Knowledge and (Ab)Use in Connection with Novel Psychoactive Substances: A Cross-Sectional Analysis of Iraqi Medical Students

Ahmed Al-Imam[1,2], Farah Al-Mukhtar[3], Aisha Shafiq[3] & Manolia Irfan[3]

[1] Department of Anatomy and Cellular Biology, College of Medicine, University of Baghdad, Iraq

[2] Department of Postgraduate Medicine, School of Life and Medical Sciences, University of Hertfordshire, United Kingdom

[3] College of Medicine, University of Baghdad, Iraq

Correspondence: Dr Ahmed Al-Imam, House 18/5, Al-Akhtal Street, District 318, Al-Adhamyia, 10053, Baghdad, Iraq. E-mail: tesla1452@gmail.com; a.m.al-imam@herts.ac.uk

Abstract

Background: The extent of (ab)use of the *Novel Psychoactive substances* has been thoroughly mapped in the developed world, particularly in the US, Canada, UK, Western Europe, Australia, and New Zealand. However, there are still untapped geographic locations particularly in the developing world including the Middle East.

Materials and Methods: This study is observational in nature and cross-sectional in design; it is based on a survey that will aim is to estimate the level of knowledge and the extent of (ab)use of psychoactive substances, traditional and novel, in a population of undergraduate medical students from Iraq. There will be an implementation of inferential statistical analyses for the purpose of hypothesis testing. Ethical approvals were granted from the College of Medicine at the University of Baghdad and the University of Hertfordshire.

Results: There was some degree of knowledge in connection with psychoactive substances among a population of medical students. However, the extent of (ab)use is still minimal when compared to that of the developed countries. In general, the knowledge and the extent of NPS (ab)use did not vary substantially as the students progressed through the medical college.

Conclusion: The use of observational analytic tools for assessing the diffusion of the phenomenon of psychoactive and novel psychoactive substances is indispensable. The extent of knowledge and (ab)use of NPS in the Middle East may still be considered minute or insignificant. Further analyses are required in the Middle East; different populations are to be targeted including; students, academics, researchers, medical and paramedical staff, psychiatric patients, prisoners, military and para-military organisations, and even terrorists.

Keywords: Novel Psychoactive Substances, NPS, Hallucinogens, research chemicals

1. Background

Novel psychoactive substances (NPS), also known as research chemicals and designer drugs, represents a unique phenomenon that has witnessed an explosive growth globally; its threats to the economy and public health are innumerable (Boyer et al., 2007; Burns, 2013). The prevalence of the NPS phenomenon within the region of the Middle East is still ambiguous (Al-Imam et al., 2016; Al-Imam et al., 2017; Bigdeli et al., 2013).

A critical question remains unanswered; how to estimate the magnitude of the NPS in this region? Can the extent of NPS (ab)use be determined by modalities other than observational studies of the web? The answer is yes; it can be inferred by modes other than web analytics, for example; cross-sectional studies and survey in a real (non-virtual) population of users, and retrospectively from; seized batches of illicit substances, databases from criminal records, hospital emergency units, border patrol agencies, police departments, and counter-terrorism units. Some of these modalities of research have been already extensively implemented by regulating bodies including; the World Anti-Doping Agency (WADA), the United Nation Office on Drugs and Crime (UNODC), the INTERPOL, and the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) (Burns, 2014 ; Ferri et al., 2015; Mackey & Liang, 2013).

The majority of studies that were implemented to assess the extent and prevalence of (ab)use were carried out in

the developed countries; few attempts were prosecuted in the developing world, and even a fewer attempts were committed for the Middle East and Arabic countries. For instance, the work accomplished by Al-Hemiary and colleagues (Bigdeli et al., 2013; Al-Diwan et al., 2015; Al-Hemiary et al., 2014; Al-Hemiary et al., 2015; Al-Hemiary et al., 2016). However, the advent of intranet networks and virtual social communication media enabled studies to be carried out promptly and with an unrivalled efficiency (Hadgar, 2016; Joh et al., 2017; Moorhead et al., 2013).

In this observational analysis, a cross-sectional survey will be targeting a population of undergraduate medical students from Baghdad-Iraq. As a whole, this study will explore the magnitude of knowledge in relation to the NPS phenomenon, and the extent of use and misuse in the studied population. The study will aim to derive an inference via hypothesis testing models of data science; this study is the 1st of its kind to be carried out in Iraq. The overall level-of-evidence of these integrative analyses is estimated to be of level-2b in accordance with the classification system imposed by the *Oxford Centre for Evidence-Based Medicine* (University of Oxford, 2009).

2. Materials and Methods

This study has been ethically approved by the Institute Review Board (IRB) of the College of Medicine-University of Baghdad under the authority of the IRB meeting no.7 on the 20th of December 2016; the study was also approved by the University of Hertfordshire (Protocol no. LMS/PGR/UH/02723). The nature of the study is observational and cross-sectional; it is based on a survey targeting a population of undergraduate medical students at the College of Medicine, University of Baghdad. It is estimated that the study will reach-out to $1/4^{th}$ of the total students' population at the College of Medicine. The aim of the survey is to infer an estimate in connection with; the level of knowledge of medical student about psychoactive substances including novel ones (NPS) (1), the extent of (ab)use of these substances, if any exist (2), and the correlation with other parameters including demographics, social status, medical illnesses, and past psychiatric history (3). A population of approximately 1800 students was targeted; the survey was made available to students starting from the 17th of March 2017 to the 28th of March 2017. The survey was transferred into an electronic form (e-form) which was composed of three main sections dedicated for; demographic parameters of participants (1), knowledge and the extent of (ab)use of NPS (2), and the smoking, alcohol drinking habits, and other social habits (3).

The time required to complete the survey was estimated to be in the range of 4-7 minutes. The survey questionnaires addressed specific variables; age, gender, handedness, ethnicity, religious affiliation, number of siblings, place of residence, marital and social status, past medical and psychiatric history, the knowledge in connection with psychoactive substances, the knowledge about specific substances including NPS, the extent of use, the experienced adverse effects, drinking and smoking habits, and other related social practices. All responses were anonymous; personal data including name and physical address were neither required nor asked for via the e-survey.

The e-form of the survey was *pilot-tested* (Figure 1) by a group of 20 students; the average duration of time required to complete the questionnaire was 5.3 (+/- 1.2) minutes. The total number of participants was 458, including participants from year-1 students (n=157), year-2 to year-6 (n=301). This 1:2 ratio will enable an intergroup group analyses to be carried out in between students from years-1 versus students from year-2 to year-6; the aim is to test the hypothesis whether the level of knowledge and the extent of (ab)use will significantly vary as the students progress in the medical college.
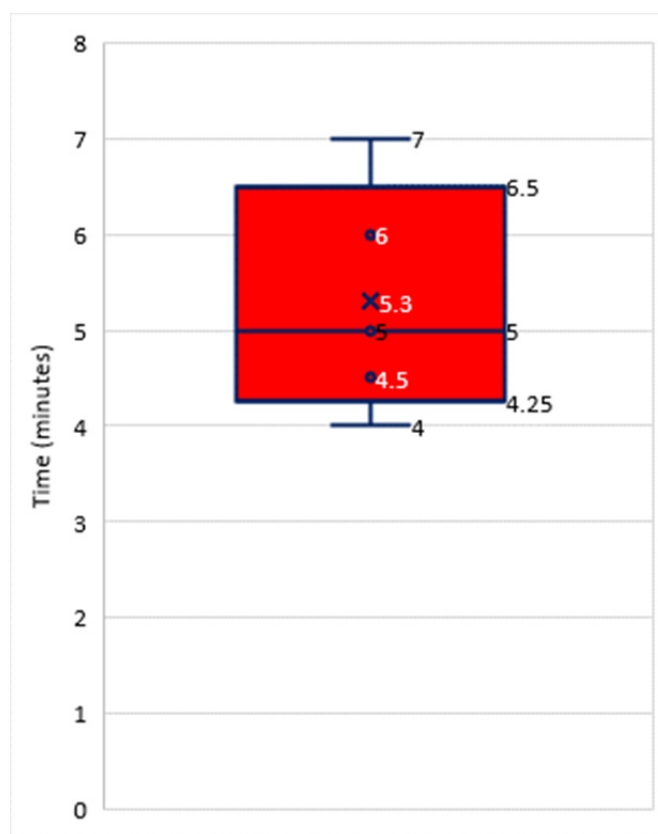
Figure 1. Boxplot Presentation: Time Required to Complete the Survey

The survey itself (e-survey) was created using *Google Forms* online tool; it was distributed to students electronically via the University's encrypted intranet system; the intranet is known as the *Iraqi Network Learning Environment* (INLE) (Iraqi Ministry of High Education and Scientific Research, 2017). The students have been prompted about the nature and the topic of the survey prior to its distribution. Once it was distributed, each student had only one attempt to fill and submit the e-form. Afterwards, responses were not accepted, and the e-form was electronically closed. Responses were later downloaded as *comma-separated values* (.csv) file format, which was converted into a database on *Microsoft Excel 2017*, upon which graphical presentations and statistical analyses were carried out.

Inter-group analyses were done between year-1 medical students versus other medical students from year-2, 3, 4, 5, and 6. The implemented statistical analyses were both descriptive and inferential; inferential statistics included both parametric and nonparametric tests. Alpha (α) value of 0.05 was set as the cutoff margin for statistical significance, and at a confidence interval of 95% (95% CI). Data in relation to this survey were stored on a secure 256-bit encrypted personal computer (PC) with an active firewall deploying anti-virus and anti-malware technologies; the PC was also password-protected, and only one user (the leading researcher) had access to it.

3. Results

In relation to year-1, the age of the participants was from 17-20 years with an average of 18.39 (+/- 0.65) years (Figure 2); the vast majority of year-1 participants were aged 18 (58%) and 19 (33.1%). Females constituted 58.6% (n=92) and males constituted 41.4% (n=65). The majority were right-handed (96.2%), while left-handed individuals were a minority (3.8%) as expected. Arabs were the predominant ethnic group (96.8%), while Turkman (Iraqis of Turkish origins) and Kurdish people accounted for 3.1% and 0.6% respectively. The majority were Muslims (96.8%), while atheists and Mandaists accounted for 2.5% and 0.6% respectively. Most of the respondents were residents of urban areas, while rural area residents accounted for 7.6%. The majority of year-1 students lived with their parents (91.7%), few of them lived either with friends (6.4%) or a male/female partner (1.9%). Few of these students were employed (7.6%), and none of them was married (0%). Only 11.4% were diagnosed with either a neurological or a psychiatric condition. All of the psychiatric conditions were related to the neurotic spectrum including; generalised anxiety disorder (50%), personality disorders, social anxiety, panic

attacks, phobias, tension headache, and migraine headache; participants with psychotic disorders were not detected. On the other hand, 26.8% of the year-1 population has disclosed their need to be evaluated by a psychiatrist either for social support or to manage an existing psychiatric condition. Only 15.3% used to regularly drink caffeinated beverages (Pepsi, CocaCola, etc.), while others were habituated to energy drinks (15.9%) or smoking (6.4%), but none of them (0%) used to drink alcohol or had an *alcohol use disorder* (AUD).
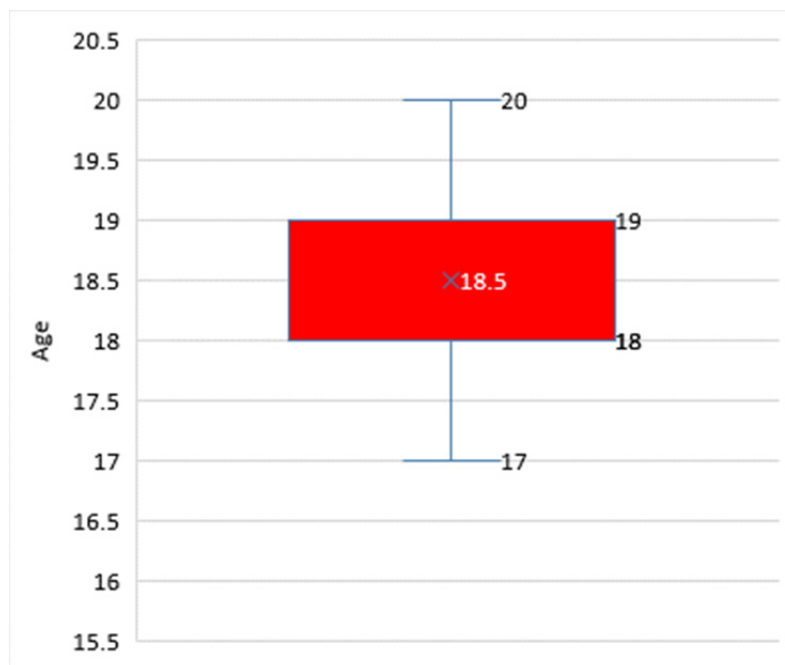

Figure 2. Age of Participants from Year-1: Boxplot Presentation

In relation to NPS knowledge, year-1 students had some degree of knowledge (24.2%), the rest of them (75.8%) had no idea about NPS, and had never heard of any of the terms; *novel psychoactive substances*, *NPS*, *research chemicals*, *legal highs*, *designer drugs* or *street drugs*. Additional specific terms in the Arabic language were also screened for. In relation to those who were aware of NPS, the level-of-knowledge was either; negligible (33.8%), simple (35%), intermediate (26.8%), or advanced (4.5%). Students have also identified their source of knowledge on NPS from; Internet (45.2%), lectures (36.3%), friends and family (24.2%), textbooks (14%), newspapers and media (4.5%), online drug fora (0.6%), and other undesignated resources (1.3%). The top known substances were (Figure 3); valium (50.3%), opium and opioid-related substances (20.4%), Xanax (14.6%), cannabis, hashish, and synthetic cannabinoids (10.8%), amphetamines and amphetamine-type stimulants (8.9%), Crystal Meth (8.3%), Krokodil (7.6%), Khat (6.4%), Salvia Divinorum (4.5%), captagon (4.5%), Haldol (4.5%), Olan (2.5%), Octodrine (2.5%), Ayahuasca (1.9%), and NBOMe (0.6%). Less than one-tenth (9.6%) of the year-1 population used one or more of these NPS. The (ab)use of these substances was categorized based on the frequency of use into; few occasions per year (52.6%), on a monthly basis (31.6%), and on a weekly basis (15.8%), while none has used them on a daily basis. In relation to chronicity of (ab)use, these were categorised into; few months (26.3%), 1-5 year (36.8%), more than 5 years (26.3%), and more than 10 years (10.5%). The (ab)users admitted that they used to purchase substances either from; friends and family members (40%), local pharmacies and "chemists" shops (40%), or from the internet via e-commerce (20%). Additionally, only 15.3% of year-1 population were knowledgeable about the presence of the e-commerce activity. Only 42.1% of (ab)users admitted to being taken to the hospital due to some serious adverse reactions or intoxication (Figure 4); these included loss of consciousness (3.8%), hypersensitivity and allergic reactions (3.8%), delusions (3.2%), cardiac and vascular problems (2.5%), respiratory problems including asthma and suffocation (2.5%), hallucinations (1.3%), musculoskeletal problems (1.3%), aggression and violent behaviour (1.3%), and blood-transmitted diseases including hepatitis and AIDS (0.6%).
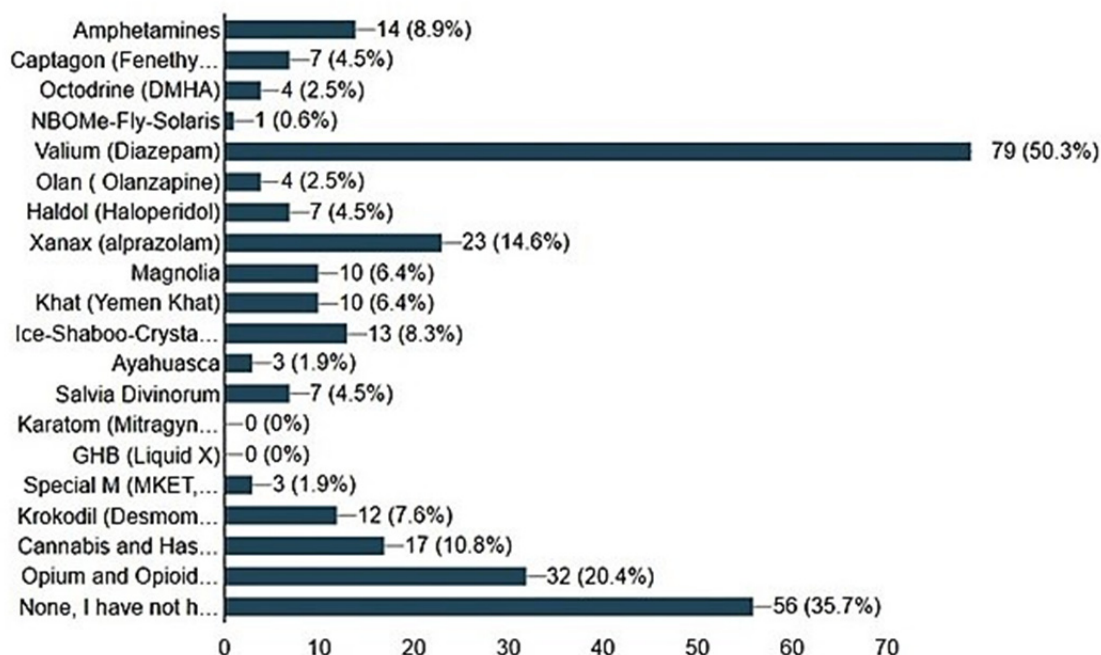
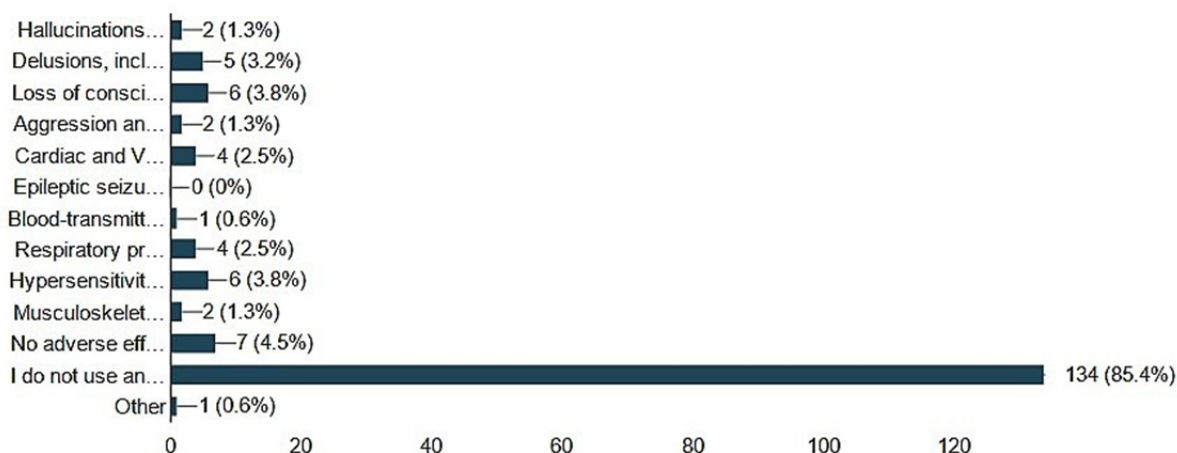Figure 3. NPS Knowledge: Year-1 Students

Figure 4. Most Commonly Encountered Adverse Reactions for NPS (ab)use in Year-1 Students

In relation to year-2 up to year-6, the age of the participants was from 18-24 years with a mean of 20.36 (+/- 1.15) years (Figure 5). The vast majority of participants were aged 20 (33.6%) 21 (24.9%), and 19 (24.3%). Females constituted (69.4%); the majority were right-handed, while left-handed individuals contributed to 8%. The most common ethnic group (Figure 6) were Arabs (88.7%) and Christian ethnicities (5.6%), while Kurdish and Turkman people accounted for 3.3% and 1.3% respectively, other ethnicities contributed modestly (1%). The predominant religious affiliation was accounted for Muslims (92%), Christians (5.6%), Mandaists (2%), and atheists (0.3%). Most of the respondents were residents of urban areas (96.7%), while rural area residents accounted for 3.3%; the majority lived with their parents (95%), few of them lived either with friends (2.7%) or a male/female partner (0.3%), and 2% lived alone. Few of these students were employed (7%), while the rest were unemployed. Those who were married accounted for 1.7%. Only 16.9% were diagnosed with either neurological or psychiatric condition, all of the psychiatric conditions were related to the neurotic spectrum including;

generalized anxiety disorder (27.5%), depression, personality disorders, irritable bowel syndrome (IBS), social anxiety, panic attacks, phobias, tension headache ,and migraine headache; participants with psychotic disorders were not detected. On the other hand, 39.2% of the year-2 to year-6 population has disclosed their need to be evaluated by psychiatrists, which was found to be significantly higher than in year-1 participants (26.8%). Only 15.6% used to regularly drink caffeinated beverages (Pepsi, CocaCola, etc.), while others were habituated to energy drinks (12%) or smoking (11.3%). The extent of Alcohol intake was found to be 1.3%, while AUD was estimated to be a bit less (0.7%). Alcohol consumption seems to be increasing as students progress in the medical college.
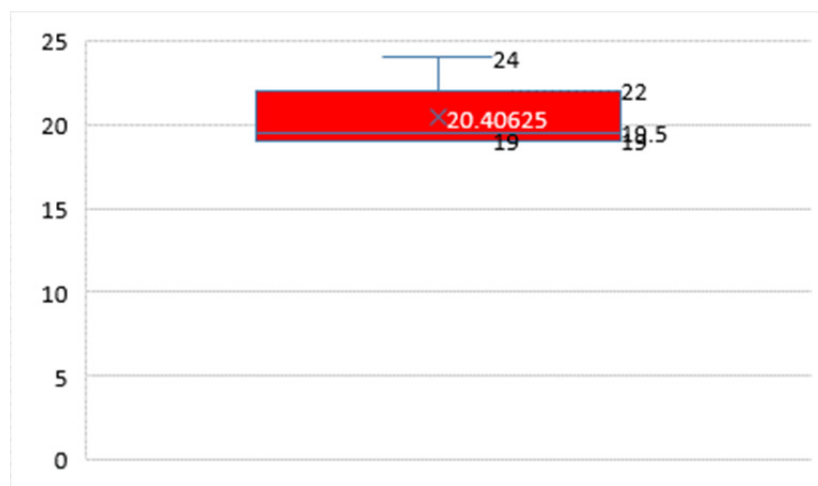

Figure 5. Age of Participants from Year-2 to Year-6: Boxplot Presentation
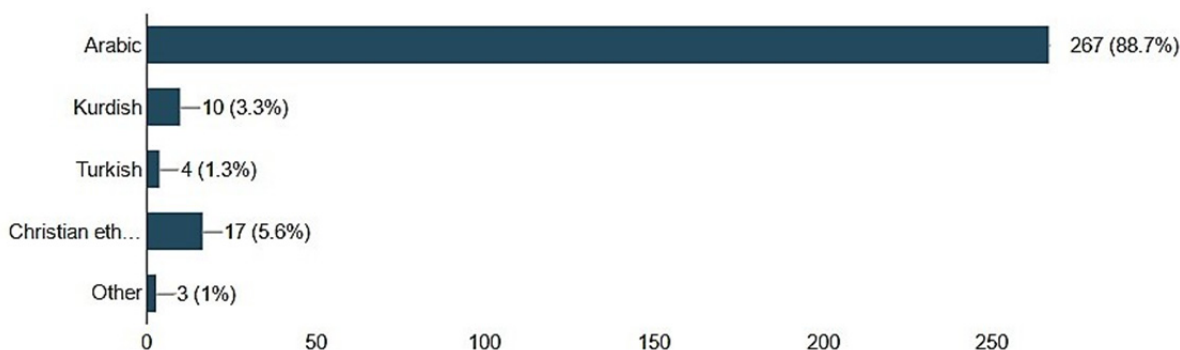

Figure 6. Ethnic Distribution of Survey's Participants, Year-2 to Year-6

In relation to NPS knowledge, year-2 to year-6 students had some degree of knowledge (27.6%), the rest of them (72.4%) never heard of any of the terms; *novel psychoactive substances*, *NPS*, *research chemicals*, *legal highs*, *designer drugs* or *street drugs*; the level of knowledge was not significantly greater than in year-1 students (*p-value*=0.77). Of those who were aware of NPS, the level-of-knowledge was categorised as; negligible (26.9%), simple (44.5%), intermediate (23.9%), or advanced (4.7%); these were also not significantly different from year-1 participants (p=0.41). Students have also identified their source of knowledge on NPS from; Internet (41.5%), lectures (38.2%), friends and family (18.6%), textbooks (9%), newspapers and media (3.3%), online drug fora (1%), and other undesignated resources (9.3%). The top known psychoactive substances (Figure 7), both traditional and novel substances, included Valium (67.8%), opium and opioid-related substances (51.5%), Xanax (17.9%), cannabis, hashish, and synthetic cannabinoids (25.9%), amphetamines and amphetamine-type stimulants (65.1%), Crystal Meth (9.3%), Krokodil (6.3%), Khat (17.3%), Salvia Divinorum (2%), captagon (10.6%), Haldol (8.6%), Olan (8.6%), Octodrine (3.7%), Ayahuasca (0.7%), and NBOMe (0.3%). More than one-tenth (15%) used one or more of these substances, and these were significantly higher than in year-1 students (*p-value*<0.001). The

(ab)use of these substances was categorized based on the frequency of use into; few occasions per year (84.6%), monthly-basis (3.8%), weekly basis (3.8%), while those who (ab)used substances on a daily basis were a bit higher (7.7%). In relation to the chronicity of (ab)use, these were categorised into; few months (28.6%), 1-5 year (28.6%), more than 5 years (39.3%), and more than 10 years (10.7%). The (ab)users used to purchase their substances from; friends and family members (26.2%), from local pharmacies and "chemists" shops (67.4%), or from the internet via e-commerce (6.4%). Additionally, only 15% of the year-2 to year-6 population were knowledgeable of the presence of the e-commerce activity. Only 42.1% of NPS (ab)users admitted to being taken to the hospital due to some serious adverse reactions or intoxication (Figure 8), these included; loss of consciousness (1.7%), hypersensitivity and allergic reactions (3%), cardiac and vascular problems (2%), respiratory problems including asthma and suffocation (1.7%), hallucinations (3.3%), musculoskeletal problems (3.7%), aggression and violent behaviour (1.3%).
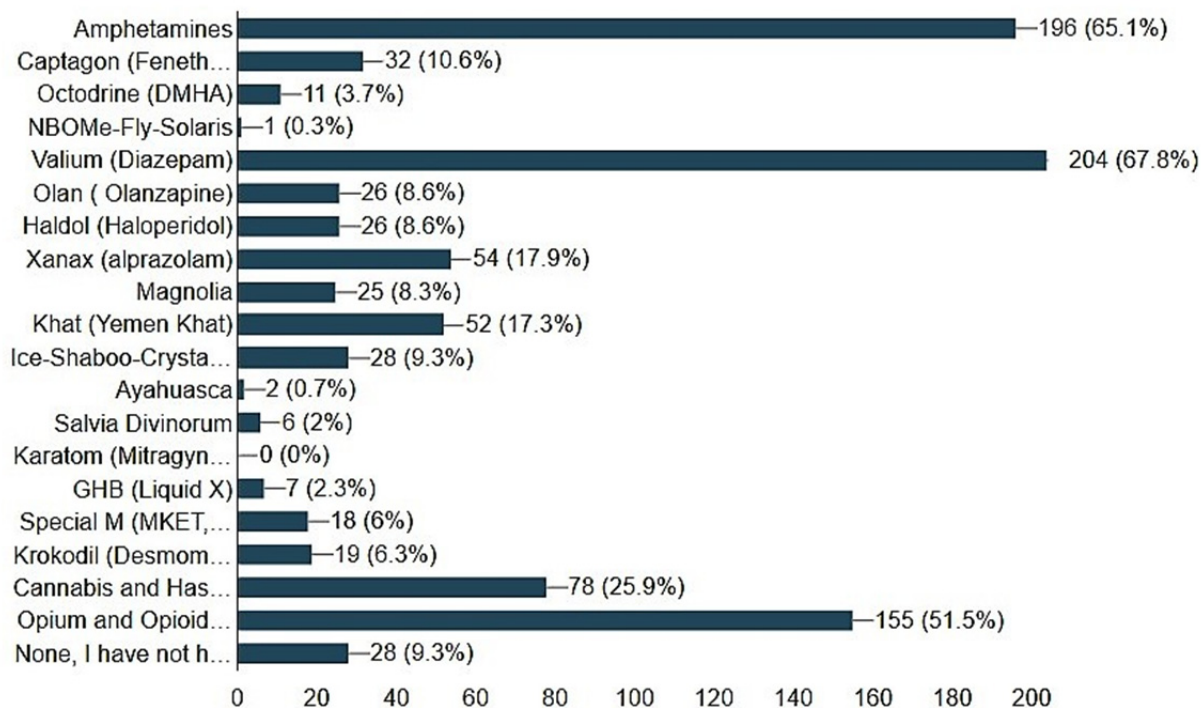
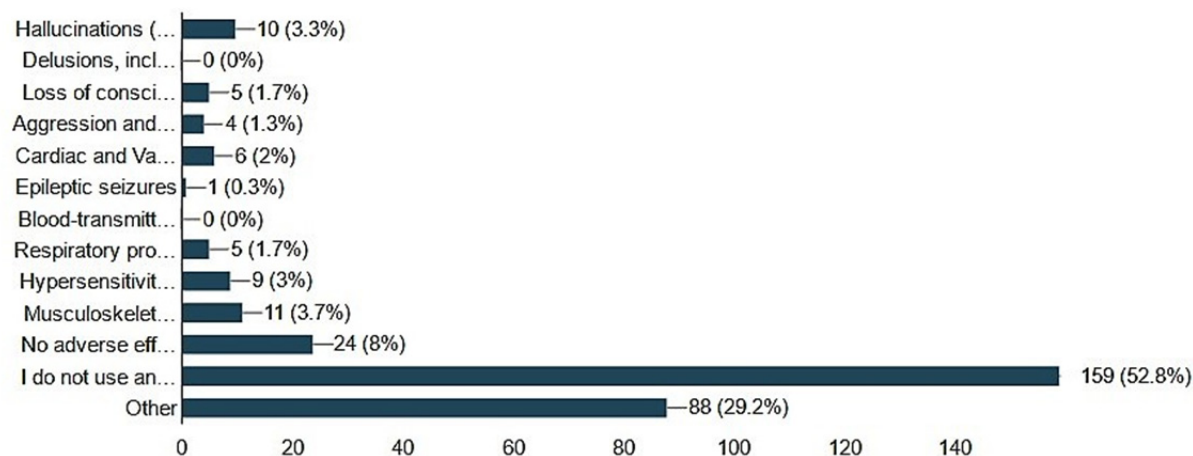

Figure 7. NPS Knowledge: Year-2 to Year-6 Students.

Figure 8. Most Commonly Encountered Adverse Effects in Year-2 to Year-6 Students.

4. Discussion

In the past two decades, designer drugs represented a significant evolving threat to the public health and economy; the phenomenon has been escalating at a logarithmic pace, paralleled only by the explosive collateral evolution within the discipline of *information and communication technologies* (Al-Imam, 2017; Al-Imam et al., 2017; Brew, 2016; Dargan & Wood, 2013; Lin et al., 2014). The technologic advancement in the developed western world made it feasible for the NPS, its e-commerce, and the collateral e-phenomena on both divisions of the web to flourish to unprecedented levels beyond the control of legal authorities and regulating bodies. Accordingly, the NPS phenomena are more spread in the developing world (Al-Imam et al., 2016; Al-Imam et al., 2017; Bigdeli et al., 2013). In 2014, Best and colleagues studied the online platforms including the social media in connection with the adolescent well-being; their systematic review of the literature was based on assessing 43 original studies that were committed for the purpose of evaluating the harmful and beneficial effects of these online platforms. There was a contradictory evidence while revealing although it was concluded that online platforms and technologies could have a detrimental effect on health well-being and yet can also be exploited for health and social care purposes (Best et al., 2014).

Few research attempts were dedicated to the NPS phenomenon in the developing world as in the case of the Middle East, Latin and Central America, Africa, and Asia (Dargan and Wood, 2013). This observational cross-sectional analysis represents one of the few attempts to analyse selected populations from the Middle East in connection with the extent of spread and (ab)use of psychoactive substances. However, there have been prior attempts dating back to to the end of the last decade (Al-Hemiary et al., 2010; Dargn & Wood, 2013).

Al-Hemiary and colleagues have led one of the earliest attempts in Iraq. By 2012, those authors have concluded that the most commonly used substances were alcohol, cannabis, and prescription-related chemicals; Novel drugs (NPS) started to appear on the *drug scene* as in the case of amphetamine-type substances (ATS) including captagon and crystal (methamphetamine); other traditional psychoactive substances were also found in abundance including tramadol, Afghan opium, teriac (an opioid), and heroin (Al-Hemiary et al., 2010; Al-Hemiary et al., 2014; Al-Hemiary et al., 2016). Subsequent research attempts by Al-Imam and colleagues in 2016 has confirmed that captagon was infiltrating the destabilized countries of the Middle East; captagon was available in e-commerce within the UAE, Syria, Iraq, and Turkey; the substance was diffuse in a dozen of e-markets on the darknet, including AlphaBay, Agora, Valhalla, and Hansa (Al-Imam et al., 2017). Further, Al-Diwan and coworkers inferred that high household density (crowding density) and low educational status were correlated with alcohol and substance abuse; the peak age for using psychoactive substances was found to be 24-35 years (Al-Diwan et al., 2015). In 2013 and 2014, Bigdeli and colleagues discovered the existence of fourteen new substances; data were extrapolated from 104 websites. The majority of these substances were either herbal, synthetic, pharmaceutical, or combinatory chemicals that are promoted via the e-commerce (Bigdeli et al. 2014).

Very recently (2017), Joh and co-workers have conducted cross-sectional analyses among Korean University students with an aim to assess the health promotion in young adults following a three-days university-wide health promotion program; the program was aiming at enhancing health awareness via promoting a healthy diet, healthy behaviour, and an active lifestyle (Joh et al., 2017). An earlier attempt back in 2012, Dargan & Wood have studied the recreational drug use, including those of traditional and novel psychoactive substances in the Asia Pacific region via critical analysis of the *UNODC programmes* of relevance to the topic; they have concluded that there are still gaps to be filled (Dargan & Wood, 2012).

5. Conclusion

Data on the knowledge of NPS seems to be either primitive or completely lacking. Similarly, the extent of (ab)use of NPS in the studied population of Iraqi medical students was also found to be minimal, unlike those of the western societies in developed countries. However, there seems to be some degree of knowledge on NPS derived from prototypical medicines and traditional psychoactive substances. The level of knowledge on NPS did not substantially differ upon the transitions of students from year-1 to subsequent years of medical training; the level-of-knowledge was also not significantly different. However, the knowledge in relation to specific NPS substances increased substantially. Similarly, the chronicity of use was significantly different in between year-1 students and year-2 to year-6 students. The encountered adverse effects were very similar; the most frequently reported reactions included loss of consciousness, musculoskeletal-related, and hallucinations. To be concluded, the extent of (ab)use in this particular population from the Middle East was minute when compared to that of the developed world. Future studies to be deployed in the Middle East should target a varied array of populations including; students, medical professionals, researchers, medical and psychiatric patients, convicts and criminals, military personnel, and even terrorists.

Acknowledgments

References

Al-Diwan, J., Al-Hemiary, N., & Hashim, M. (2015). Alcohol and Drug Abuse in Post-conflict Iraq. *European Psychiatry, 30*, 1394. https://doi.org/10.1016/S0924-9338(15)31080-4

Al-Hemiary, N. J., Al-Diwan, J. K., Hasson, A. L., & Rawson, R. A. (2014). Drug and alcohol use in Iraq: findings of the inaugural Iraqi Community Epidemiological Workgroup. *Substance use & misuse, 49*(13), 1759-1763. https://doi.org/10.3109/10826084.2014.913633

Al-Hemiary, N. J., Hashim, M., Al-Diwan, J., & Abdulrazzak, E. (2010). *Alcohol and drug abuse in post-conflict Iraq*. Unpublished manuscript. Baghdad University, Iraq.

Al-Hemiary, N.J., Hashim, F.M., Al-Shawi, C.A. (2016). Effect of post-traumatic stress disorder on school achievement among secondary school students in Baghdad, Iraq. *J Fac Med Baghdad, 58*(2).

Al-Imam, A. (2017). Could Hallucinogens Induce Permanent Pupillary Changes in (Ab) users? A Case Report from New Zealand. *Case Reports in Neurological Medicine*, 2017. https://doi.org/10.1155/2017/2503762

AL-Imam, A., Santacroce, R., Roman‐Urrestarazu, A., Chilcott, R., Bersani, G., Martinotti, G., & Corazza, O. (2017). Captagon: use and trade in the Middle East. *Human Psychopharmacology: Clinical and Experimental*, 32(3).

Al-Imam, A., Simonato, A. P., & Corazza, O. (2016). Haloperidol, an old antipsychotic with potential use by NPS users in Iraq. *Research and Advances in Psychiatry*, *3*(3), 81-84. Retrieved from https://www.rapjournal.eu/materiale_cic/948_3_3/8031_haloperidol/article.htm

Best, P., Manktelow, R., & Taylor, B. (2014). Online communication, social media and adolescent wellbeing: A systematic narrative review. *Children and Youth Services Review, 41*, 27-36. https://doi.org/10.1016/j.childyouth.2014.03.001

Bigdeli, I., Corazza, O., Aslanpour, Z., & Schifano, F. (2013). Novel psychoactive substances (NPS): A study on Persian language websites. *Iranian journal of public health, 42*(5), 511.

Boyer, E. W., Lapen, P. T., Macalino, G., & Hibberd, P. L. (2007). Dissemination of psychoactive substance information by innovative drug users. *CyberPsychology & Behavior, 10*(1), 1-6. https://doi.org/10.1089/cpb.2006.9999

Brew, I. (2016). Novel psychoactive substances. *The British Journal of General Practice, 66*(644), 125. https://doi.org/10.3399/bjgp16X684253

Burns, L. (2014). World Drug Report 2013 By United Nations Office on Drugs and Crime New York: United Nations, 2013ISBN: 978‐92‐1‐056168‐6, 151 pp. Grey literature. *Drug and Alcohol Review, 33*(2), 216-216. https://doi.org/10.1111/dar.12110

Dargan, P. I., & Wood, D. M. (2012). Recreational drug use in the Asia Pacific region: improvement in our understanding of the problem through the UNODC programmes. *Journal of Medical Toxicology, 8*(3), 295-299. https://doi.org/10.1007/s13181-012-0240-4

Dargan, P., & Wood, D. (Eds.). (2013). *Novel psychoactive substances: classification, pharmacology and toxicology*. Academic Press.

Ferri, M., Bo, A., Amato, L., Guedes, I. C., Esteves, C. S., Wiessing, L., ... & Davoli, M. (2015). What is needed in future drug treatment research? A systematic approach to identify gaps on effectiveness of drug treatment from the EMCDDA. *Drugs: education, prevention and policy*, 22(1), 86-92. https://doi.org/10.3109/09687637.2014.954988

Hadjar, K. (2016). University Ontology: A Case Study at Ahlia University. In Semantic Web (pp. 173-183). Springer International Publishing. https://doi.org/10.1007/978-3-319-16658-2_9

Iraqi Ministry of High Education and Scientific Research. Iraqi Network Learning Environment (INLE). Retrieved 16 March, 2017, from http://inle.education/

Joh, H. K., Kim, H. J., Kim, Y. O., Lee, J. Y., Cho, B., Lim, C. S., & Jung, S. E. (2017). Health promotion in young adults at a university in Korea: A cross-sectional study of 625 participants in a university. *Medicine, 96*(7). https://doi.org/10.1097/MD.0000000000006157

Lin, C. A., & Atkin, D. J. (Eds.). (2014). *Communication technology and social change: Theory and implications*. Routledge.

Mackey, T. K., & Liang, B. A. (2013). Improving global health governance to combat counterfeit medicines: a proposal for a UNODC-WHO-Interpol trilateral mechanism. *BMC medicine, 11*(1), 233. https://doi.org/10.1186/1741-7015-11-233

Moorhead, S. A., Hazlett, D. E., Harrison, L., Carroll, J. K., Irwin, A., & Hoving, C. (2013). A new dimension of health care: systematic review of the uses, benefits, and limitations of social media for health communication. *Journal of medical Internet research, 15*(4). https://doi.org/10.2196/jmir.1933

University of Oxford. Center for Evidence Based Medicine. Retrieved 16 March, 2017, from http://www.cebm.net/

Van Hout, M. C., & Bingham, T. (2013). 'Surfing the Silk Road': A study of users' experiences. *International Journal of Drug Policy, 24*(6), 524-529. https://doi.org/10.1016/j.drugpo.2013.08.011

Copyrights