Science & Technology · GS - III

Discuss the role of biotechnology and biomarker-based diagnostics in improving cancer detection and treatment in India. What challenges must be addressed?

EXAM YEAR	PAPER	SUBJECT
DAILY PRACTICE 23/10/2026	GS - III	Science & Technology

MARKS	WORD LIMIT
10	~150 words

Answer Hint

Early diagnosis, liquid biopsy, biomarkers, precision medicine, affordability, clinical validation, false positives, research funding, healthcare access.

Model Answer

Introduction:

Biotechnology is transforming cancer care through biomarker-based diagnostics, which can help detect disease-associated biological changes and support timely treatment.

Significance

1. Early detection: Blood-based tests may identify cancer-associated biomarkers before advanced symptoms appear.
2. Non-invasive diagnosis: Liquid biopsy approaches can analyse tumour-associated material in blood, potentially reducing reliance on invasive procedures in selected settings.
3. Precision medicine: Biomarker information can help guide treatment selection.
4. Affordable healthcare: Simple diagnostic tools may expand access, particularly where advanced medical facilities are limited.

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Challenges

1. Clinical accuracy: Tests must demonstrate adequate sensitivity and specificity.
2. False results: False positives and false negatives can lead to unnecessary investigations or missed diagnoses.
3. Research-to-practice gap: Promising laboratory findings require extensive clinical validation.
4. Accessibility: Cost, laboratory infrastructure and trained personnel remain important concerns.

Way Forward:

India should strengthen biomedical research, clinical trials, regulatory oversight and equitable access to validated diagnostic technologies.

Conclusion:

Biomarker-based diagnostics can strengthen cancer care, provided their safety, accuracy and clinical benefits are established before widespread adoption.

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