

COMPARATIVE ANALYSIS OF LABORATORY TECHNIQUES FOR DETECTING PLASMA CELL CLONALITY IN PATIENTS WITH MULTIPLE MYELOMA AT AN ACADEMIC LABORATORY IN GAUTENG.

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BACKGROUND AND OBJECTIVES: Multiple myeloma (MM) is a malignant plasma cell disorder characterized by clonal proliferation of plasma cells in the bone marrow and production of monoclonal immunoglobulins (M-proteins), disrupting normal haematopoiesis and causing systemic complications. Accurate detection of plasma cell clonality is essential for diagnosis, risk stratification, and management. This study compared the diagnostic performance of commonly used laboratory techniques for detecting plasma cell clonality in patients with MM.

METHODS: A retrospective cross-sectional descriptive study was conducted on patients diagnosed with MM over a five-year period (1 January 2020–31 December 2024). Data were collected on serum protein electrophoresis (SPEP), urine protein electrophoresis (UPEP), flow cytometry (FC), and immunohistochemistry (IHC). Sensitivity, specificity and concordance for detecting plasma cell clonality were evaluated using SPEP as the reference standard, and test performance was examined across categories of bone marrow disease burden.

RESULTS: Of 96 records screened, 75 untreated, confirmed MM cases met the inclusion criteria. FC detected clonality in 69 patients and showed the highest concordance with SPEP (sensitivity 88.2%, specificity 40.0%). IHC demonstrated moderate agreement (sensitivity 85.2%, specificity 23.5%), while UPEP was the least reliable due to low detection rates and frequent specimen-related exclusions. Among 69 cases with available bone marrow aspirate results, 69.6% had adequate samples and 55.1% had high disease burden (>30% plasma cells). FC detected clonal plasma cells across all burden categories, whereas IHC, SPEP and UPEP performed best in higher burden disease.

CONCLUSION: Flow cytometry was the most sensitive method for detecting plasma cell clonality, with IHC, SPEP and UPEP contributing complementary but more limited roles. These findings

support the use of combined serological and marrow-based methods to optimise diagnostic accuracy and resource utilisation for MM in resource-limited academic settings.