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Whole-Organ Radiotherapy in the Era of Poor Anatomical Resolution: Evidence from a Population-Based Bladder Cancer Registry (Sri Lanka, 2015–2022)

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Background:

Precision radiotherapy in bladder cancer increasingly relies on accurate tumor localization for focal boosting and adaptive strategies. However, in many low- and middle-income countries (LMICs), population-based cancer registries lack anatomical granularity, with most cases classified as “not otherwise specified” (NOS). The implications of this limitation for radiotherapy strategy remain underexplored.

Objective:

To quantify anatomical data resolution in bladder cancer registry data in Sri Lanka and assess its implications for radiotherapy target volume selection.

Methods:

A retrospective population-based analysis was conducted using Sri Lanka National Cancer Registry data (2015–2022). Bladder cancer cases (ICD-10: C67) were analyzed by year, sex, anatomical subsite, and histology. The proportion of cases coded as C67.9 (bladder NOS) was calculated annually. Findings were interpreted within a radiotherapy planning framework.

Results:

A total of 6,364 cases were identified, with a stable male predominance ($\approx 80\text{--}85\%$). Across all years, 90–99% of tumors were classified as bladder NOS, with subsite-specific data available in $<10\%$ annually and no temporal improvement. Urothelial carcinoma predominated ($>80\%$). Despite adequate case volumes, anatomical localization was insufficient to support population-level subsite-directed radiotherapy approaches.

Conclusion:

Bladder cancer registry data in this LMIC setting demonstrate profound anatomical data collapse, limiting the feasibility of precision, tumor-directed radiotherapy strategies. These findings support the continued relevance of whole-bladder radiotherapy as a robust and reproducible approach in resource-constrained settings. Strengthening anatomical data granularity is essential to enable future transition toward precision radiotherapy paradigms.

Keywords:

Bladder cancer; Radiotherapy; Whole-bladder irradiation; Cancer registry; Anatomical data collapse; Data quality; Urothelial carcinoma; LMIC; Epidemiology; Target volume delineation; Precision radiotherapy; Health systems