

ORIGINAL ARTICLE

Development and Validation of a Clinical Prediction Model for Diagnosing Mycoplasma Infections in Gynecological Patients

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SUMMARY

Background: In adult females, mycoplasma infection is common and challenging to diagnose. This study aimed to use retrospective laboratory data to construct a nomogram for predicting the mycoplasma infection of individuals with probable urogenital tract mycoplasma infection.

Methods: A total of 2,859 patients with suspected urogenital tract mycoplasma infection were retrospectively enrolled in this study. Demographics and routine examinations of leucorrhea were used to develop a nomogram for predicting mycoplasma infection. The least absolute shrinkage and selection operator (LASSO) method was applied to filter variables and select predictors, and multivariable logistic regression was used to construct a nomogram. The discriminatory ability of the model was determined by calculating the area under the curve (AUC). The performance and clinical utility of the nomogram were generated by using Harrell's concordance index, calibration curve, and decision curve analysis (DCA).

Results: By using the LASSO regression method, seven variables (age, white blood cell, epithelial cell, cleanliness, candidiasis vaginalis, sialidases, and leukocyte esterase) were chosen, and a nomogram was constructed using these variables. The prediction nomogram (0.676, 95% CI: 0.611 - 0.744) demonstrated a satisfactory performance. The prediction model's AUC was 0.679 (95% CI: 0.660 - 0.691). Furthermore, the DCA showed a good clinical net benefit based on the mycoplasma infection nomogram.

Conclusions: A nomogram was created in this study, which included seven demographic and clinical characteristics of female patients. The nomogram could be of great value for the diagnosis of mycoplasma infection. (Clin. Lab. 2024;70:xx-xx. DOI: 10.7754/Clin.Lab.2024.240215)

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Supplementary Data

Table S1. Demographics and laboratory results between the two groups.

Clinical characteristic	Negative (n = 1,415)	Positive (n = 1,444)	Z/ χ^2	p-value
Age (year)	34.70 ± 9.17	33.76 ± 9.01	Z = -2.347	0.019
WBC (/HPF)			$\chi^2 = 10.123$	0.002
≤ 15 (0) *	1,138 (80.42 %)	1,089 (75.42 %)		
> 15 (1)	277 (19.58 %)	355 (24.58 %)		
RBC (/HPF)			$\chi^2 = 2.333$	0.127
Not found (0)	1,248 (88.20 %)	1,245 (86.22 %)		
Found (1)	167 (11.80 %)	199 (13.78 %)		
Epithelial cell (/HPF)			$\chi^2 = 0.145$	0.704
≤ 1/2 field (0)	836 (59.08 %)	842 (58.31 %)		
> 1/2 field (1)	579 (40.92 %)	602 (41.69 %)		
Cleanliness			$\chi^2 = 135.91$	< 0.001
I - II (0)	871 (61.55 %)	573 (39.68 %)		
III - IV (1)	511 (38.45 %)	871 (60.32 %)		
CV (/HPF)			$\chi^2 = 0.278$	0.598
Not found (0)	1,324 (93.57 %)	1,343 (93.01 %)		
Found (1)	91 (6.43 %)	101 (6.99 %)		
TV (/HPF)			$\chi^2 = 1.468$	0.226
Not found (0)	1,395 (98.59 %)	1,414 (97.92 %)		
Found (1)	20 (1.41 %)	30 (2.08 %)		
NAG			$\chi^2 = 24.499$	< 0.001
Negative (0)	837 (59.15 %)	720 (49.86 %)		
Positive (1)	578 (40.85 %)	724 (50.14 %)		
SNA			$\chi^2 = 87.917$	< 0.001
Negative (0)	1,360 (96.11 %)	1,242 (86.01 %)		
Positive (1)	55 (3.89 %)	202 (13.99 %)		
LE			$\chi^2 = 10.175$	0.001
Negative (0)	227 (16.04 %)	171 (11.84 %)		
Positive (1)	1,188 (83.96 %)	1,273 (88.16 %)		
GUS			$\chi^2 = 0.814$	0.367
Negative (0)	1,378 (97.39 %)	1,397 (96.75 %)		
Positive (1)	37 (2.61 %)	47 (3.25 %)		
H₂O₂			$\chi^2 < 0.001$	> 0.999
Negative (0)	188 (13.29 %)	191 (13.23 %)		
Positive (1)	1,277 (86.71 %)	1,253 (86.77 %)		
pH	4.44 ± 0.35	4.46 ± 0.32	Z = -1.506	0.132

HPF - high power field.

* - The numbers in parentheses indicate their assignment in the nomogram.

Table S2. Distribution characteristics of the positive mycoplasma culture patients at the different ages.

Age (year)	Total (n = 1,444)	Uu(+)Mh(-) (n = 1,050)	Uu(-)Mh(+) (n = 12)	Uu(+)Mh(+) (n = 382)
	n (%)	n (%)	n (%)	n (%)
≤ 20	53 (3.67)	36 (3.43)	1 (8.33)	16 (4.19)
21 - 30	496 (34.35)	385 (36.67)	2 (16.67)	109 (28.53)
31 - 40	606 (41.97)	442 (42.10)	3 (25.00)	161 (42.15)
41 - 50	214 (14.82)	144 (13.71)	3 (25.00)	67 (17.54)
51 - 60	65 (4.50)	34 (3.24)	3 (25.00)	28 (7.33)
> 60	10 (0.69)	9 (0.86)	0 (0.00)	1 (0.26)

Table S3. Drug sensitivity of the positive mycoplasma culture specimens to the 9 antibiotics.

Antibiotics	Uu(+)Mh(-)(n = 1,050)			Uu(-)Mh(+) (n = 12)			Uu(+)Mh(+) (n = 382)		
	S (%)	I (%)	R (%)	S (%)	I (%)	R (%)	S (%)	I (%)	R (%)
JOS	1,015 (96.67)	31 (2.95)	4 (0.38)	12 (100.00)	0 (0.00)	0 (0.00)	298 (78.01)	55 (14.40)	29 (7.59)
CLA	1,014 (96.57)	20 (1.90)	16 (1.52)	4 (33.33)	0 (0.00)	8 (66.67)	165 (43.19)	63 (16.49)	154 (40.31)
DOX	1,028 (97.90)	2 (0.19)	20 (1.90)	12 (100.00)	0 (0.00)	0 (0.00)	371 (97.12)	2 (0.52)	9 (2.36)
LEV	136 (12.95)	871 (82.95)	43 (4.10)	1 (8.33)	5 (41.67)	6 (50.00)	15 (3.93)	260 (68.06)	107 (28.01)
OFL	76 (7.24)	821 (78.19)	153 (14.57)	1 (8.33)	2 (16.67)	9 (75.00)	4 (1.05)	177 (46.34)	201 (52.62)
MIN	1,031 (98.19)	10 (0.95)	9 (0.86)	12 (100.00)	0 (0.00)	0 (0.00)	373 (97.64)	2 (0.52)	7 (1.83)
ROX	341 (32.48)	665 (63.33)	44 (4.19)	1 (8.33)	3 (25.00)	8 (66.67)	2 (0.52)	116 (30.37)	264 (69.11)
SPA	196 (18.67)	760 (72.38)	94 (8.95)	3 (25.00)	3 (25.00)	6 (50.00)	32 (8.38)	193 (50.52)	157 (41.10)
AZI	798 (76.00)	226 (21.52)	26 (2.48)	0 (0.00)	3 (25.00)	9 (75.00)	64 (16.75)	121 (31.68)	197 (51.57)