diagnosis, treatment and prevention of digital drug abuse in our society, in general, and particularly among medical practitioners, to control it effectively. This study aimed to investigate the level of knowledge of digital drug abuse among health practitioners in the Kingdom of Saudi Arabia, explore their attitude towards this type of abuse and describe the possible preventive policies, if any, and their experience of any medicolegal implemented awareness strategies to combat this phenomenon.

2. Materials and Methods

A cross-sectional survey was done. An open ended self-administered questionnaire was developed, validated, pretested and distributed to 200 voluntary participating healthcare practitioners of both sexes attending a continuous medical education (CME) seminar in May 2015, held in Medina, Kingdom of Saudi Arabia. The inclusion criteria as a healthcare practitioner in KSA were verified by their Saudi Commission for Health Specialties (SCFHS) registration number.

All procedures were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants participating in the study.

The questionnaire included three parts: the first part inquired about the demographic profile of the participant such as gender, age, and the area of practice of the healthcare worker, while the second part addressed the professional status and specialty of the participant. In the third part, 8 questions were included to assess their knowledge,

attitude, perception and prior awareness of digital drugs with a total of 13 items. The collected data was coded, tabulated and statistically analyzed by using SPSS version 22. Descriptive statistics included frequencies and percentages.

3. Results

The response rate was 80% where 160 out of 200 volunteers fully completed the provided questionnaire, while 40 were excluded due to incompletion. The participants who completed the questionnaire consisted of 104 (65%) males and 56 (35%) females. Their ages ranged between 28-59 years (Table-1). Areas of their practice covered all of KSA spreading across Medina (78.8%), Makkah (16.3%), Jeddah (10%), Tabuk (6.9%), Riyadh (5%), Al Khobar ((3.1%) and Dammam (1.9%) having different professional degrees and qualifications. Table-2 shows the academic and professional profile of the responders. The participants presented various professional roles and specialties, from consultants (30%) to residents (17.5%), and from medical (34.4%) to obstetrics and gynecology (2.5%). Specialties related directly with the management of acute cases of digital drug abuse included emergency medicine (14.4%), critical care (10.6%) and psychiatry (10.6%).

Table-3 categorizes various aspects of Healthcare Practitioner's knowledge regarding digital drug abuse or I-dosing. Surprisingly, 70% of them were not aware of the terms, "digital drug abuse" or "I-dosing", and from those who knew this term 60% of them came across this phenomenon through media. The mechanism of action of digi-

Table 1- *Demographic profile of the responders.*

Variables	Number (%)
Gender	
Male	104 (65%)
Female	56 (35%)
Age (Years)	
25-30	39 (24.4%)
31-40	62 (38.8%)
>40	59 (36.9%)
Area of practice	
Makkah	26 (16.3%)
Tabouk	11 (6.9%)
Medina	78 (48.8%)
Dammam	3 (1.9%)
Al-Khobar	5 (3.1%)
Jeddah	16 (10%)
Riyadh	8 (5%)
Total	***n* = 160**

Table 2- *Professional profile of the responders.*

Variables	Number (%)
Professional Status	
Consultant	48 (30.0%)
Fellow	33 (20.6%)
Specialist	51 (31.9%)
Resident	28 (17.5%)
Specialties	
Medical	55 (34.4%)
Toxicology	15 (9.4%)
ENT	19 (11.9%)
Psychiatry	17 (10.6%)
Surgery	4 (2.5%)
Critical care	17 (10.6%)
Emergency Medicine	23 (14.4%)
Clinical Pathology	6 (3.8%)
Obstetrics and gynecology	4 (2.5%)
Total	***n* = 160**

Table 3- *Healthcare practitioner's knowledge of digital drug abuse.*

Questions	Response	Frequency (%)
Do you know the term digital drug abuse or I-dosing?	Yes	48(30%)
	No	102(70%)
What is the source of your knowledge?	Media	96(60%)
	Practice	23(14.4%)
	Both	41(35.6%)
Have you been approached by inquiries about this type of abuse?	Yes	115(71.9%)
	No	45(28.1%)
Do you know how a teenager purchases digital drugs?	Yes	32 (20%)
	No	128(80%)
Do you know the mechanism of action of digital drugs "auditory driving"?	Yes	23(14.7%)
	No	137 (85.3%)
Do you think it is a real threat or it is just a media work?	Yes	104(65%)
	No	56(35%)
In your opinion, how can digital drug abuse be prevented?	Increasing awareness	120(75 %)
	Parenteral control to internet access	103(64.4%)
	Banning the I-doser sites	128(80%)
	More researches are needed to prove this abuse	96(60%)
	Guidelines for management of these cases are needed	90(56.2%)
	Survey for diagnosed or suspected cases in KSA	115(72%)
Have you been approached by an awareness program in this topic?	Yes	27(16.9%)
	No	133(83.1 %)

tal drugs or "auditory driving" was known only to 14.7%, while 85.3% were unaware of the mode of action of these drugs (Table-3). Twenty percent of the participants knew how digital drugs can be purchased, while 80% were unaware about their online availability. Approximately, 72% of the participants were approached by inquiries concerning this topic while 65% of the participants thought digital drugs are real threats.

The suggested prevention protocols included increasing awareness through media (75%), applying parental control

to internet access (64.4%), and banning the I-doser websites (80%). Only 16.9% were approached by an awareness program coordinator concerning this issue. More research work is needed to highlight dangers associated with this abuse and establish guidelines for the proper management of these cases through well designed surveys for diagnosed or suspected cases of digital drug abuse in the Kingdom of Saudi Arabia.

4. Discussion

In 1839, Heinrich Wilhelm Dove, a Prussian physicist, discovered that binaural beats had an impact on the brain [29]. Digital drugs might help with issues such as attention-deficit/hyperactivity disorder (ADHD), sleep problems, anxiety, and addiction. I-dosing and getting high through the internet is a serious growing issue in our community highlighted through many media reports. This is supported by our study, which showed that 96% of participants got their knowledge through media; although they should have more verified sources of acquiring information concerning digital drug abuse. Although healthcare practitioners represent the main sector which parents and social workers approach to seek their help and advice about suspected digital drugs abuse, only 30% of the participating practitioners knew about digital drugs, their abuse and their proper management [4].

Music has always had an effect on the people listening to it. Having a teen-ager using an mp3 to listen to music and beats in the dark could be the introductory way to real narcotic abuse. Being able to detect, prevent and deal with this rapidly growing social evil is the responsibility of the healthcare system and community workers.

Sixty-five percent of participating health care professionals encountered digital drug abuse in one form or the other, and they realized it as being a real threat to teenagers. This perspective has also been emphasized and highlighted by many media reports which warned the society of its danger and marked it as a gateway to digital narcotics abuse. Therefore, legal restrains should be applied for I-doser internet sites. The Saudi National Committee for Drug Control has been working in coordination with the Anti-Drug Commission and the Telecommunications Commission to curb the spread [4,26].

Purchasing wired tracks to bring about the same effects of marijuana, cocaine, opium and peyote needs further studies. It is a frightening thought that only 20% of participants knew the purchasing method for digital drugs, despite this being a very important contributing factor to their abuse as they are easily accessable on the internet [5, 26].

Medical practitioners should have enough knowledge of digital drugs to convey to parents and children. The study showed that 71.9% of participants were approached with parents inquiries, which necessities increasing their knowledge about the symptoms and management processes of digital drug abuse [27].

Only 16.9% of our participants participated in an awareness program for digital drugs, which is low in comparison to the importance of this problem. Therefore, awareness and prevention of digital drugs abuse should be an important part of healthcare programs and community programms too.

Despite the presence of online addiction centers offering help for suspected cases of digital drug abuse, proper management guidelines and combating strategies are still needed to be identified on a wider scale to enable healthcare givers to help them convey proper advice to their pa-

tients and caregivers. Thus, further studies to manage and control this phenomenon are necessary together with proper awareness programs [27].

In this study, participating healthcare professionals proposed that preventive measures to combat this addiction should include restricted access to I-dosing websites and control of online shopping for teens. Also, internet I-dosing sites should be banned by the concerned authorities. Otherwise, teens, being the main targeted customers for I-dosing, will continue to suffer its effects [4,26].

Gao et al., (2014) investigated EEG changes in response to binaural waves. Their results supported the hypothesis that binaural beats can induce brain connectivity changes and recommended further studies to verify this theory [11].

Wahbeh et al. (2007) conducted an uncontrolled pilot study on 8 volunteers to collect preliminary data on psychological and physiologic effects of 60 days daily use of BBT for hypothesis generation and to assess compliance, feasibility, and safety for future studies. Psychological and physiological data were collected before and after a 60-day intervention. There was a decrease in trait anxiety (p = 0.004), an increase in quality of life (p = 0.03), and a decrease in insulin-like growth factor-1 (p = 0.01) and dopamine (p = 0.02) observed between pre- and post intervention measurements. It was concluded that Binaural beat technology may exhibit a positive effect on self-reported psychological measures, especially anxiety. Further research was warranted to explore the effects on anxiety using a larger, randomized and controlled trial. [13]

In their study of effects of binaural beats, Chaieb et al. (2015) stated that these beats may be a promising tool for manipulation of cognitive processes and the modulation of mood states [28,29]. Claims were issued in 2012 by UAE police to ban them, like other addictive substances [6].

National surveys are needed to assess the real size of the problem and to plan a proper preventive and awareness strategy as suggested by the participants for digital drugs abuse control and prevention.

5. Conclusion

This study concluded a dire need for an awareness program directed to medical practitioners and members of the community in KSA, most appropriately though university toxicology and psychiatry sectors to provide a satisfactory level of knowledge about digital drug abuse. Effective awareness programs should be planned across the Arab countries targeting all community partners, including both healthcare and non-healthcare providers, aiming to combat the spread of digital drug abuse properly in our society.

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