Using Internet Snapshot Surveys to Enhance Our Understanding of the Availability of the Novel Psychoactive Substance 4-Methylaminorex and 4,4'-Dimethylaminorex

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Abstract 4,4'-Dimethylaminorex is a stimulant novel psychoactive substance (NPS) first detected in Europe in November 2012. It is a derivative of 4-methylaminorex, a substance controlled under Schedule 1 of the 1971 United Nations Convention on Psychotropic Substances. There is currently no information on the availability or cost of these substances from Internet suppliers. An Internet snapshot study was undertaken in English using established European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) methodology to determine the availability of 4-methylaminorex and 4,4'-dimethylaminorex in April 2014. Twenty Internet sites selling 4-methylaminorex were identified, 18 selling in US dollars and two in GB Pound Sterling. Fourteen (70 %) Internet sites had a minimum purchase amount of ≥ 10 g (compared to user doses of 10–25 mg). For the 18 suppliers selling in US\$, 9 quoted a fixed price per gram irrespective of the amount ordered and 11 had a reducing price per gram with increasing purchase quantity (US\$30.8 $\pm$ 34.2/g for 1 g purchase to US\$15.2 $\pm$ 20.3/g for 1 kg purchase). Only one Internet site selling 4,4'-dimethylaminorex was identified, selling in Euros. The minimum purchase quantity was 500 mg. The price

per gram reduced from €36.08/g for a 500 mg purchase to €2.20/g for a 100 g purchase. This Internet snapshot demonstrated that there was a greater availability from Internet suppliers of products advertised as 4-methylaminorex than 4,4'-dimethylaminorex, despite the 4-methylaminorex being an internationally controlled substance. Whilst this may reflect misunderstanding by suppliers, it has the potential to put those purchasing at risk of contravening border control and/or local law enforcement legislation. The use of methodology such as Internet snapshot surveys is of increasing interest to clinical/medical toxicologists in their understanding of the supply, availability and cost of novel psychoactive substances.

Keywords Internet · Novel psychoactive substance · Legal high · Bath salt

Introduction

The recreational drug market has changed over the last decade, with increasing availability and use of novel psychoactive substances (NPS) [1–7]. The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) monitors the detection of NPS in Europe and the neighbouring countries through its early warning system (EWS) [5].

4,4'-Dimethylaminorex (4,4'-DMAR) is a stimulant NPS that was first detected in the Netherlands in November 2012, although the first report to the EMCDDA EWS was from Finland on 2nd July 2013 in relation to analysis and detection in a customs seizure in May 2013 [8]. 4,4'-DMAR is a disubstituted 2-amino-5-phenyl oxazoline substance, which is a derivative of both aminorex and 4-methylaminorex (4-MAR). Both of these latter compounds are controlled under the 1971 United Nations Convention on Psychotropic

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Substances (aminorex—Schedule 4 and 4-MAR—Schedule 1). By May 2014, 4,4'-DMAR had been detected in analysis of customs and/or law enforcement seizures in seven European countries (Denmark, Finland, Hungary, the Netherlands, Romania, Sweden and the UK) and in biological samples from two European countries (Hungary and the UK) [8].

The EMCDDA has developed a novel monitoring technique known as 'Internet snapshot methodology' [9, 10]. This methodology allows understanding of the role of the Internet in the supply, availability and cost of NPS and allows monitoring of trends in this availability and cost. We undertook a single time point Internet snapshot study to determine the availability and cost to European residents of 4,4'-dimethylaminorex, and also to determine whether 4-methylaminorex was available for purchase from Internet sites despite being controlled under the 1971 United Nations Convention on Psychotropic Substances.

Methods

Using the EMCDDA Internet methodology [9, 10], we undertook an English Internet snapshot survey using the Internet search engine 'google.co.uk' in April 2014. The search terms used 'buy 4-methylaminorex', 'buy U4Euh' and 'buy 4,4'-dimethylaminorex'. Internet searching was undertaken to exhaustion, whereby the first 100 Internet sites identified were reviewed in full to understand their content and then sampling continued until 20 successive unrelated sites were identified. Data was extracted from each individual Internet site only once, irrespective of search term. Prior to data being extracted, it was confirmed either from the Internet site or by e-mail contact that the product could be shipped to Europe. Internet sites that appeared unable to ship products to Europe were excluded, as per EMCDDA methodology.

The following data was extracted from appropriate Internet sites on the amount (mass quantity of powder, liquid or crystal) and the relevant cost. This was then converted into cost per gram to allow comparison between different quantities available for purchase. Additionally, we attempted to extract the apparent country of origin of the Internet site, again by review of the Internet site or e-mail contact.

Results

4-Methylaminorex

Twenty Internet sites selling 4-methylaminorex were identified: 'buy 4-methylaminorex'—19 Internet sites; and 'buy U4Euh'—four. Eighteen of these Internet sites were selling in US dollars, and two were selling in GB pound sterling; we did not identify any Internet sites selling in Euros. Only one

Internet site indicated which isomer of 4-methylaminorex it was selling; this was the trans isomer. The formulation sold was only identified in eight sites: powder (six), crystal (four), liquid (one) and rock (one). All the Internet sites sold the product as mass per quantity of weight in grams, even where 4-methylaminorex was sold in liquid form. The country of origin was only obvious on eight Internet sites: Cameroon (two), Ukraine (two), USA (two), China (one) and Italy (one). The country of origin was either not apparent and/or there was no response to the e-mail requesting clarification for the remaining Internet sites.

Purchase Amount and Cost

The minimum purchase amount of 4-methylaminorex is shown in Fig. 1; interestingly, for seven of the 18 US dollar sites, the minimum purchase amount was ≥ 50 g. Eleven Internet sites quoted purchase costs which dropped with increasing quantities being ordered; the remaining nine quoted a fixed price per gram irrespective of the amount ordered. The mean cost per gram of 4-methylaminorex for purchase in US dollars is shown in Fig. 2. Regarding the two Internet sites selling in GB pounds sterling: one Internet quoted a price of £10/g irrespective of purchase amount with a minimum purchase amount of 1 g; the other quoted a price of £10/g for 10 g purchase reducing to £5.80/g for 50 g purchase and £4.60/g for purchase quantities above 100 g, with a minimum purchase amount of 10 g.

4,4'-Dimethylaminorex

Only one Internet site was identified selling 4,4'-dimethylaminorex, which was in powder form. It was not possible to determine the country of origin of the supplier, although it was sold in Euros. The minimum purchase quantity was 500 mg, with a purchase cost equivalent to €36.08/g. Similar to the Internet sites selling 4-methylaminorex, purchase cost reduced with increasing purchase amounts: €12/g for a 1 g purchase to €6/g for a 50 g purchase to €3.50/g for a 50 g purchase to €2.20/g for a 100 g purchase.

Discussion

This single-time point English language Internet snapshot study has identified only one Internet site selling 4,4'-dimethylaminorex compared to 20 Internet sites selling 4-methylaminorex, despite the latter being listed and controlled under the 1971 United Nations Convention on Psychotropic Substances. In addition, the majority of Internet sites selling 4-methylaminorex quoted in US dollars rather than GB pounds sterling or Euros, which has not been seen in other Internet snapshot studies [2, 9–12]. Similar to other previous Internet

Fig. 1 Minimum purchase amount of 4-methylaminorex

snapshot studies, for example alpha-methyltryptamine (AMT) and methiopropamine, the cost per gram of both 4-methylaminorex and 4,4'-dimethylaminorex decreased with increasing size of intended purchase [11, 12].

We also reviewed the minimum purchase quantity of both 4-methylaminorex and 4,4'-dimethylaminorex. For 4-methylaminorex, the 'standard' user dose appears to be 10–25 mg [13]. It is interesting that 14 (70 %) of Internet sites identified had a minimum purchase amount of ≥ 10 g, which would equate to between 400 and 1,000 individual user doses. This would suggest that these Internet sites are targeting sales

more towards 'dealer-level' purchases, rather than 'user-level' purchases. There appears to be a wider range of doses reported by users for 4,4'-dimethylaminorex between 10 and 200 mg [8]. The only Internet site identified selling 4,4'-dimethylaminorex had a minimum purchase amount of 500 mg, which would be the equivalent of between 2.5 and 50 doses. Since it was available for purchase in amounts up to 100 g (500 to 10,000 doses), this suggests that the smaller purchase amounts are targeted more towards individual users, whereas the larger amounts are more targeted towards dealer-level purchases.

Fig. 2 Mean ($\pm$ Std Dev) per gram for different purchase weight quantities of 4-methylaminorex for Internet sites selling in US dollars

In this study of aminorex derivatives, we identified that the majority of Internet sites were advertising for purchase a substance that has already been controlled under the 1971 United Nations Convention on Psychotropic Substances but is structurally related to a more recently identified and uncontrolled NPS. It is possible that the Internet suppliers themselves may be confused as to which substance they are intending to sell, since in some user discussion fora, there appears to be confusion between 4-methylaminorex and 4,4'-dimethylaminorex [13, 14]. In addition, there are numerous studies that have demonstrated that the contents of NPS products purchased from the Internet, high street headshops or street-level drug dealers are variable and the actual contents may not reflect the stated contents [15–20]. The main limitation of the Internet snapshot methodology is that the products are not purchased and analysed; therefore, it is not possible to be certain of the actual contents of the products being sold. However, it should be noted that potential users would also be searching using similar techniques to find these types of products for purchase.

Previous Internet snapshot studies have demonstrated that the availability of products containing NPS varies depending on the particular NPS [2, 11, 12]. Studies undertaken in March 2012 demonstrated that products containing alpha-methyltryptamine (AMT), diphenylprolinol (D2PM) and desoxypropadrol (2-DPMP) were available from 30, 5 and 13 Internet suppliers, respectively [2, 11]; these are comparable to the number of Internet suppliers identified in this reported snapshot (4-methylaminorex (20) and 4,4'-dimethylaminorex (1)). The Internet supply and marketing of NPS change over time and also within different geographical regions [11, 12]. The number of Internet sites with products containing AMT had dropped from 30 in March 2012 to 25 in October 2012 [11]. An Internet snapshot study for methiopropamine in June 2013 identified 62 Internet sites: google.co.uk in English, google.fr in French, google.ca in English and google.ca in French identified 56, 6, 44 and 9 Internet sites, respectively. When comparing the data from different Internet snapshot studies, it is essential that any potential impact of the search methodology (language or search engine) and/or when the snapshot was undertaken is considered.

Conclusion

This Internet snapshot demonstrated that there was a greater availability from Internet suppliers of products advertised as 4-methylaminorex than 4,4'-dimethylaminorex, despite 4-methylaminorex being an internationally controlled substance. This survey methodology, developed by the EMCDDA, is a useful technique for monitoring the availability of NPS for purchase from Internet sites. Continual

monitoring using this methodology will enable law enforcement agencies and policy makers to understand the availability of these substances to potential users. It is also important when undertaking these snapshots to consider whether there should be inclusion of not only the NPS of interest but also structurally related controlled substances to see if these are also being offered from similar Internet sites. The use of methodology such as Internet snapshot surveys is of increasing interest to clinical/medical toxicologists in their understanding of the supply, availability and cost of NPS.

Conflict of Interest The authors report no conflicts of interest in relation to this study.

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