

New Psychoactive Substances (NPS): A Cross-Sectional Study on Their Use, Accessibility and Public Awareness, and Their Associated Harms, in an East Midlands (UK) Local Authority

Mabhala Mzwandile^{1,*}, Yohannes Asmait²

¹Department of Public Health and Wellbeing, University of Chester, Riverside Campus, Chester, CH1 1SF, United Kingdom

²Department of Surgery, Mount Sinai, New York, USA

Email address

a.mabhala@chester.ac.uk (M. Mabhala)

*Corresponding author

Citation

Mabhala Mzwandile, Yohannes Asmait. New Psychoactive Substances (NPS): A Cross-Sectional Study on Their Use, Accessibility and Public Awareness, and Their Associated Harms, in an East Midlands (UK) Local Authority. *AASCIT Journal of Health*.

Vol. 5, No. 3, 2018, pp. 69-77.

Received: July 8, 2018; **Accepted:** July 26, 2018; **Published:** August 9, 2018

Abstract: Despite the increase in NPS presence in drug market, the extent of their use and related harms is not fully understood. Our cross-sectional study (n=204) indicated that 85.8% of respondents were aware of NPS, 33.8% knew NPS users, and 13.3% knew more than five users. 30.4% had been offered NPS by someone they knew, 17% by a stranger; 9.8% accepted and used it, and 40% said accessing NPS was easy and 35.8% very easy. The study showed rho values of 0.3 between age and knowing of NPS ($P < 0.001$); 0.47 between age and knowing NPS users ($P < 0.001$); 0.28 between age and number of NPS users known ($P < 0.001$); 0.14 between age and the number of times they accepted and consumed NPS ($P > 0.040$); 0.042 between age and being offered NPS by someone known to them ($P \geq 0.548$); 0.11 between age and being offered NPS by strangers ($P > 0.097$); and 0.08 between age and perceived ease of access to NPS ($P > 0.253$). We concluded that the positive correlation between age and the number of times users accepted and consumed NPS, warrants public health concern. Given the level of exposure to the peers who consume NPS, it is possible there were more NPS users amongst this study respondents than it directly detected. We recognise that our small sample size limited generalisability of these findings, and propose repeating the research using larger samples to make the results more widely applicable.

Keywords: Psychoactive Substance, Addiction, Accessibility, Health and Social Harms

1. Introduction

Increasingly, new psychoactive substances (NPS) are becoming a public health concern. The relevant web page of the United Nations Office on Drugs and Crime (UNODC) defines them as “substances of abuse, either in a pure form or a preparation, that are not controlled by the 1961 Single Convention on Narcotic Drugs or the 1971 Convention on Psychotropic Substances, but which may pose a public health threat” [1]. Some of the challenges facing policymakers in relation to these substances are confusing terminology, difficulties with classifying them, and understanding the full extent of their use and related harms.

Categorising these substances as novel or new

psychoactive substances implies they are newly invented substances, though some were discovered at the same time as more traditional illicit drugs such as cocaine and lysergic acid diethylamide (LSD). Many are formulated by chemical manipulation of the traditional drugs, making them undetectable by standard toxicology screens, and enabling them to stay ahead of the law prohibiting their sale and use [2, 3]. In the United Kingdom (UK), NPS were known as “legal highs” until the passing of the Psychoactive Substances Act 2016 [4] which stipulates that an individual commits an offence if they:

- a) Produce a psychoactive substance (i.e. a substance that stimulates or depresses an individual's central nervous system or alters their mental functioning or emotional

- state), know or suspect that a substance is psychoactive,
- b) intend to consume or is aware that another individual is likely to consume it for its psychoactive effects,
- c) supply or intend to supply or offer to supply a psychoactive substance,
- d) import or export a psychoactive substance,
- e) possess a psychoactive substance, know or suspect that the substance is psychoactive, intend to supply it to be consumed by others owing to its psychoactive effects.
- f) possess a psychoactive substance in custodial institutions, which may be misinterpreted as legal [3, 5].

In terms of the extent of NPS use, some of the UK-based reports show that although there is a downward trend in drug use amongst 11 to 15-year-olds in England and Wales since a peak in 2003, there is also a steady increase in the use of NPS amongst the same population group [6-11]. These reports also indicate that the use of NPS remains lower than that of many traditional illicit drugs [7, 8]. However, studies acknowledge that the national prevalence of NPS is patchy [6].

In the UK several surveys have been undertaken to establish the prevalence of NPS use. However, these tend to focus on the prevalence of use of particular substances by a specific population group. For example, Dargan *et al.* [11] revealed that 20.3% of school, university and college students in the area of Tayside, Scotland in February 2010 reported previous use of mephedrone; 23.4% reported using mephedrone on only one occasion previously and 4.4% reported daily use. In 2011, Winstock *et al.* [10] found that the prevalence of ketamine use was 33.8% among *MixMag* magazine readers. Recently, the study by Blundell *et al.* [12] revealed that 9.4% of surveyed UK adults aged 16 and over currently use electronic vaping devices for recreational drug administration with 6.2% reporting lifetime cannabis vaping use.

In terms of associated harms, the general view amongst researchers is that the extent of harms associated with NPS is still not fully understood. However, a review by HM Inspectorate of Prisons [13] reported that prevalence of NPS-related health harms amongst the prison population in the UK is increasing.

Reports of deaths associated with NPS vary markedly, with the most frequently reported harms being caused by benzodiazepines-type variants [8, 14]. For example, in 2014 National Records of Scotland reported 55 deaths where these were implicated [9, 14]. The study by Stephenson and Richardson [6] reported 60 NPS-related deaths in England and Wales in 2014, a rise from 52 in 2012; this itself was a sharp increase from 29 deaths in 2011. Very little evidence was found from peer-reviewed studies that examine the extent of harm in the UK.

This study aims to add to the growing number of studies that seek to increase our understanding of NPS use, and to identify the high risk populations in one local authority in the East Midlands (UK). Specific objectives of this study are: 1) to document the prevalence, accessibility, awareness and self-reported associated harms of NPS use; 2) to determine

the association between respondents' age and awareness, use and accessibility; and 3) to examine whether age is an accurate predictor for using NPS.

2. Methods

2.1. Design and data

We used data from a cross-sectional survey collected by youth workers from Telford and Wrekin Council's drug and alcohol action team (DAAT). The data were collected between September 2016 and February 2017. The study sites included probation facilities, further education colleges and the night economy in Telford, Wrekin and surrounding areas.

The questionnaire design was inspired by similar surveys including Winstock *et al.* [10] and Dargan *et al.* [11]. Based on these, the University of Chester/Telford and Wrekin steering team developed a questionnaire specifically for their population. The street term "legal high" was used in the questionnaire instead of "new psychoactive substances" as it was envisaged that respondents would be most likely to know it.

2.2. Ethics Approval

The Research Ethics Sub-committee of the Faculty of Health and Social Care, University of Chester granted ethical approval for the study. Self-administered questionnaires were then distributed to eligible people, mainly during drug and alcohol education sessions. The respondents were informed about the study and that participation was purely voluntary. Those who wished to take part were asked to sign the consent form and complete a short two page questionnaire; those who did not were asked to simply return blank questionnaires. Confidentiality and data protection safeguards were observed at all stages.

2.3. Variable Measures

Socio-demographic status was assessed using gender, age, sex and occupation. Occupation status was further stratified through full-time education, part-time education, full-time employment, part-time employment and unemployment.

Awareness of NPS was assessed using three questions: "Do you know of legal highs?", "Do you know anybody who takes legal highs?", and "If so, how many legal highs users do you know?"

Three questions were asked to assess their perceived ease of access to NPS: "How easy do you think it is to access legal highs?", "Have you ever been offered legal highs by someone you know?", and "Have you ever been offered legal highs by someone you DON'T know?"

The question asked to assess their use of NPS was: "Did you accept and consume the legal high?"

We also asked: "Have you or your friends ever had a negative experience when taking legal highs?", "If Yes, did this put you or them off taking legal highs?", and "If No, would a known negative experience put you or them off taking legal highs again?"

The inferential statistics was used to measure the correlations between independent variable (age) and dependent variables – NPS awareness, use, accessibility and harms associated.

2.4. Statistical Analysis

The data were analysed using the IBM SPSS statistical package, version 21. Descriptive statistics were used to document frequency data in relation to socio-demographic status. Frequency data on use, accessibility, awareness and associated harms were analysed with confidence levels set at 95%.

To determine the correlations between age, awareness, accessibility, use and NPS-related harms, the Spearman's correlation coefficient (*rho*) significance level was set at $p < 0.05$, with a confidence interval of 95%. Furthermore, since one of the objectives was to determine the correlation between age and use, we used linear regression analysis (R^2) to examine whether age was an accurate predictor for the likelihood of consuming NPS.

3. Results

3.1. Socio-Demographic Data

The sample comprised 204 respondents: 41.1% males, 55.8% females and 2.9% undeclared genders. Their mean age

was 25.7 years (SD = 10.9, median = 25 years) and the range was 16–63 years. Their mode age was 18 years. 68.6% were in full-time education, and 1.5% in part-time education. 9.3% were in full-time employment, and 2.5% in part-time employment; 16.6% were unemployed and 1.5% chose not to declare.

3.2. Awareness

Table 1 summarises respondents' views on awareness, accessibility and use of NPS. 85.8% of respondents knew about NPS (CI 95% 80.9–90.2), 33.8% knew a user of NPS (CI 95% 27.5–40.2) and 13% knew more than five users (CI 95% 8.8–18.1).

3.3. Accessibility

Table 1 indicates that 40.2% perceived access to NPS to be easy (CI 95% 33.3–46.6), and 35.8% very easy (CI 95% 29.4–42.6). 30.4% of respondents said that they had been offered NPS by someone they knew (CI 95% 24.0–36.8), and 17.2% said they had been offered it by a stranger (CI 95% 12.3–22.1).

3.4. Uses

It terms of use, 9.8% said that they had been offered and consumed NPS (CI 95% 5.9–14.2).

Table 1. Frequency data on awareness, accessibility and use of NPS.

Variables	Frequency	Percentage %	95%CI	
Do you know of NPS			Lower	Upper
No	21	10.3	6.4	14.7
Yes	175	85.8	80.9	90.2
Prefer not to say	8	3.9	1.5	6.9
Total	204	100.0	88.8	111.8
Do you know any users				
No	96	47.1	39.7	53.4
Yes	69	33.8	27.5	40.2
Prefer not to say	39	19.1	13.7	25.0
Total	204	100.0	80.9	118.6
How many users do you know				
None	107	52.5	45.6	59.3
One	10	4.9	2.0	7.8
More than one	21	10.3	6.4	14.7
More than three	18	8.8	5.4	12.7
More than five	27	13.2	8.8	18.1
Not answered	21	10.3	6.4	14.7
Total	204	100.0	74.6	127.3
How easy is it to access NPS				
Easy	82	40.2	33.3	46.6
Very easy	73	35.8	29.4	42.6
Not easy	42	20.6	14.7	26.5
Very difficult	7	3.4	1.0	5.9
Total	204	100.0	78.4	121.6
Has anyone you know offered you NPS				
Yes	62	30.4	24.0	36.8
No	134	65.7	58.8	72.1
Prefer not to say	7	3.4	1.0	5.9
Not answered	1	.5	.0	1.5

Variables	Frequency	Percentage %	95%CI	
Do you know of NPS			Lower	Upper
Total	204	100.0	83.8	116.3
Has stranger offered NPS				
Yes	35	17.2	12.3	22.1
No	159	77.9	72.5	83.3
Not answered	10	4.9	2.5	8.3
Total	204	100.0	87.3	113.7
Do you accept and consume NPS				
Yes	20	9.8	5.9	14.2
No	85	41.7	34.8	48.5
Prefer not to say	3	1.5	.0	3.4
Not answered	96	47.1	40.7	54.4
Total	204	100.0	81.4	120.5

3.5. Harms

Table 2 indicates that 12.3% of respondents said that they or their friends had experienced negative effects from NPS at least once. 8.3% said a negative experience had put them off NPS and 16.6% said it had not. 31.9% said a negative experience would put them off NPS and 10.8% would not have been put off by negative experience.

Table 2. Self-reported harms associated with NPS.

Variable	Frequency	Percentage%
You or friends had negative experience from NPS		
Yes	25	12.3
No	62	30.3
Prefer not to say	1	.5
Not answered	116	56.9
Total	204	100.0
Did negative experience put you off NPS		
Yes	17	8.3
No	34	16.6
Prefer not to say	1	.5
Missing	99	74.6
Total	204	100.0
Would negative experience put you off NPS		
Yes	65	31.9
No	22	10.8
Prefer not to say	2	0.9
Missing	99	56.4
Total	204	100.0

3.6. Correlations

The associations between age, awareness, use, accessibility and harms associated with NPS are depicted in table 3. Spearman's correlation coefficient (ρ) shows a statistically significant positive correlation between respondents' age and knowledge of NPS; a moderate positive correlation between age and knowing NPS users; and a weak positive correlation between age and the number of NPS users they know, with $p < 0.001$.

Table 3 indicates a positive correlation between age and the number of times they accept and consume NPS; this correlation was statistically significant with $p < 0.04$. Since a key objective of this study was to determine the correlation between age and use, we used linear regression analysis (R^2)

to further examine whether age was an accurate predictor for taking NPS. This showed that age only accounts for low amounts of variation with $R^2 = 0.031$ for accepting and $R^2 = 0.005$ for consuming, with the standard error of the estimate being 1.273 for both.

Table 3 further indicates a statistically insignificant positive correlation between age and the perception of how easy it is to access NPS ($p > 0.2$).

Finally, table 3 shows a weak negative correlation between age and one or more friends having a negative experience from NPS ($p > 0.08$), and a negative correlation between age and being put off by the negative experience ($p > 0.3$). There was a positive correlation between age and the potential likelihood of being put off by a negative experience of NPS ($p > 0.2$).

Table 3. Association between respondents' age and awareness, use and accessibility of NPS.

Age	<i>rho</i>	1.000	.302
	Sig. (2-tailed)	.	.000
	N	204	204
Do you know NPS	<i>rho</i>	.302	1.000
	Sig. (2-tailed)	.000	.
	N	204	204
Age	<i>rho</i>	1.000	.476
	Sig. (2-tailed)	.	.000
	N	204	204
Do you know any user	<i>rho</i>	.476	1.000
	Sig. (2-tailed)	.000	.
	N	204	204
Age	<i>rho</i>	1.000	.277
	Sig. (2-tailed)	.	.000
	N	204	204
How many users do you know	<i>rho</i>	.277	1.000
	Sig. (2-tailed)	.000	.
	N	204	204
Age	<i>rho</i>	1.000	.143
	Sig. (2-tailed)	.	.041
	N	204	204
Did you accept and consume NPS	<i>rho</i>	.143	1.000
	Sig. (2-tailed)	.041	.
	N	204	204
Age	<i>rho</i>	1.000	.080
	Sig. (2-tailed)	.	.253
	N	204	204
How easy is it to access NPS	<i>rho</i>	.080	1.000
	Sig. (2-tailed)	.253	.
	N	204	204
Age	<i>rho</i>	1.000	-.123
	Sig. (2-tailed)	.	.081
	N	204	204
You or friends had negative experience from NPS	<i>rho</i>	-.123	1.000
	Sig. (2-tailed)	.081	.
	N	204	204
Age	<i>rho</i>	1.000	-.141
	Sig. (2-tailed)	.	.318
	N	204	52
Did negative experience put you off NPS	<i>rho</i>	-.141	1.000
	Sig. (2-tailed)	.318	.
	N	52	52
Age	<i>rho</i>	1.000	.118
	Sig. (2-tailed)	.	.271
	N	204	89
Would negative experience put you off NPS	<i>rho</i>	.118	1.000
	Sig. (2-tailed)	.271	.
	N	89	89

4. Discussion

The respondents' demographic profile is comparable to most studies conducted in the western countries where NPS has been investigated [15-34]. In comparing our study with previous ones, we excluded studies that are solely university or school based, as they were deemed to have a potential age bias towards younger people.

Table 1 indicates that 85.8% of respondents reported that they knew about NPS and 13.2% knew more than five NPS users. These estimates are in line with other studies, though the evidence suggests that the level of NPS awareness is higher in the UK than in other countries. In an international study by Deligianni et al. [35] 65% of respondents

considered themselves aware of NPS and the most aware members in this sample were from the UK. In contrast, the Australian based study indicated that just under half (49%) of those sampled had ever heard of NPS.

Table 1 shows that only 9.8% of respondents admitted having consumed NPS; however, considering the CI range (5.9–14.2) this should be interpreted with caution. This prevalence is comparable with similar studies: for example, the study by Zarrouq et al. [37] in Morocco reported an overall lifetime prevalence of 9.4% (95% CI: 8.35–10.47). Even lower prevalences were reported in other western countries: for example, a lifetime prevalence of 2.2–3.9% was reported in a study in Germany [15]. In the Australian study by Champion et al. [32] only 3% of the sample reported having tried any NPS, though a higher percentage (14%) of users was reported in an international study by Deligianni et al. [36]. All studies consistently concluded that NPS use remains lower than that of traditional illicit substances.

Table 1 also showed that 13.2% of respondents knew more than five people who use NPS. This indicates that the number of users could be higher than this study detected directly. This is consistent with evidence from several studies which show that more exposure to peers who use NPS increases the likelihood of becoming a user [25, 36-40]. For example, NPS users in the Vreeker et al. [39] study had significantly more peers who used cannabis (OR = 2.41, $P < 0.001$) compared to non-users. Similarly, Pavlović and Jakovljević [38] found that going out with peers who are smoking, binge drinking and using synthetic substances increases the risk of becoming an NPS user. Similar findings were reported in Bezinović and Malatestinić's [41] study, which indicated that pupils whose parents, siblings and peers used substances developed the same behavioural patterns significantly more often ($P < 0.001$).

Table 1 indicates that 40.2% of respondents perceived NPS to be easily and 35.8% very easily accessible. Again, the CI was significantly wide, suggesting statistical insignificance. This is a higher prevalence than that presented in the Eurobarometer survey [16] where just over a quarter (29%) of respondents said it was 'very easy' to obtain cannabis, with 8% for cocaine, 7% for ecstasy and for NPS, and 4% for heroin. Several studies attempted to explain the factors that facilitate access to NPS. Most reported that the internet makes access easy [42, 43]. One of them, by Sutherland et al. [44], reported that 9% of NPS consumers nominated online marketplaces as their main source in the preceding year.

Furthermore, the present study also indicates that 30.4% of respondents said that they had been offered NPS by someone they knew, and 17% said they had been offered it by a stranger. Again, the UK appears to have a higher percentage of being offered NPS by a stranger than do other countries. For example, in an Australia-based study only 12% of respondents reported that they had been offered NPS by a stranger [32]. The study by Sutherland et al. [44] makes a link between access and supply: they found that NPS consumers who nominated online sources as their main

suppliers were also more likely to have supplied NPS to others in the past year (RR 1.57, 95% CI: 1.35–2.27), and were more likely to have supplied to strangers (RR 6.05, 95% CI: 1.65–22.17) and acquaintances (RR 12.11, 95% CI: 3.31–44.34).

Table 2 indicates that 12.3% of respondents reported that they or their friends had experienced negative effects from NPS. Several studies reported that NPS users know about the harms associated with their use [41–47]. A qualitative study by Gittins *et al.* [45] provides insight into why people continue to use NPS despite knowing the harms: some attributed harmful effects to NPS being too strong, leading to unwanted effects and overdoses, and felt that if users regulated the dose they could minimise the negative effects. Others preferred them for their strength, considering them to be more cost-effective and of higher quality. Similarly, Sande *et al.* [46] found that while respondents were aware of the harms associated with NPS, a significantly higher number of users said they could not evaluate the risks. The findings from a qualitative study in the Netherlands showed that despite the adverse effects, participants continued using NPS because they were widely available and cheap [47].

This found a significant correlation between respondents' age and awareness of NPS. While many studies reported a higher prevalence of NPS use amongst young people, there were no studies found that specifically measured the correlation between age and awareness.

Table 3 indicates a positive correlation between age and the number of times they accept and consume NPS; this correlation was statistically significant with $p < 0.04$. The correlation between age and use of NPS has also been reported in other studies; for example, Gomes de Matos *et al.* [15] reported that greater age and higher educational level were associated with a lower risk of accepting and using NPS. Similarly, the study by Palamar *et al.* [25] reported that older respondents (age 22–60) were less likely to report any lifetime NPS use. Furthermore, Palamar *et al.* [48] reported that those who used NPS were more likely to be younger, male, and to have not co-used other drugs ($p < 0.001$).

Table 3 further indicates a statistically insignificant positive correlation between age and the perception of how easy it is to access NPS ($p > 0.2$). This is consistent with the Palamar *et al.* [25, 48] studies which indicate that the average age of exposure was as young as five years old, but the correlation was statistically insignificant.

Finally, table 3 shows insignificant correlation between age and harm or likelihood of being put off by NPS associated harms. This arguably reflects the perception of risk of this population group as reported in the study by Pacek *et al.* [34]: they found that ages 12–17 and 18–25 were most associated with having low perceptions of risk.

However, this raises a question whether age was a useful predictor of using NPS: R^2 indicates there is no significant correlation between age and the use of NPS, this and several other studies delineate a significant trend demonstrating that the mean age of individuals with reported exposure to NPS is young [25, 48].

5. Limitations

The present study has a number of limitations. Firstly, the sample size is relatively small, which is reflected in statistically insignificant results, thus limiting the generalisability of findings. However, prevalence of use, awareness, perceived accessibility and perceived harms are comparable with other studies.

While this study suggests that the prevalence of NPS use is low, the wide confidence intervals means that results are imprecise, and suggesting that these findings should be interpreted with some caution and a larger sample is needed. However, despite these limitations, several studies demonstrate similar findings.

Finally, apart from the correlation between age and awareness, all other correlations were statistically insignificant.

6. Conclusion

This study set out to expand our understanding of NPS in relation to: socio-demographic status of respondents - age, sex and occupation, prevalence of their awareness of NPS, their perception of accessibility, use, associated harms/negative effect and correlation between age and awareness, perceived accessibility and the associated harms. It established that the prevalence of NPS use remains low, that access to NPS is easy and that the manifestation of NPS associated harms is not fully understood.

As 13.2% of respondents knew more than five NPS users, 40.2% perceived NPS to be easily and 35.8% very easily accessible, and 30.4% said that they had been offered NPS by someone they knew, a positive correlation between age and the number of times they accepted and consumed NPS warrants public health concern. We recognise that the small sample size limited generalisability of these findings, and propose that larger samples are needed to definitively accept or reject our conclusions.

List of Abbreviations

NPS	new psychoactive substances
UNODC	United Nations Office on Drugs and Crime
LSD	lysergic acid diethylamide
UK	United Kingdom
HM	Her Majesty
DAAT	Council's drug and alcohol action team
IBM	International Business Machines
SPSS	Statistical Package for the Social Sciences
SD	Standard deviation
CI	Confidence interval

Acknowledgements

The research that led to the production of this article was undertaken by M. Mabhala and Nahim Khan under the guidance of Professor John Reid from University of

Chester's Department of Public Health and Wellbeing, working in partnership with Telford and Wrekin's drugs and alcohol team led by Bhavna Taank. The following individuals steered the research process: Michelle Astbury, Duncan Henney, Barbara Jones, Mark Darlington, Lyn Stepanian, Emma Trowell, Wendy Sloan, Robert Eysers and Sarah Williams. Special thanks to Chelsea Mabhala and Mariska Griffiths for their assistance with SPSS data input.

Funding

This research was supported by the Department of Public Health at Telford and Wrekin Council, grant number HSC16/09.

Availability of Data and Materials

The datasets generated or analysed during the current study are not publicly available due to ethical restrictions and the need for privacy of participant data, but are available from the corresponding author on reasonable request.

Authors' Contributions

MM was involved in the conception of designed the study, collected, analysed and interpreted the data, and presented the findings. He also wrote the entire manuscript. AY contributed to the SPSS data analysis, presented the analysed data. JAR was involved in early stage of project conception and contributed at later stage of manuscript editorial process. All three author proofread the final version of the manuscript.

Ethics Approval

Ethical approval to conduct the study was provided by the Faculty of Health and Social Care Research Ethics Subcommittee at the University of Chester.

Competing Interests

The authors declare that they have no competing interests.

Consent for Publication

All participants have given consent to publication.

References

- [1] United Nations Office on Drugs and Crime (UNODC), UNODC Early warning advisory (EWA) on new psychoactive substances (NPS). 2018. <https://www.unodc.org/LSS/Page/NPS>. Accessed 10 April 2018.
- [2] Khaled SM, Hughes E, Bressington D, Zolezzi M, Radwan A, Badnapurkar A, Grayet R. The prevalence of novel psychoactive substances (NPS) use in non-clinical populations: a systematic review protocol. *Systematic Reviews*, 2016; 5: 95.
- [3] Corazza O, Demetrovics Z, van den Brink W, Schifano F. Legal highs: an inappropriate term for novel psychoactive drugs in drug prevention and scientific debate. *International Journal of Drug Policy*. 2013; 24 (1): 82-83.
- [4] HM Government, Psychoactive Substances Act 2016 (c. 2). 2016. http://www.legislation.gov.uk/ukpga/2016/2/pdfs/ukpga_20160002_en.pdf. Accessed 10 April 2018
- [5] Corazza O, Assi S, Simonato P, Corkery J, Bersani FS, Demetrovics Z, Stair J, Fergus S, Pezzolesi C, Pasinetti M, Deluca P, Drummond C, Davey Z, Blaszkowski U, Moskalewicz J, Mervo B, Furia LD, Farre M, Flesland L, Pisarska A, Shapiro H, Siemann H, Skutle A, Sferrazza E, Torrens M, Sambola F, van der Kreeft P, Scherbaum N, Schifano F. Promoting innovation and excellence to face the rapid diffusion of novel psychoactive substances in the EU: the outcomes of the ReDNet project. *Human Psychopharmacology: Clinical and Experimental*. 2013; 28 (4): 317-323.
- [6] Stephenson G, Richardson A. New psychoactive substances in England: A review of the evidence. UK Home Office: London. 2014. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/368587/NPSevidenceReview.pdf. Accessed 10 April 2018
- [7] Drug and Alcohol Support, New psychoactive substances review report of the expert panel. Home Office: London. 2014
- [8] Public Health England, Trends in drug misuse deaths in England, 1999 to 2014. 2014. <http://www.nta.nhs.uk/uploads/trendsdrugmisusedeaths1999to2014.pdf>. Accessed 10 April 2018
- [9] Scottish Government Social Research, New psychoactive substances – evidence review. 2014, Scottish Government Social Research: Glasgow. <http://www.gov.scot/Resource/0045/00457682.pdf>. Accessed 10 April 2018
- [10] Winstock AR, Mitcheson L, Gillatt DA, Cottrell AM. The prevalence and natural history of urinary symptoms among recreational ketamine users BJUI, 2011. 110 (11): 1762–1766.
- [11] Dargan PI, Albert S, Wood D. Mephedrone use and associated adverse effects in school and college/university students before the UK legislation change. *Quarterly Medical Journal*. 2010; 103: 875-879.
- [12] Blundell M, Dargan P, Wood D. A cloud on the horizon – a survey into the use of electronic vaping devices for recreational drug and new psychoactive substance (NPS) administration. *QJM: An International Journal of Medicine*. 2018; hex178-hex178.
- [13] HM Inspectorate of Prisons, Changing patterns of substance misuse in adult prisons and service responses: A thematic review. 2015. <https://www.justiceinspectorates.gov.uk/hmiprisonswp-content/uploads/sites/4/2015/12/Substance-misuse-web-2015.pdf>. 7 January 2018
- [14] National Records of Scotland, Drug-related deaths in Scotland in 2014. 2014, National Records of Scotland: Scotland. <http://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/vital-events/deaths/drug-related-deaths-in-scotland/2014>. 7 January 2018

- [15] Gomes de Matos E, Hannemann T, Atzendorf J, Kraus L, Piontek D. The consumption of new psychoactive substances and methamphetamine: Analysis of data from 6 German federal states. *Deutsches Ärzteblatt International*. 2018; 115 (4): 49-55.
- [16] European Monitoring Centre for Drugs and Drug Addiction (EMCDDA). Eurobarometer survey results: young people and drugs. 2014. http://www.emcdda.europa.eu/system/files/publications/809/D_rugnetEurope_N87_weboptimised_478293.pdf_en. 7 January 2018
- [17] Beck O, Bäckberg M, Signell P, Helander A. Intoxications in the STRIDA project involving a panorama of psychostimulant pyrovalerone derivatives, MDPV copycats. *Clin Toxicol*. 2018; 56 (4): 256-263.
- [18] Dunne J, Kimergård A, Brown J, Beard E, Buykx P, Michie S, Drummond C. Attempts to reduce alcohol intake and treatment needs among people with probable alcohol dependence in England: a general population survey. *Addiction*. 2018; doi: 10.1111/add.14221
- [19] Kimergård A, Foley M, Davey Z, Wadsworth E, Drummond C, Deluca P. The challenge of complex drug use: Associated use of codeine-containing medicines and new psychoactive substances in a European cross-sectional online population. *Human Psychopharmacology: Clinical and Experimental*. 2017; 32 (3).
- [20] Tarján A, Dudás M, Wiessing L, Horváth G, Rusvai E, Tresó B, Csohán Á. HCV prevalence and risk behaviours among injectors of new psychoactive substances in a risk environment in Hungary 2014: An expanding public health burden. *International Journal of Drug Policy*. 2016; 41: 1-7.
- [21] Bäckberg, M. Westerbergh J, Beck O, Helander A. Adverse events related to the new psychoactive substance 3-fluorophenmetrazine – results from the Swedish STRIDA project. *Journal Clinical Toxicology*. 2016. 54 (9): 819-825.
- [22] Beck O, Franzén L, Bäckberg M, Signell P, Helander A. Toxicity evaluation of α -pyrrolidinovalerophenone (α -PVP): results from intoxication cases within the STRIDA project. *Journal Clinical Toxicology*. 2016; 54 (7): 568-575.
- [23] Palamar JJ, Acosta P, Cleland CM. Attitudes and beliefs about new psychoactive substance use among electronic dance music party attendees. *Substance Use & Misuse*. 2017; 53 (3): 381-390.
- [24] Palamar JJ, Acosta P, Sherman S, Ompad DC, Cleland CM. Self-reported use of novel psychoactive substances among attendees of electronic dance music venues. *The American Journal of Drug and Alcohol Abuse*. 2016; 42 (6): 624-632.
- [25] Palamar JJ, Barratt MJ, Ferris JA, Winstock AR. Correlates of new psychoactive substance use among a self-selected sample of nightclub attendees in the United States. *The American Journal on Addictions*. 2016; 25 (5): 400-407.
- [26] Palamar JJ, Martins S, Su MK, Ompad DC. Self-reported use of novel psychoactive substances in a US nationally representative survey: prevalence, correlates, and a call for new survey methods to prevent underreporting. *Drug and Alcohol Dependence*. 2015; 156: 112-119.
- [27] Sutherland R, Bruno R, Peacock A, Lenton S, Matthews A, Salom C, Dietze P, Butler K, Burns L, Barratt MJ. Motivations for new psychoactive substance use among regular psychostimulant users in Australia. *International Journal of Drug Policy*. 2017; 43: 23-32.
- [28] Sutherland R, Peacock A, Whittaker E, Roxburgh A, Lenton S, Matthews A, Butler K, Nelson M, Burns L, Bruno R. New psychoactive substance use among regular psychostimulant users in Australia, 2010 - 2015. *Drug & Alcohol Dependence*. 2016; 161: 110-118.
- [29] Dines A, Wood DM, Yates C, Heyerdahl F, Hovda KE, Giraudon I, Sedefov R, Dargan PI, Euro-DEN Research Group. Acute recreational drug and new psychoactive substance toxicity in Europe: 12 months' data collection from the European Drug Emergencies Network (Euro-DEN). *Clin Toxicol* 2015; 53 (9): 893-900.
- [30] Schepis TS, West BT, Teter CJ, McCabe SE. Prevalence and correlates of co-ingestion of prescription tranquilizers and other psychoactive substances by U.S. high school seniors: Results from a national survey. *Addictive Behaviors*. 2016; 52: 8-12.
- [31] Schwarz K, Fuchs M, Veraar M, Menz W, Kemmler G, Simma B. Cross-sectional study to evaluate the longitudinal development of child and adolescent psychiatric diagnoses of inpatients in Vorarlberg, Austria. *European Journal of Pediatrics*. 2016; 175 (2): 221-228.
- [32] Champion, KE, Teesson M, Newton NC. Patterns and correlates of new psychoactive substance use in a sample of Australian high school students. *Drug & Alcohol Review*. 2016; 35 (3): 338-344.
- [33] Martinotti G, Lupi M, Carlucci L, Cinosi E, Santacroce R, Acciavatti T, Chillemi E, Bonifaci L, Janiri L, Giannantonio MD. Novel psychoactive substances: use and knowledge among adolescents and young adults in urban and rural areas. *Human Psychopharmacology: Clinical and Experimental*. 2015; 30 (4): 295-301.
- [34] Pacek LR, Mauro PM, Martins SS. Perceived risk of regular cannabis use in the United States from 2002 to 2012: differences by sex, age, and race/ethnicity. *Drug and Alcohol Dependence*. 2015; 149: 232-244.
- [35] González D, Ventura M, Caudevilla F, Torrens M, Farre M. Consumption of new psychoactive substances in a Spanish sample of research chemical users. *Human Psychopharmacology: Clinical and Experimental*. 2013; 28 (4): 332-340.
- [36] Deligianni E, Corkery JM, Schifano F, Lione LA. An international survey on the awareness, use, preference, and health perception of novel psychoactive substances (NPS). *Human Psychopharmacology: Clinical and Experimental*. 2017; 32 (3).
- [37] Zarrouq B, Bendaou B, Elkinany S, Rammouz I, Aalouane R, Lyoussi B, Khelafa S, Bout A, Berhili N, Hlal H, Nejari C, El Rhaz KE. Suicidal behaviors among Moroccan school students: prevalence and association with socio-demographic characteristics and psychoactive substances use: a cross-sectional study. *BMC Psychiatry*. 2015; 15: 284.
- [38] Pavlović Z, Jakovljević B. Frequency and risk factors of the use of psychoactive substances among the young. *Vojnosanit Pregl*. 2008; 65 (6): 441-8.
- [39] Vreeker A, van der Burg BG, van Laar M, Brunt TM. Characterizing users of new psychoactive substances using psychometric scales for risk-related behaviour. *Addictive Behaviours*. 2017; 70: 72-78.

- [40] Champion KE, Newton NC, Stapinski LA, Teesson M. Effectiveness of a universal internet-based prevention program for ecstasy and new psychoactive substances: a cluster randomized controlled trial. *Addiction*. 2016; 111: 1396-1405.
- [41] Bezinović P, Malatestinić D. Perceived exposure to substance use and risk-taking behavior in early adolescence: Cross-sectional study. *Croatian Medical Journal*. 2009; 50 (2): 157-164.
- [42] Haden M, Archer JR, Dargan PI, Wood DM. MDMB-CHMICA: Availability, patterns of use, and toxicity associated with this novel psychoactive substance. *Substance Use & Misuse*. 2017; 52 (2): 223-232.
- [43] Boys A, Marsden J, Griffiths P, Fountain J, Stillwell G, Strang J. Substance use among young people: the relationship between perceived functions and intentions. *Addiction*, 1999; 94 (7): 1043-1050.
- [44] Sutherland R, Bruno R, Peacock A, Dietze P, Breen C, Burns L, Barratt MJ. New psychoactive substances: Purchasing and supply patterns in Australia. *Hum Psychopharmacol Clinical and Experimental*. 2017; 32 (e2577).
- [45] Gittins R, Guirguis A, Schifano F, Maidment I. Exploration of the use of new psychoactive substances by individuals in treatment for substance misuse in the UK. *Brain Science*. 2018; 8 (58).
- [46] Sande M. Characteristics of the use of 3-MMC and other new psychoactive drugs in Slovenia, and the perceived problems experienced by users. *International Journal of Drug Policy*. 2016; 27: 65-73.
- [47] Kassai S, Pintér JN, Rácz J, Böröndi B, Tóth-Karikó T, Kerekes K, Gyarmathy VA. Assessing the experience of using synthetic cannabinoids by means of interpretative phenomenological analysis. *Harm Reduction Journal*. 2017; 14: 9.
- [48] Palamar JJ, Su MK, Hoffman RS. Characteristics of novel psychoactive substance exposures reported to New York City Poison Center, 2011–2014. *The American Journal of Drug and Alcohol Abuse*. 2016; 42 (1): 39-47.