

Abstract

Accurate analysis of multivitamin formulations is necessary to ensure product quality, efficacy, and safety. This research aimed to develop and validate an analytical method for the simultaneous identification and quantification of water-soluble vitamins using Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS). Method development involved system suitability testing, linearity, accuracy, precision, and robustness evaluation. The LC-MS/MS method enabled the successful detection of multiple vitamins with optimized chromatographic and mass spectrometric parameters.

The developed method showed good linearity for most vitamins, including thiamine, riboflavin, niacin, niacinamide, pantothenic acid, pyridoxine HCl. Recovery and precision showed significant deviations due to instrumental limitations and sample preparation variability. Vitamin C was excluded due to its instability under analytical conditions. Despite limitations, this method demonstrates potential for routine multivitamin screening, especially in pharmaceutical quality control. Further optimization, such as improved weighing accuracy and the use of specialized chromatographic columns could enhance performance and broaden its applicability.

Keywords: LC-MS/MS, multivitamins, water-soluble vitamins, analytical method development