

Abstract No: MO-04

Determination of narcotic (morphine, codeine, 6-monoacetylmorphine) levels in human urine by gas chromatography

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Drug abuse has become a more prevalent problem in Sri Lanka in the last few years. The presence of residues and their metabolites of illicit drugs that are excreted by humans is an evidence of intake. Therefore, the aim of this study was to develop a selective and sensitive gas chromatography-mass spectrometry (GC-MS) method for the analysis of morphine, codeine, 6-monoacetylmorphine (6-MAM) in biological samples. Selected Ion Monitoring (SIM) mode of gas chromatography-mass spectroscopy was used to quantify morphine, codeine and 6-MAM in human urine samples. Derivatization was carried out after the liquid-liquid extraction of samples. The derivatization improved the sensitivity enabling the detection of codeine by 52% and morphine by 26%. For 6-MAM, recovery was greater than 45% compared to samples without derivatization. The linearity (r^2) values of the methods were greater than 0.9976 for all the three analytes and the limits of quantifications were 2.22 $\mu\text{g/mL}$, 2.22 $\mu\text{g/mL}$ and 2.14 $\mu\text{g/mL}$ for morphine, codeine and 6-MAM respectively. These methods were applied to six urine samples collected from "Seth Sevana" Awareness and Rehabilitation Centre in Colombo. The samples were found to be containing 80-300 $\mu\text{g/mL}$ of morphine and 219-439 $\mu\text{g/mL}$ of codeine. However, the presence of 6-MAM in urine could not be identified due to possible rapid metabolization of 6-MAM, which addresses the lower recovery of the method for 6-MAM. The results indicate that this method can be used successfully for the determination of codeine and morphine levels in human urine, which thus can be used for rehabilitative purposes and to study drug addiction.

Keywords: GC-MS SIM, Derivatization, Rehabilitative