

# The Impact of Body Mass Index and Diabetes Mellitus for patients with Non-Muscle Invasive Bladder Cancer Treated with Bacillus Calmette–Guérin: Abstract 2938

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## Introduction

- There's an association between increased body mass index (BMI) and a possible association between DM and bladder cancer risk
- Cancer recurrence and progression occur in 32-45% and 9.5-13.4% of patients treated with BCG, respectively
- 'Obesity paradox': positive correlation between elevated BMI and clinical outcomes for patients treated with immunotherapy-even when elevated BMI is associated with worse outcomes without treatment
- The relationship between BMI, DM, and NMIBC has been minimally described
- There may exist an 'obesity paradox' for patients with NMIBC treated with BCG.

**Primary objective: Evaluate the impact of BMI, DM, and other potential confounding variables associated with the metabolic syndrome on: recurrence free (RFS), progression free (PFS), overall (OS), and cancer specific survival (CSS) for patients with NMIBC treated with BCG therapy**

## Methods

- Population: patients over 18 who received ≥1 instillation of BCG between 1/2004 and 8/2018 were identified by billing data.
- Inclusion criteria included: NMIBC, receipt of an induction course of (≥5 instillations) at our institution and completion of at least 1 follow-up cystoscopy within 6 months.
- Univariate Cox models and log rank tests were used to evaluate the association between outcomes and clinical factors. A final multivariable Cox model was obtained
- Analysis for time to progression was calculated to ensure that OS did not confound PFS.

Patient characteristics

Demographic Characteristics	n	%
<b>Total</b>	<b>583</b>	<b>100</b>
<b>Gender</b>		
Male	466	79.9
Female	117	20.1
<b>Age yrs (Mean, +/-SD)</b>	67.7 +/- 11	NA
<b>BMI kg/m2 (Mean, +/-SD)</b>	29.0 +/-6.0	NA
Underweight (<18.5)	5	0.9
Normal (≥18.5 and < 25)	135	23.3
Overweight (≥25 and <30)	217	37.5
Obese (≥30)	222	38.3
Unknown	4	0.6
<b>Any Diabetes Mellitus</b>		
Yes	105	18.1
No	474	81.9
Unknown	4	0.6
<b>Smoking Status</b>		
Current	89	15.3
Never	185	31.8
Former	308	52.9
Unknown	1	0.2
<b>Stage of Entry Tumor</b>		
cTa	267	45.8
cTis	41	7
cT1	275	47.2
<b>Grade of Entry Tumor</b>		
Low	60	10.3
High	523	89.7
<b>Any CIS</b>		
Yes	187	32.1
No	396	67.9
<b>Number of Tumors</b>		
Single	275	47.3
Multiple	306	47.3
Unknown	2	0.3
<b>Tumor Status</b>		
Primary	379	65.3
Recurrent	201	34.7
Unknown	3	0.5
<b>Repeat TUR</b>		
Yes	357	61.4
No	224	38.6
<b>Repeat TUR When cT1</b>		
Yes	234	85.1
No	41	14.9
<b>Maintenance BCG Received</b>		
Yes	532	91.7
No	48	8.3

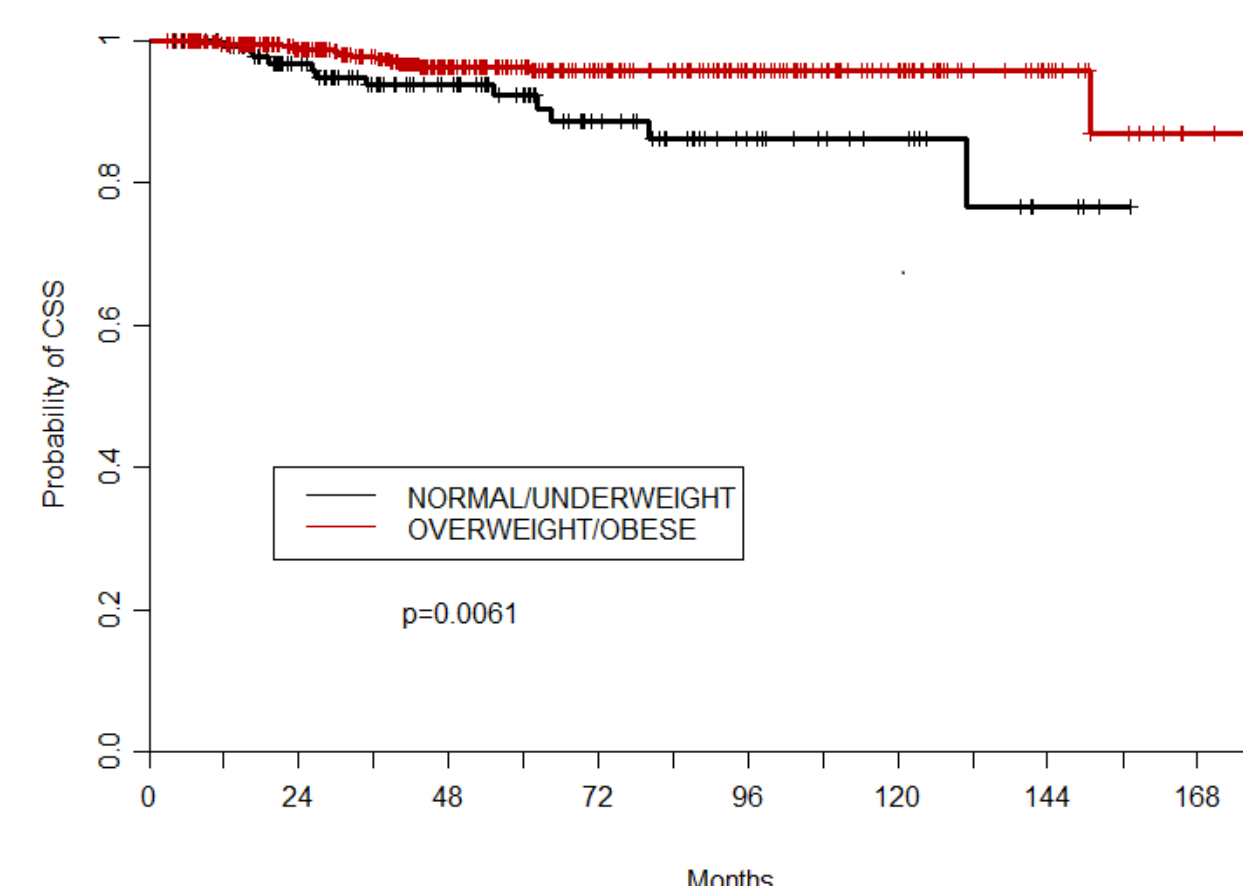
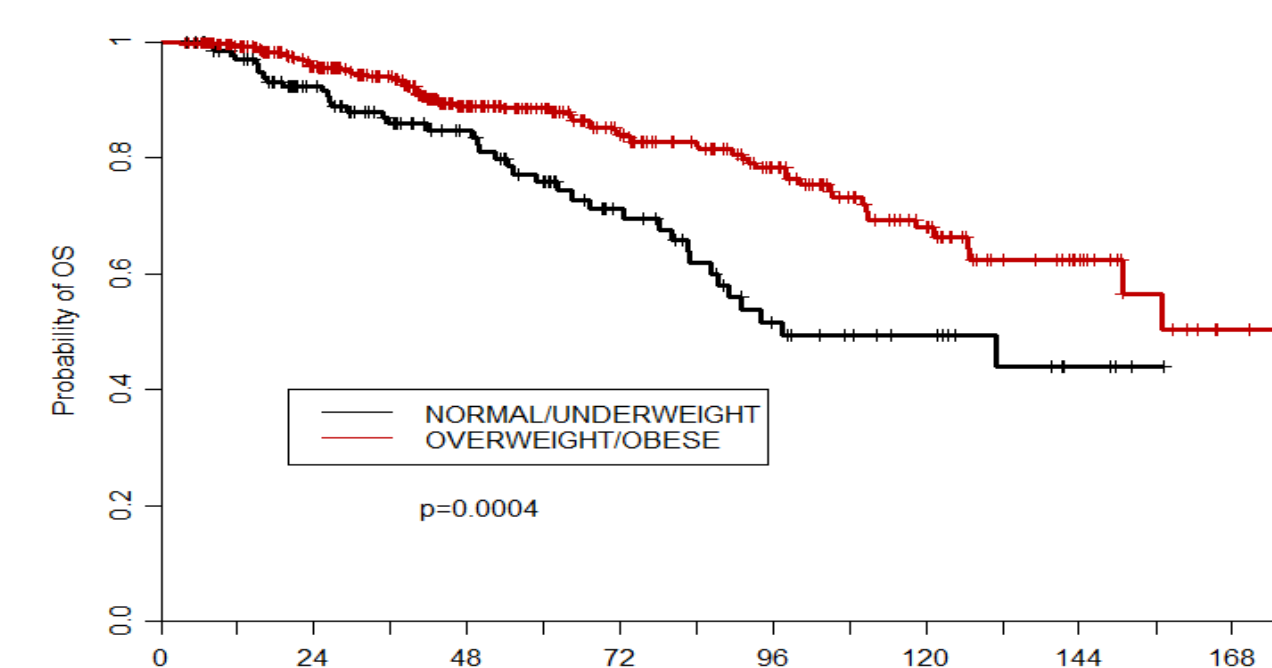
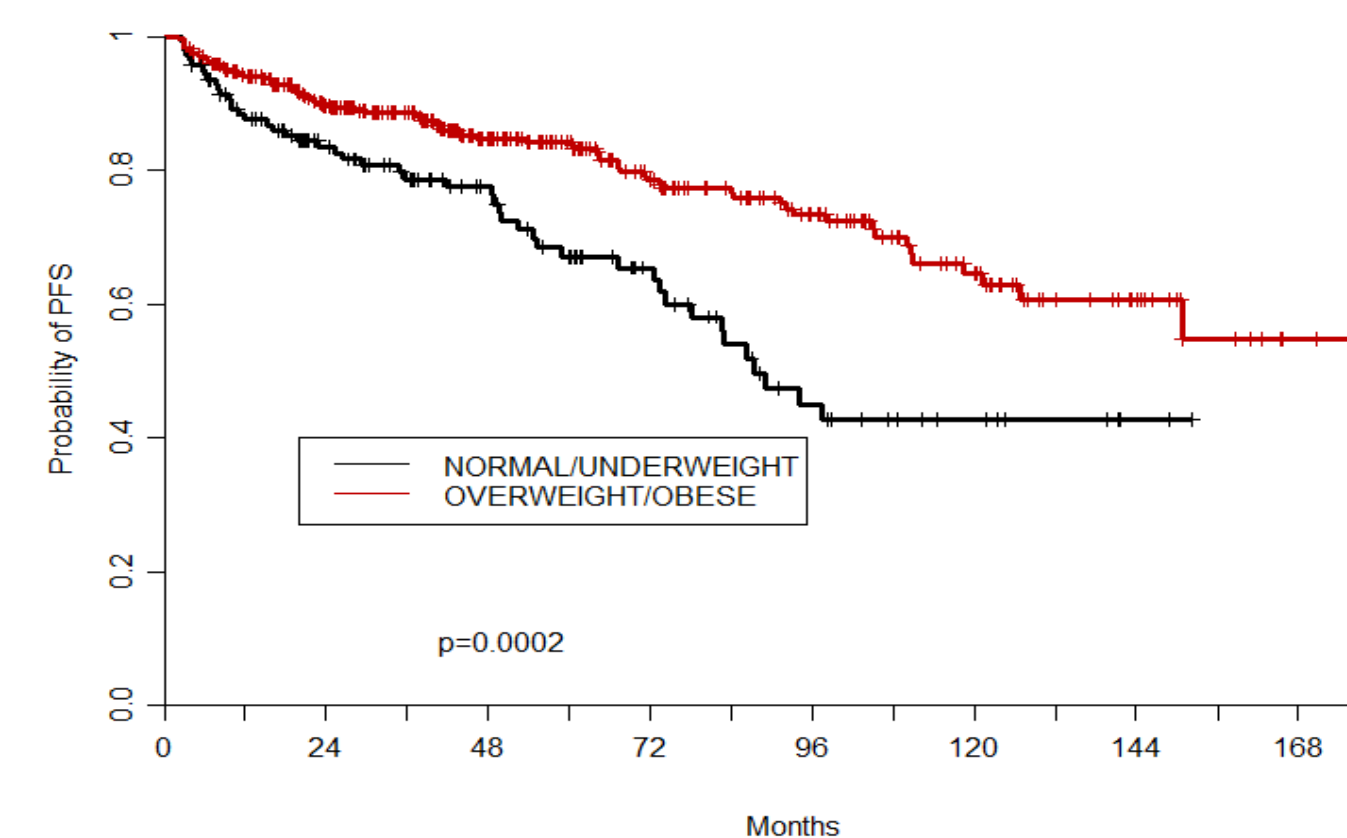
Multivariate Analysis of factors associated with RFS. The diagnosis of DM was associated with worse RFS.

Parameter	Variable	Hazard Ratio	95% Hazard Ratio Confidence Limits	P value
<b>Tumors at Entry</b>	Multiple vs. Single	1.40	1.09 1.79	0.0087
<b>Tumor Status</b>	Recurrent vs. Primary	1.58	1.23 2.02	0.0003
<b>mBCG</b>	Yes vs. No	0.194	0.14 0.28	<.0001
<b>Diabetes</b>	Present vs. Absent	1.58	1.17 2.13	0.0029

Multivariate Analysis of factors associated with PFS

Parameter	Variable	HR	95% Hazard Ratio Confidence Limits	p-value
<b>BMI</b>	Overweight/Obese vs. Normal/Underweight	0.58	0.39 0.85	0.005
<b>BMI</b>	Continuous	0.95	0.92 0.97	<0.0001
<b>Prior BCG</b>	Yes vs. No	1.9	1.1 3.3	0.0211
<b>mBCG</b>	Yes vs. No	0.26	0.16 0.41	<.0001
<b>Age</b>	Continuous	1.05	1.03 1.07	<.0001

Kaplan Meier Curve demonstrating (from top): improved PFS, OS, and CSS for patients with BMI ≥25 treated with BCG



## Results

- Medication history including aspirin, metformin, statins, and beta-blockers were not associated with outcomes
- Summary of factors significant on multivariate analysis:

	Worse	Improved
<b>RFS</b>	<ul style="list-style-type: none"> <li>• DM</li> <li>• Multiple Tumors</li> <li>• Recurrent Disease</li> </ul>	<ul style="list-style-type: none"> <li>• mBCG</li> </ul>
<b>PFS</b>	<ul style="list-style-type: none"> <li>• Older Age</li> <li>• Prior BCG Therapy</li> </ul>	<ul style="list-style-type: none"> <li>• Increased BMI</li> <li>• mBCG</li> </ul>
<b>OS</b>	<ul style="list-style-type: none"> <li>• Older Age</li> <li>• Prior BCG therapy</li> </ul>	<ul style="list-style-type: none"> <li>• Increased BMI</li> <li>• mBCG</li> </ul>
<b>CSS</b>	<ul style="list-style-type: none"> <li>• Older Age</li> <li>• Prior BCG Therapy</li> <li>• cT1 tumors</li> </ul>	<ul style="list-style-type: none"> <li>• Increased BMI</li> <li>• mBCG</li> </ul>

## Conclusions

- Increased BMI, specifically BMI ≥25 kg/m<sup>2</sup>, is associated with improved PFS, time to progression, OS, and CSS for patients with NMIBC treated with at least a complete induction course of BCG therapy.
- Having a diagnosis of DM but not an elevated BMI is significantly associated with worse RFS

**Our findings suggest a possible 'obesity paradox' for patients with NMIBC which warrants further examination**

## References

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 Lennon H, Sperrin M, Badrick E, Renehan AG. The obesity paradox in cancer: a review. Current oncology reports. 2016;18:56.