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Diagnostic accuracy of cannabinoid testing by liquid chromatography-tandem mass spectrometry in human hair

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Objective: To determine the diagnostic accuracy of cannabinoids testing by Liquid Chromatography-Tandem Mass Spectrometry (LC-MS) in human hair and to compare it with urine for detection of cannabis use in civil heavy vehicle drivers

Materials & Methods: This diagnostic accuracy (validation) study was carried out at Department of Forensic Medical Sciences Laboratory (FMSL), Forensic Toxicology Section, Armed Forces Institute of Pathology Rawalpindi, Pakistan. Hair and urine samples of about 151 civil heavy vehicle drivers were collected from various urban and rural areas of Punjab. Sampling technique was non-probability convenient. About 10 ml of urine volume was collected and stored at -20°C. Hair strands, about the thickness of a pencil shaft, were collected from the posterior vertex of scalp. It was cut as close to the root as possible, and kept at room temperature till further analysis separation of compounds was done on Agilent Poroshell 120 EC-C18 column (2.1 x 7.5 mm 7 micron) and analyzed on a 6460 Triple Quadrapole LC-MS along with software Mass hunter ©.

Results: 151-male civil heavy vehicle drivers, who were included in the study, were categorized into three main groups. There were 69 (71.5%) truck drivers, 43 (28.5%) were 20-wheeler drivers, whereas bus drivers were 39 (25.8%). Mean age was 36±10.82 years. Subjects were stratified according to the age into four main groups: 20-25 y: 28 (18.5%); 26-40 y: 73 (48.3%), 41-60 y: 47 (31.1%) and >60 y: 3 (2%). Paired t test was applied to check significance of study at 95% confidence interval which was significant at $p<0.05$ ($p=0.00$). Various parameters of diagnostic accuracy in hair and urine samples were: sensitivity (97% and 77%), specificity (92% and 93%), positive likelihood ratio (13% and 12%), negative likelihood ratio (0.04% and 0.24%), positive predictive value (89% and 83%), negative predictive value (98% and 91%) respectively. Overall diagnostic accuracy of cannabinoids in hair was 94.04% while in urine it was 88.67%. Receiving Operating Characteristics (ROC) curve was plotted which showed area under curve of 0.967 and 0.793 for hair and urine respectively, therefore signifying a better diagnostic accuracy of hair as compared to urine for cannabis detection.

Conclusion: This study highlights the importance of hair as an alternative biological matrix due to its good diagnostic yield, easy non-invasive specimen collection and distinctive potential of analyte stability, as well as wider period of detection as compared to urine.

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