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The authors declare that they have no conflicts of interest.

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Multidrug resistant bacteria in a neurological rehabilitation hospital☆

Microorganismos multirresistentes en un hospital monográfico de rehabilitación neurológica

The Institut Guttmann (IG) is a centre dedicated to neurological rehabilitation, where patients affected by spinal cord injury (SCI), brain damage and other neurological diseases are treated. As in all health centres, the control of multidrug-resistant organisms (MDROs) is a challenge, increased by the peculiarities of this type of centre (admissions from other hospitals, therapeutic activities in common spaces, personal contact due to patients' dependence, limitation of rehabilitation treatment). The IG has an MDRO control programme that includes screening on admission, isolation of affected patients, hand hygiene and an optimisation programme for the use of antibiotics.[1]

In order to describe the MDROs presented by patients on admission to the IG, as well as the MDRO infections they suffer during their stay and related factors, we carried out a prospective longitudinal cohort study of the 502 patients admitted for rehabilitation treatment during 2019. Demographic data (age and sex) was collected, along with details of the cause and date of acquisition of the neurological injury, functional level at admission (functional independence measure[2]) and length of stay in the IG. Regarding MDROs, we compiled the results of the screening performed on admission (<48 h from the date of admission), which included nasal smears, rectal smears, urine cultures, cultures of skin wounds, and cultures of tracheal aspirates in the case of tracheostomy. Cultures were performed in the microbiology laboratory following the recommendations of the Sociedad Española de Enfermedades Infecciosas y Microbiología Clínica [Spanish Society of Infectious Diseases and Clinical Microbiology].[3] Throughout hospitalisation, infections caused by MDROs occurring 48 hours after admission were recorded, including details of their aetiology and site. The diagnosis of infection was made based on the presence of suggestive symptoms together with radiological criteria (respiratory infection), laboratory tests and positive culture, taking into account the characteristics of the patients (neurogenic bladder, permanent or intermittent bladder catheterisation, tracheostomy).

The statistical analysis performed and the results are summarised in Table 1 and highlight that MDROs were detected in 31% of the patients on admission and 6.6% suffered some MDRO infection during their stay in the IG.

The most frequent MDROs isolated on admission were extended spectrum beta-lactamase (ESBL)-producing *Enterobacteriaceae* and methicillin-resistant *Staphylococcus aureus* (MRSA), as has been described in the few similar studies published, but we differed in finding multiresistant *Pseudomonas aeruginosa* (*P. aeruginosa*), but not vancomycin-resistant *Enterococcus spp*. This variability is due to methodological differences and/or differences in the prevalence of MDROs, depending on the geographical area.[4–6] MDRO infections in neurorehabilitation centres have hardly been described in the literature. Our results coincide, in terms of the most common site (urological) and aetiology (ESBL *Enterobacteriaceae*, MRSA), with the Estudio de Prevalencia de Infecciones Nosocomiales en España [Prevalence Study of Nosocomial Infections in Spain] for the rehabilitation specialty.[7] We highlight the presence of infections by multiresistant *P. aeruginosa* and not

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Table 1
Multidrug-resistant organisms detected on admission and causing infection during hospitalisation in relation to the characteristics of the patients studied.

	Total percentage of patients	Percentage Neurological injury group			Gender (male/female)	Age (years; mean and range)	Duration of injury (days; mean and range)	Functional level at admission (total FIM; mean and range)	Length of hospital stay (days; mean and range)
	Total (n = 502)	BD (n = 341)	SCI (n = 127)	OTHER (n = 34)					
Sample characteristics	-	68%	25%	7%	67% / 33%	48.7 (8-88)	173 (8-17,175)	65 (18-126)	70 (1-308)
MDRO screening at admission									
Patients with 1 or >1 MDRO at admission	31%	33%[a]	32%[a]	12%	68% / 32%	46.6 (4-83)	183 (8-5,386)	55 (18-125)[b]	82 (4-308)
Patients with no MDRO at admission	69%	67%	68%	88%	66% / 34%	46.8 (0-88)	168 (9-17,175)	69 (18-126)	64 (1-308)
Isolated MDROs on admission									
ESBL Klebsiella pneumoniae,	14%	13%	20%[c]	6%	70% / 30%	47 (7-85)	121 (1-940)	58 (18-119)	91 (22-308)
ESBL Escherichia coli	8%	8.5%	9.4%	2.9%	63% / 37%	49 (13-75)	364 (10-5,386)	59 (18-125)	70 (6-170)
Methicillin-resistant Staphylococcus aureus	6%	7.3%	2.3%	2.9%	79% / 21%	45 (4-74)	114 (30-473)	49 (18-125)	77 (4-173)
Multiresistant Pseudomonas aeruginosa	4%	3.8%	3.1%	2.9%	67% / 33%	50 (13-72)	103 (29-201)	43 (18-115)	99 (10-236)
Carbapenemase-producing Enterobacteriaceae	1.3%	1.4%	1.5%	0	57% / 43%	37 (14-58)	82 (8-110)	51 (18-113)	87 (43-174)
Multiresistant Acinetobacter baumanii	1.1%	1.4%	0.7%	0	83% / 17%	28.1 (14-50)	181 (68-321)	42.2 (18-101)	112 (43-181)
Other multidrug-resistant organisms	1.7%	2.6%	0	0	67% / 33%	39.8 (16-60)	128.6 (28-532)	35.9 (18-83)	61 (28-128)
MDRO infections on admission									
Patients with 1 or >1 MDRO infection	6.6%	4.6%	12.5%[d]	2.9%	73% / 27%	51.3 (9-78)	98.3 (8-489)	47.7 (18-103)	112.5 (36-236)[e]
Patients with no MDRO infection	93.4%	95.4%	87.5%	97.1%	66% / 44%	46.4 (0-88)	229.7 (1-20,870)	66 (18-126)	67 (1-308)
MDROs causing infections									
ESBL Klebsiella pneumoniae,	2%	0.5%	7%	2.9%	83% / 17%	58 (10-78)	44 (8-110)	60 (39-98)	126 (38-236)
ESBL Escherichia coli	2%	1.7%	3.9%	0	73% / 27%	45 (9-74)	102 (10-489)	46 (18-103)	107 (36-177)
Methicillin-resistant Staphylococcus aureus	1.5%	1.7%	1.5%	0	75% / 25%	52 (33-74)	125 (54-281)	32 (18-55)	137 (59-236)
Multiresistant Pseudomonas aeruginosa	1%	1.1%	0.7%	0	60% / 40%	47 (33-60)	138 (91-236)	26 (18-47)	170 (41-346)
Carbapenemase-producing Enterobacteriaceae	0	-	-	-	-	-	-	-	-
Multiresistant Acinetobacter baumanii	0	-	-	-	-	-	-	-	-
Other multidrug-resistant organisms	0.6%	0.2%	1.5%	0	100% / 0%	46 (28-74)	152 (58-321)	55 (20-101)	111 (55-177)
Infection site									
Urological	5.3%	2.3%	11.8%	2.9%	-	-	-	-	-
Respiratory	2.3%	2%	0.7%	0	-	-	-	-	-
Cutaneous	1.1%	0.5%	1.5%	0	-	-	-	-	-
Other	0.1%	0	0.7%	0	-	-	-	-	-

ESBL: extended spectrum beta-lactamase; BD: brain damage; FIM: functional independence measure; SCI: spinal cord injury; MDRO: multidrug-resistant organism.

[a] p = 0.04. Chi-square test shows a higher probability of presenting MDROs on admission in patients with brain damage or spinal cord injury than in other neurological diseases.

[b] p < 0.001. Student's t-test shows a worse functional level at admission (lower FIM) in patients with MDROs on admission compared to patients without MDROs on admission.

[c] p = 0.04. Chi-square test shows a higher probability of detecting ESBL *Klebsiella pneumoniaeon* on admission in patients with spinal cord injury than in patients with brain damage or other neurological diseases.

[d] p = 0.006 Chi-square test, shows a higher probability of MDRO infections in patients with spinal cord injury than in patients with brain damage or other neurological diseases.

[e] p < 0.001 Student's t-test, shows a longer hospital stay at the Institut Guttmann in patients with MDRO infections during hospitalisation compared to patients without MDRO infection.

by carbapenemase-producing *Enterobacteriaceae* or multiresistant *Acinetobacter baumanii*. Except for ESBL *Klebsiella pneumoniae*, which is more frequent on admission in patients with SCI, we have not found other patient characteristics related to a certain MDRO detected on admission or as an aetiology of infection.

As for factors related to the presence of MDROs, we agree with other studies that low functional level is a risk factor for presenting MDROs at admission, unlike the length of time with the injury or other factors described in the literature (age, sex).[4–6] MDRO infections are more frequent in patients with SCI, due to a higher incidence of urological infections,[8] and patients with MDROs at admission (61% with MDROs vs. 39% without MDROs at admission; $p < 0.001$ chi-square test). Although 6.6% of patients had MDRO infections during hospitalisation, it is noteworthy that in 39% of them MDROs were not detected on admission, which reveals the transmission and/or acquisition of new MDROs during the hospital stay, a circumstance already described in our centre for ESBL *Enterobacteriaceae*.[9]

In patients with MDRO infection, the length of hospital stay in the IG was significantly longer, in the same way as has been described in nosocomial infections in general.[10]

In conclusion, the notable presence of patients with MDROs on admission, especially in those most dependent, and its possible consequences (transmission, infection, hospital stay), make control measures in neurorehabilitation centres essential, especially screening on admission.

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Multisystem inflammatory syndrome in adults associated to SARS-CoV-2☆,☆☆

Síndrome inflamatorio multisistémico del adulto asociado a SARS-CoV-2

Paediatric multisystem inflammatory syndrome is a condition described in 2020 as a result of the COVID-19 pandemic and whose pathogenesis is not completely clear.[1] Cases have also been described in adults, in whom it is much more infrequent; the largest series published to date is of 51 cases.[2]

We describe a case of multisystem inflammatory syndrome in adults (MIS-A) and its histopathology.

The patient was a 31-year-old woman, with a history of lymphocytic meningitis of probable viral origin in 2010 and pyelonephritis in 2018. She was diagnosed in January 2021 with mild COVID-19 (positive antigen test), progressed favourably and was discharged two weeks later. Four weeks later she began with fever, headache, vomiting, mild diarrhoea and very intense pain in the right iliac fossa (RIF) for which she went to the emergency department. She was admitted on the fourth day after the onset of symptoms. At that time, she was febrile (38.5 °C), with blood pressure of 95/70 mmHg, heart rate of 96 bpm and baseline oxygen saturation of 98%. Of note were her mucocutaneous pallor, RIF pain on palpation and mild neck stiffness. Laboratory tests revealed thrombocytopenia, anaemia, lymphopenia, and elevated ESR, D-dimer, ferritin and C-reactive protein (Appendix B). An ECG showed sinus tachycardia. An urgent abdominal CT revealed mesenteric adenopathy. A SARS-CoV-2 PCR test (GeneXpert®, Cepheid) of nasopharyngeal swab was positive with a cycle threshold (Ct) >30. Lumbar puncture was normal. Blood cultures, stool cultures and urine cultures were negative. Serologies, performed with chemilumi-

☆ This case was awarded first prize in the COVID SEIMC-Gilead clinical case contest at the XXIV Congress of the Sociedad Española de Enfermedades Infecciosas y Microbiología Clínica, held online from 5 to 11 June 2021.

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