



Multidrug-resistant Gram-negative Bacteremia in Cancer Patients: Development of a Clinical Score for Risk Assessment

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BACKGROUND

Multidrug-resistant Gram-negative bacteremias (MDR-GNB) have become a significant problem in several countries and have been reported as one of the major emerging causes of severe and fatal infections in cancer patients.

OBJECTIVES

To evaluate risk factors for MDR-GNB in cancer and Stem Cell Transplant (SCT) patients and develop a clinical score for risk assessment of MDR-GNB.

METHODS

Prospective multicenter study. Episodes of GNB in adult cancer and SCT patients were included in 10 centers of Argentina, from July 2014 to November 2016. To evaluate risk factors for MDR-GNB, variables with $p < 0.10$ in univariate analysis were included in a logistic regression model for multivariate analysis. The predictive performance of the model and score were assessed using sensitivity, specificity, negative and positive predictive value and area under the ROC curve, with value of 1.0 indicating perfect prediction. We evaluated the posttest probability of the different score values to predict MDR-GNB.

RESULTS

394 episodes of Gram-negative bacteremia were included

Underlying disease:

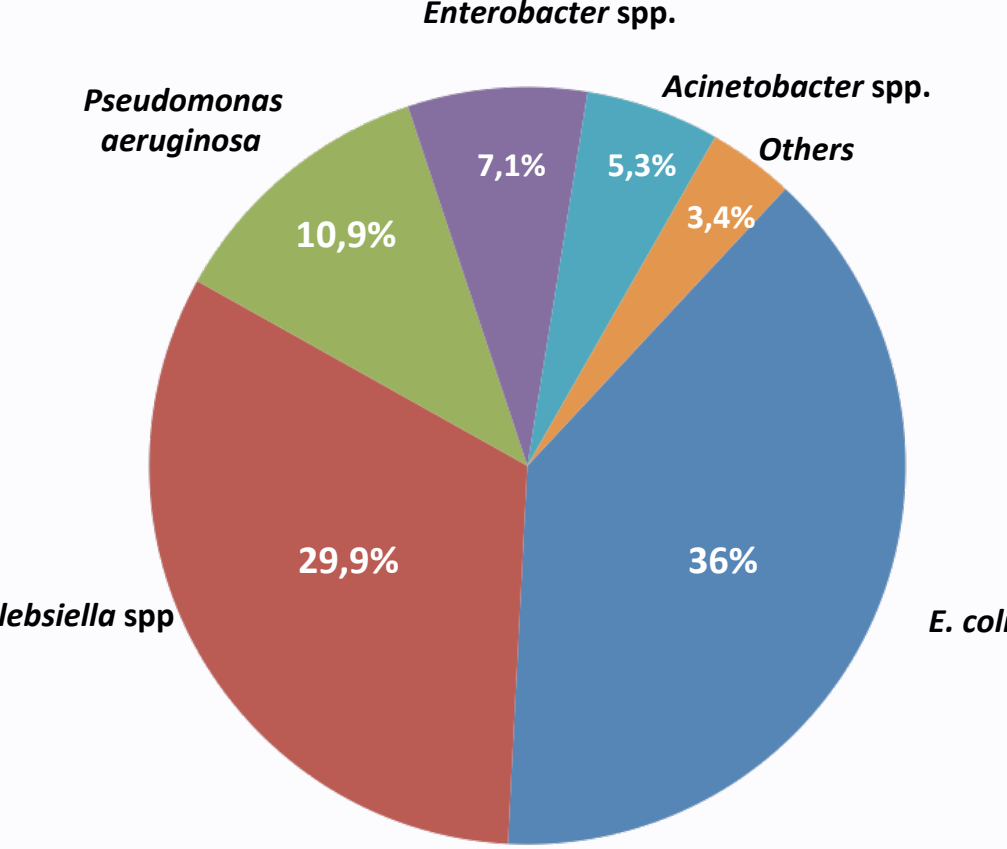
- Hematological tumor: 245 (62,2%) (acute leukemia: 55.8%)
- Solid tumor: 77 (19,5%)
- SCT: 72 (18,3 %) (Allogeneic: 52,8 %)

CLINICAL CHARACTERISTICS

Variable	Non MDR-GNB	MDR-GNB	<i>p</i>
Age (years) (median, P25-P75)	55 (36-65)	46 (31-60)	0,001
Hematological tumor	130 (57,5%)	115 (68,5%)	0,027
Solid tumor	61 (27%)	16 (9,5%)	0,0001
Neutropenia	138 (61,1%)	139 (82,7%)	0,0001
Bacteremia with clinical source	167 (73,9%)	120 (71,4%)	0,586
Abdominal	69 (41,3%)	41 (34,2%)	0,219
Respiratory	20 (12%)	12 (10%)	0,6
Severe mucositis	6 (3,6%)	17 (14,2%)	0,001
Apache II Score (median, P25-P75)	14 (10-19)	13 (9-18)	0,41
Pitt Score (median, P25-P75)	0 (0-2)	0 (0-3)	0,9
Nosocomial infection	113 (50%)	147 (87,5%)	0,0001

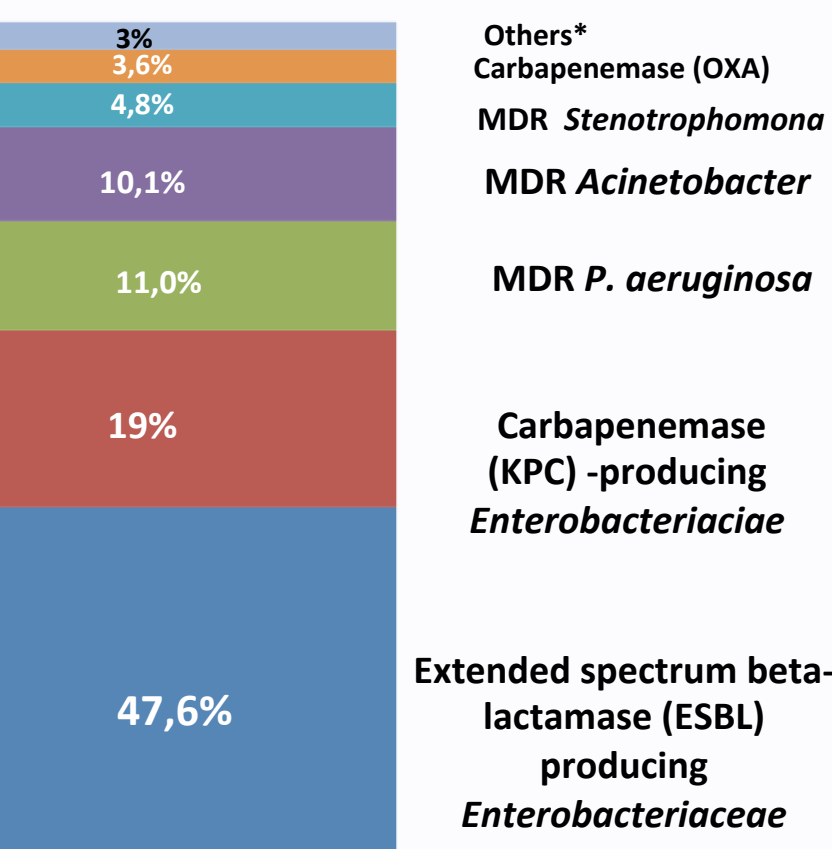
MICROBIOLOGICAL CHARACTERISTICS

(n=394)

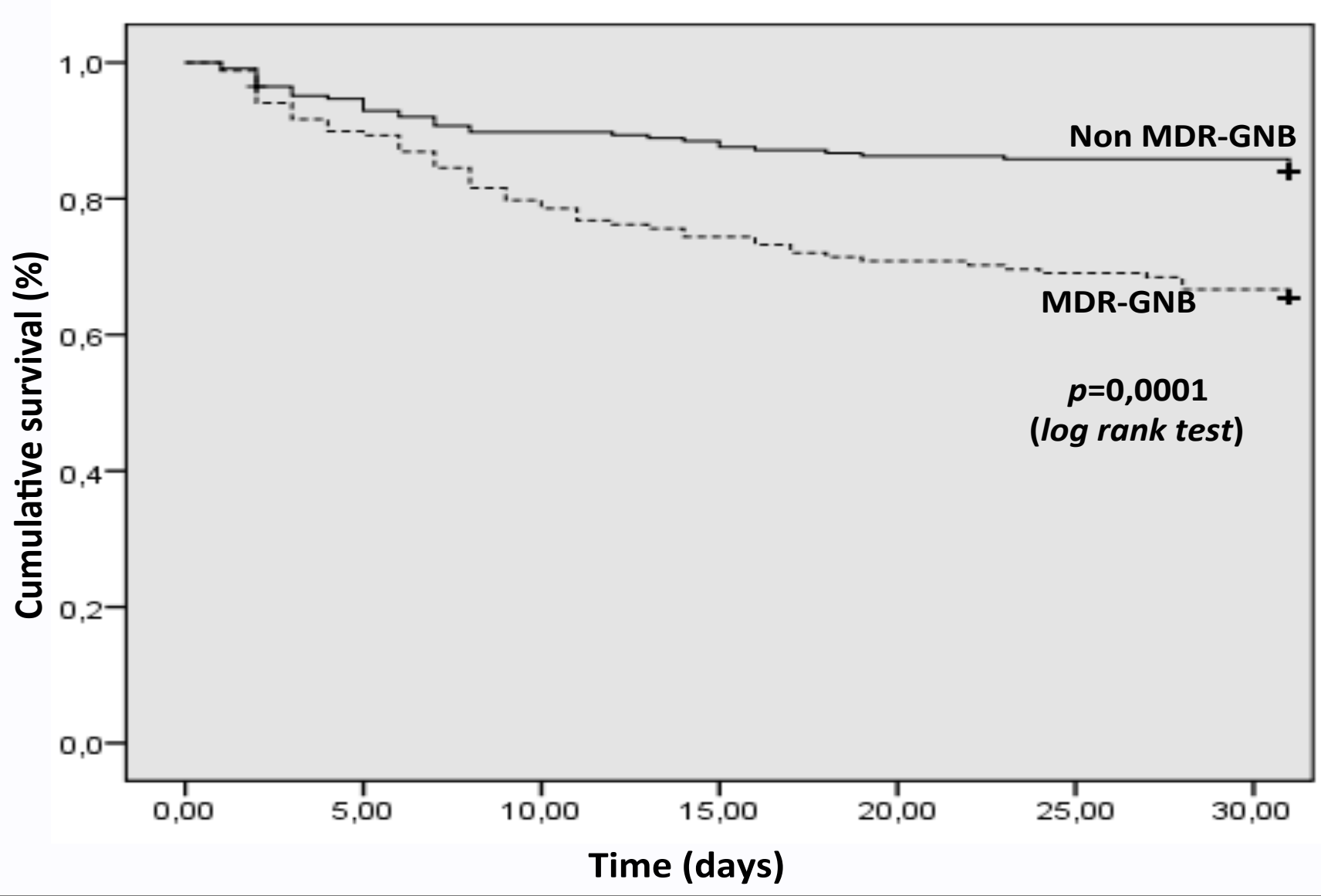


MDR-GNB (n=168)

42,6 %



OUTCOMES: 30 day mortality



Variable	OR (95% CI) Univariate	OR (95% CI) Multivariate	<i>p</i>
Hematological tumor	1,6 (1,05-2,4)		
Recently diagnosed disease	1,8 (1,2-2,8)		
Previous hospitalization (30 days)	1,75 (1,2-2,6)		
Previous antibiotic treatment (30 days)	3,6 (2,4-5,4)	2,65 (1,5-4,6)	0.001
Fluoroquinolone prophylaxis	2 (1,3-3,3)		
Previous intensive care unit hospitalization	4,1 (1,8-9,4)	2,79 (0,96-8,1)	0.061
Central venous catheter (2 weeks)	2,18 (1,4-3,3)		
Severe mucositis as a clinical source	4,4 (1,7-11,6)	4,75 (1,6-13,9)	0.005
Neutropenia during bacteremia	3 (1,9-4,9)	2,37 (1,3-4,5)	0.008
7 or more days of hospitalization until bacteremia	5,17 (3,3-8)	2,95 (1,7-5,2)	0,0001
Previous colonization or infection with MDR-GNB	2,8 (1,6-5)	2,39 (1,1-5,3)	0.033
Current colonization with MDR-GNB	2,8 (1,4-5,8)		

SENSITIVITY, SPECIFICITY AND POST-TEST PROBABILITY OF THE DIFFERENT SCORE VALUES

Score cut-off	Sensitivity	Specificity	LR +	LR -	Positive Post Test Probability	Negative Post Test Probability
≥ 0 risk factors	100.00%	0.00%	1		42.00%	
≥ 1 risk factors	97.50%	24.55%	1.2923	0.1018	48.34%	6.87%
≥ 2 risk factors	84.17%	58.08%	2.008	0.2726	59.25%	16.49%
≥ 3 risk factors	58.33%	83.23%	3.4792	0.5006	71.59%	26.61%
≥ 4 risk factors	17.50%	97.01%	5.845	0.8505	80.89%	38.11%
≥ 5 risk factors	1.67%	100.00%		0.9833		41.59%
> 5 risk factors	0.00%	100.00%		1		42.00%

SENSITIVITY, SPECIFICITY, PPV AND NPV: 3-POINT CUTOFF VALUE . PREDICTIVE PERFORMANCE OF THE SCORE

Sensitivity (IC 95 %)	Specificity (IC 95 %)	PPV (IC 95 %)	NPV (IC 95 %)
58,3 % (49-67,3%)	83,2 % (76,7-88,6%)	72,4 % (64,4-79,2%)	72,6 % (67,9-76,8%)

Predictive Performance of the Score: Satisfactory
(AUROC median: 0,78; IC 95% 0,73-0,83)

Episodes of Bacteremia with ≥ 3 points vs ≤ 2:
OR for MDR-GNB bacteriemia of 6,96 (IC95%, 4-12)

CONCLUSION

This predictive score for MDR GNB in cancer patients with a cut off value of 3 or more points has a good specificity and positive predictive value. It could be used as a valuable tool in the selection of empiric antimicrobial treatment. The score and its applicability should be validated in prospective studies.