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Accuracy of Psi Multiplication Product Sum (PMS) in Predicting Hepatotoxicity Following Acute Acetaminophen Overdose

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Aim and objectives: Acetaminophen overdose is a prevalent cause of hepatotoxicity, typically treatable with N-acetylcysteine (NAC). Identifying patients at risk of acetaminophen-induced hepatotoxicity is crucial for individualized treatment planning. Risk factors for acetaminophen-induced hepatotoxicity include elevated serum acetaminophen levels and delayed initiation of NAC therapy. Several predictors, including timed-acetaminophen concentration, acetaminophen-aminotransferase multiplication product (APxAT), and the Psi parameter (Psi), have been explored. However, no single diagnostic tool with a definitive cutoff has provided satisfactory accuracy in predicting hepatotoxicity following acute acetaminophen overdose. This study investigates the diagnostic accuracy of the Psi Multiplication Product Sum (PMS) for predicting hepatotoxicity in such cases.

Methodology: A retrospective analysis was conducted on patients presenting with acute acetaminophen overdose at Siriraj Hospital, Bangkok, Thailand, between January 2007 and December 2016. PMS, calculated as the sum of Psi (unit mM hour) and Acetaminophen aminotransferase multiplication product (unit mg U/L^2), was employed. Hepatotoxicity was defined as aspartate or alanine aminotransferase levels exceeding 1000 U/L. Diagnostic accuracy for hepatotoxicity was assessed through sensitivity, specificity, the area under the receiver operating characteristic curve (ROCAUC), and their corresponding 95% confidence intervals (CI). The optimal cutoff was determined using the maximum Youden index method.

Results: The study included 421 patients, predominantly female (82.9%) with a median age of 23 years (interquartile range 20-28). Hepatotoxicity was observed in 13.5% (57 patients). PMS demonstrated a robust ROCAUC of 0.988 (95% CI 0.974-0.997), with an optimal cutoff at 9.723, offering a sensitivity of 96.49 %(95%CI

87.89-99.57) and specificity of 97.25% (95.01-98.67). Notably, PMS's ROCAUC significantly outperformed the ROCAUCs of Psi and APxAT.

Conclusions: The Psi Multiplication Product Sum (PMS) emerges as an effective tool for predicting hepatotoxicity following acute acetaminophen overdose, offering excellent sensitivity, specificity, and diagnostic accuracy. PMS, with a defined cutoff at 9.723, holds potential for personalized treatment planning in cases of acute acetaminophen overdose.