Are the NPS used? An extensive investigation in Northern Italy based on hair analysis

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Introduction and Aim: New Psychoactive Substances (NPS) are present on the Italian illicit markets but data from the analysis of biological samples to evaluate their real consumption are rare.

For this reason, an epidemiological study was carried out by means of a UPLC-MS/MS method for the determination of 115 NPS on keratin matrix.

Materials & Methods: 847 hair samples collected in 2020 and 2021 have been analysed. The sample donors were in the age range 18-40 years, from both genders, from the province of Brescia, Bergamo and Mantova (Northern Italy), and were tested either for driving re-licensing or for drug withdrawal monitoring.

The UPLC-MS/MS system consisted of a Waters ACQUITY UPLC® I-Class, coupled with a Waters XEVO TQ-XS triple quadrupole mass spectrometer operated in multiple reaction monitoring (MRM) mode, by using an electrospray ionization (ESI) source in positive mode.

The method was developed modifying instrumental parameters to improve peak resolution and creating single acquisition windows for each compound.

Validation was carried out by evaluating following biostatistics parameters: calibration, LOD, LOQ, precision, accuracy, recovery, matrix effects and process efficiency.

Results & Discussion: LODs were set as the minimum criterion to identify positive samples. Overall, 56 samples resulted positive for ketamine, 35 for norketamine, 6 for fentanyl, 3 for norfentanyl, 3 for 4-ANPP, 3 for MDMB-4en-PINACA, 2 for N,N-DMT, 2 for 5-chloro AB-PINACA, 1 for α-PHP and 1 for methcathinone.

Conclusions: NPS were detected in a small part of samples (8.4%), which seems in contrast with the high number of materials which are commonly seized by the police.

Ketamine was the most prevalent compound, although this molecule is often used also for clinical and therapeutic purposes. Few other NPS were identified.

Based on this results, future studies will be performed to expand the investigated population, especially in terms of age and origin. In order to understand the real diffusion of NPS, the results from hair analysis will be complemented with metabolomics studies and untargeted HRMS analysis.