Study of Patterns of Drugs of Abuse in New Territories East & West Cluster Drug of Abuse Clinic Using Conventional and New Technologies

Executive Summary

Background and objectives

The study was conducted by the Department of Chemical Pathology and the Department of Psychiatry, The Chinese University of Hong Kong, and the Department of General Adult Psychiatry, the Castle Peak Hospital.

Traditionally, Immunoassay and High-performance liquid chromatography with ultraviolet detector (HPLC-UV) are used for the detection of abused drugs in urine samples. These two conventional methods are limited by sensitivity, specificity, and the requirement of a known drug library or pure standards for drug identification. Recent advance in Ultra-performance liquid chromatography time-of-flight mass spectrometric technique (UPLC-TOF-MS) allows target screening and confirmation of both conventional and novel drugs at an improved sensitivity and specificity without the need of pure standard.

Study subjects were recruited anonymously from the Substance Abuse Clinics (SACs) in the New Territories East (NTEC) and West (NTWC) Clusters Hospitals of Hong Kong to provide urine samples for analysis as well as information on their drug use and the socioeconomic background. The primary objectives of the study were to validate the use of UPLC-TOF-MS by demonstrating the accuracy and reproducibility of drug detection through comparison of use of the conventional and new laboratory techniques and to develop prevalence data on current pattern of psychotropic substance abuse in the locality. In addition, the study also compared the drug abuse history obtained from subjects with respect to their corresponding urine analytical result to look for possible novel drugs or impurities.

Summary of findings

➤ Demographic data

Four hundred and fifty four subjects were recruited from the SACs or non-government organizations (NGOs) in NTEC (200 subjects, 44.1%) or NTWC (254 subjects, 55.9%) during the period of July 2007 to March 2011. Two hundred and seventy five subjects (60.6%) were male

and 179 subjects (39.4%) were female. Age of subjects ranged from 14 to 66 years with a prevalence in the younger age groups (72% of subjects were below 40 years of age). Most subjects (360 subjects of total, 79.3%) in our study population attained secondary education level, in which most of them (249 subjects, 69.1% of 360 subjects) reached junior secondary education level only.

Irrespective of the education level attained by our study subjects, a very high unemployment rate (287 subjects, 63.2% of total) was noted in the study population. Among the 314 subjects (69.2% of total) who reported to have no monthly income, 209 subjects (46% of total) reported to be receiving financial assistance from the government. Of these 209 subjects, 111 subjects (24.4% of total) reported to have monthly expenditure on drugs ranging from <$100 to >$1,100 while they were receiving financial assistance from the government.

➢ Survey on previous drug use

Of the 454 subjects, 362 (79.7%) reported their age of first started drug abuse were below 25 years of age, of which, 90 subjects (19.8% of total) started in 10-14 years of age; 201 subjects (44.3% of total) started in 15-19 years of age; and 71 subjects (15.6% of total) started in 20-24 years of age. The lowest reported age of first started drug abuse was 10 years old.

Regarding to history of previous drug use, the number of drug items ever tried by individual subject ranged from 1 to 10. Only 103 (22.7%) of the 454 subjects reported to be single drug users all along while majority of subjects reported to have tried more than one group of drugs in the past. Overall, ketamine (250 subjects, 55.1%), cannabis (236 subjects, 52%) and amphetamines (235 subjects, 51.8%) were the three most commonly abused drugs reported in our study population. Different popularity of drug ever tried by the study subjects was observed across different age groups. Ketamine, amphetamine and hypnotics were the most popular drug of abuse item in the age groups of 10-29 years, 30-39 years, and 40-70 years, respectively.

Peer influence and recreational were the two major reasons of drug abuse reported in our study population. Most subjects (320 subjects, 70.5%) reported to have experienced complications of drug abuse subjectively. Physical complications that were most frequently reported include tiredness/weakness, hand tremor, dental caries, urinary frequency/ketamine-induced cystitis, loss of appetite, withdrawal symptoms, epigastric pain and hepatitis. Serious physical complications such as infective endocarditis, heart failure, deep vein thrombosis, loss of consciousness due to drug overdose were also reported. Psychiatric complications that were most frequently reported include impaired memory, depression, psychosis, hallucination, anxiety, irritability, insomnia, slow response and suicidal idea/attempt. Most subjects (382 subjects, 84.1%) reported to be smokers. Two hundred and seventy six subjects (60.8%) reported to have previous forensic history. Proportion of male subjects reported to have forensic history was higher than that of female subjects.

➢ Survey on last drug use

Regarding to history of last drug use, ketamine, hypnotics, opiates (heroin), cough medicine and amphetamines were the five most popular drug of abuse items that were reported by our study subjects. Cough medicine was the second most popular group of drug item reported in male subjects while its use was less popular in female subjects. A total of 227 (50%) subjects reported his/her last drug use to be within 1 week's time with regard to the time of the survey and urine collection, in which, 96 (21.1%) subjects admitted that they had active drug use even less than 24 hours before the clinic follow up. A total of 152 (33.5%) subjects reported a drug-free period of above 1 month, in which, only 44 (9.7%) subjects reported his/her last drug use to be above 1 year of time. Majority of subjects reported to use drugs at home or friend's apartment. Friends were reported as common sources of ketamine and amphetamines while pharmacy was reported as a common source of hypnotics and cough medicine. Most of the study subjects obtained drugs in Yuen Long, Tuen Mun and Yau Tsim Mong districts. Two hundred and ninety eight subjects reported to be taking therapeutic drugs. The therapeutic drug items were mainly psychiatric medications prescribed from the SACs. However, detail description of individual's therapeutic drug regime was unavailable.

➢ Comparison of new and conventional techniques

Regarding to the urine analysis, 67 urine samples were analyzed by both of the new (UPLC-TOF-MS) and conventional (HPLC-UV + Immunoassay) techniques. The total number of drug items identified by the new technique was greater than that of the conventional technique. Ratio of the scoring of deficiency and improvement of drug detection by the new method was also shown to be superior to the conventional method. The UPLC-TOF-MS method has been validated and published. The urine analysis results generated by UPLC-TOF-MS provided us useful and reliable information for the investigation of the pattern of substance abuse among our study population.

➢ Pattern of drugs of abuse detected in urine

A total of 73 drug items (including both drugs of abuse or therapeutic agents) were identified from 2,783 parent drugs and metabolites detected by UPLC-TOF-MS in the 454 urine samples. Cough medicine was the most frequently drug item detected in our study population which was discrepant from the result of the survey. Hypnotics were the second most frequent drug of abuse items detected, followed by ketamine, opiates and benzodiazepines. Higher frequency of hypnotics was detected in urine of female subjects, but higher frequency of cough medicine was detected in male subjects. Patterns of drugs detected were different in different age groups. Cough medicine and ketamine were detected in the younger age groups more frequently while opiates and hypnotics were detected in the older age groups more frequently. Number of drug of abuse items detected in individual urine sample ranged from 0 to 4. Discrepancy of number of drug items reported by subjects and number of drug items detected in urine was observed. Most of the subjects under-reported their number of drug use.

➢ Unexpected substances detected in urine

Although there was no unidentified peak of unknown substances detected in the 454 urine samples, a high prevalence of cough medicine was detected in urine of our study subjects (121 urine samples, 26.7% of 454 subjects). A total of 376 subjects (82.8% of total) did not report cough medicine in their last use, of which, 64 subjects (17% of 376 subjects) turned out to have positive findings of ingredients of cough medicine in their urine. The easy accessibility from local pharmacy and cheaper cost of cough medicine could be the reasons for the use of cough medicine by chronic drug abusers as a milder substitute of their original drug use or during their detoxification process. In addition, ingredients of cough medicine may be added to the commonly abused drugs either intentionally for the synergistic sedative effect or for minimizing some of the unwanted effects of the abused drugs, or unintentionally as contaminants. Further studies and investigations on cough medicine abuse are required.

Conclusion

The demographic characteristics of our study population with their continuing substance abuse habit and long-term psychiatric problems created a huge social, financial and healthcare burden to the society. Effort and resources on tackling the existing drug abusers in terms of stopping and monitoring their drug misuse habit, treating their physical and psychiatric illnesses, and ultimately helping them to return to the society with public acceptance are of equally importance to the primary prevention of substance abuse.

Differences in age revealed a different prevalence of drug abuse pattern in the locality. Though the most commonly detected drug of abuse items in NTEC and NTWC were similar, the differences in the frequency of detection of individual drug items can be explained by the different age components among the regional subgroups. Nevertheless, the commonness of cough medicine (26.7% of total) and hypnotics (18.3% of total) misuse among patients followed up in SACs across the new territories gives an important message to the community that their potential harmful effects should not be overlooked.

Advanced technology in drug testing is useful in diagnosing and monitoring substance abuse habit, as well as in discovering unusual pattern and novel or contaminated substances being misused, though cost and window of detection would be its limitations. With the diagnostic utility of UPLC-TOF-MS, its use in clinical practice may help to guide the treatment of substance abuse. Effective preventive measures and specific treatment program targeting the problem may also be developed from the local data on preference of substances of abuse.