The Intersection of Socioeconomic Disparities and Tumor Microenvironment Dynamics in Bladder Cancer

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BACKGROUND

- Bladder cancer is the 9th most common cancer globally, making up ~3% of new cases and 2% of cancer-related deaths annually.
- Low socioeconomic status (SES) is a known risk factor for poor outcome in bladder cancer.
- Few studies have examined the effect of low socioeconomic status on bladder tumor biology.
- It is suspected low SES influences the TME through diet, increased prevalence of smoking, alcohol use, exercise and many more factors. .
- This study examines the link between SES and bladder tumor microenvironment to better explain poor outcomes seen in bladder cancer patients with low SES.

METHODS

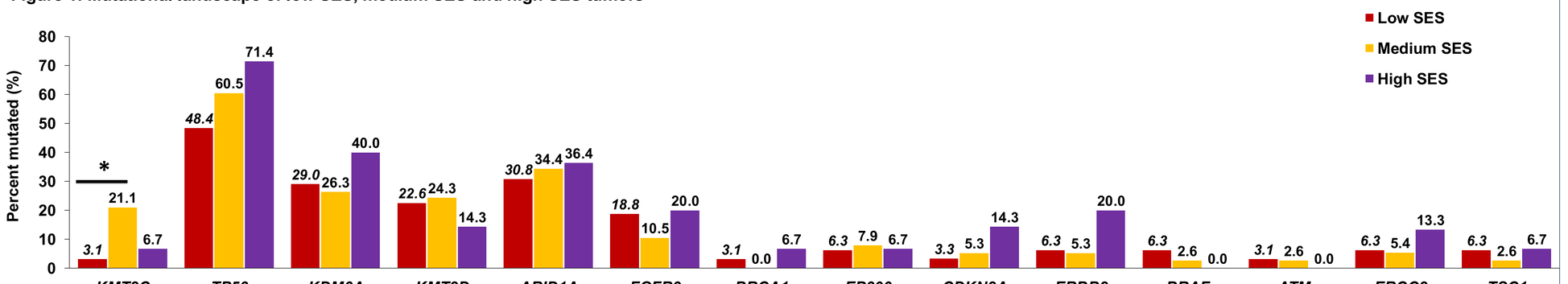
- **Study Design:** Retrospective analysis of 97 bladder cancer patients (65 male, 32 female) from 2016-2023 at the University of Arizona Cancer Center.
- **Data Collected:** Deidentified socio-demographics obtained from electronic health records, including age, race, ethnicity, marital status, substance use, ECOG score, obesity, employment status, and family history of cancer.
- **SES Scoring:** Used Area Deprivation Index (1 = highest SES, 100 = lowest SES); patients categorized into tertiles: T1 (1-33): N=16, T2 (34-67): N=43, T3 (68-100): N=34
- **Genomic Analysis:** Germline, tissue, and/or liquid biopsy with NGS (Caris Life Sciences).
- **Exclusions:** Patients without tissue biopsy NGS data.

Table 1: Patient Characteristics

		Low SES	Medium SES	High SES
Count (N)		34	43	16
Median Age [range]		73 [18 - 89]	71.5 [45 - >89]	70 [58 - 85]
Sex	Male	76.47% (26/34)	62.79% (27/43)	62.5% (10/16)
	Female	23.52% (8/24)	37.2% (16/43)	37.5% (6/16)

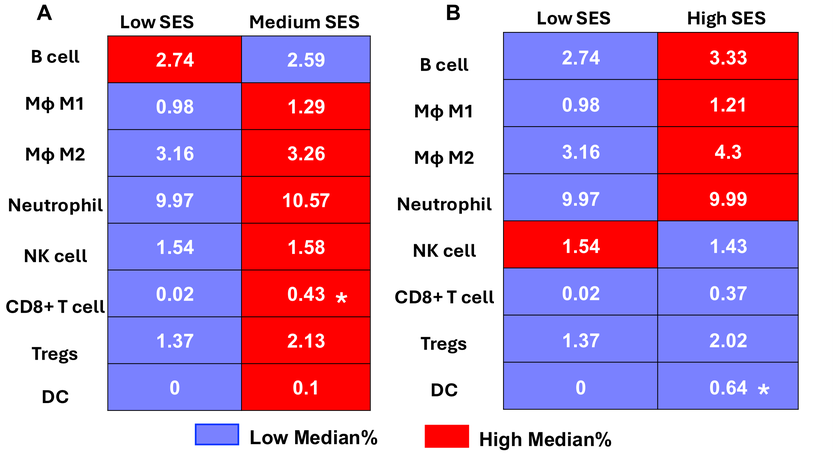
RESULTS

Figure 1: Mutational landscape of low SES, medium SES and high SES tumors



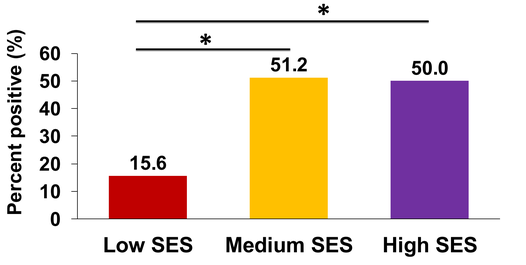
Bladder cancer patients with median SES had higher frequency of *KMT2C* mutation (21.1% vs 3.1%) compared to low SES tumors. *p<0.05

Figure 2: Immune cell infiltration



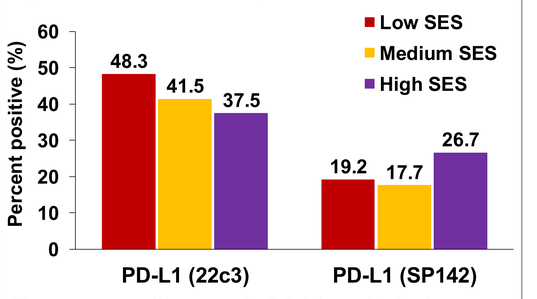
(A) Low SES tumors had lower infiltration of CD8+ T cells (0.02% vs 0.43%) compared to median SES tumors. (B) Low SES tumors had lower infiltration of DC (0% vs 0.64%) compared to high SES tumors. *p<0.05

Figure 3: TMB high analysis



Bladder cancer patients with low SES had lowest TMB high frequency compared to median SES (15.6% vs 51.2%) and high SES (15.6% vs 50%). *p<0.05

Figure 4: PD-L1 IHC analysis



There was no difference in PD-L1 positivity between patients with low SES, median SES and high SES.

CONCLUSIONS

In our study, lower SES bladder cancer patients had a lower amount of CD8+ cells, dendritic cell infiltration, and a low frequency of TMB-H, indicating a lower level of adaptive immune response present in the tumor microenvironment. Lower levels of adaptive immune activity have been associated with more aggressive tumor behavior and worse outcomes in bladder cancer patients. These findings provide a partial explanation of the molecular mechanisms underlying the poor prognosis observed in low SES patients with bladder cancer. Larger-scale studies exploring the impact of SES on tumor biology are essential as they hold significant therapeutic and preventive implications.