Detection of Colonized Patients with Organisms Resistant to Carbapenems by a Fast Molecular Method at a Hospital in Nicaragua.

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Background: The resistance to carbapenems has significant implications regard the clinical outcomes of the patients. Strategies to detect colonized patients with carbapenems-resistant organisms are useful to start isolation measures to prevent intra-hospital transmission. GeneXpert Carba-R is a fast molecular test to detect rectal colonization by this type of microorganisms.

Objective: The aim of this study was to detect colonized patients with organisms resistant to carbapenems in rectal samples and that were transferred from other countrywide hospitals in Nicaragua, to have an epidemiological panorama of the circulation of genes that confers resistance to carbapenems.

Methods: This is a retrospective cohort study in a referral hospital (Hospital Dr. Fernando Vélez Paiz) in Managua, Nicaragua. The period of the study was between January 2020 and October 2020. Patients referred to our ICU that had been stayed more than 48 hours in the originating health-care center were recruited. Rectal swab were processed by GeneXpert Carba-R to identify any of the genes of resistance (NDM, KPC, VIM, IMP, OXA-48). An association between colonization and clinical outcomes was evaluated.

Results: Eighty-nine patients were included in the study and 27 (30.3%) of them had a positive test of Xpert Carba-R. In four patients more than one gene was detected. The most frequent gene detected was NDM (66.6%). Other detected genes were VIM and KPC. Patients colonized with this kind of microorganism were identified coming from 9 countrywide hospitals and from 6 hospitals of the capital city (Managua). Independent risk factors for colonization by organisms resistant to carbapenems were previous exposition to this class of antibiotic (OR: 9.82; CI95%: 3.29-29.30) and qSOFA ≥ 2 points at the admission (OR: 7.36; CI95%: 2.60-20.76). The mortality in the colonized group was 33.3% vs 9.6% in the control group (p=0.006), with an odds ratio of 4.6 (CI95%: 1.46-14.90).
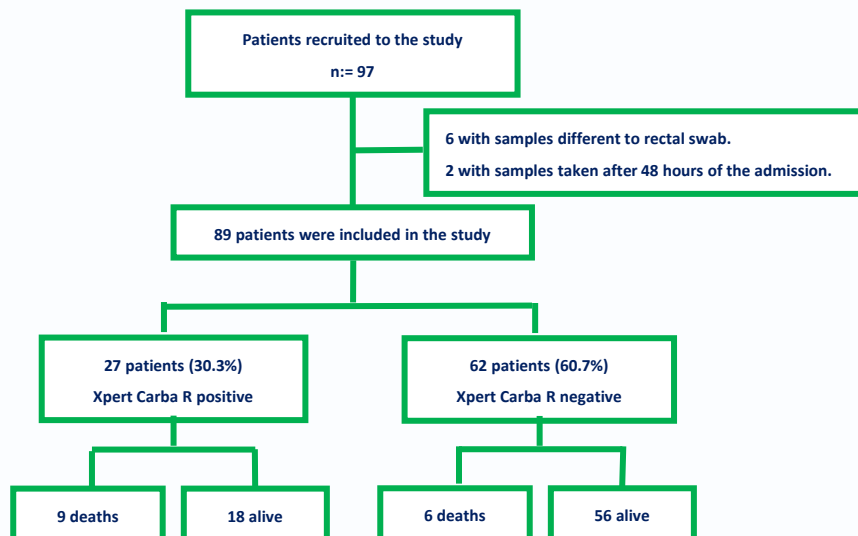
Figure 1

- Patients recruited to the study n:= 97
  - 6 with samples different to rectal swab.
  - 2 with samples taken after 48 hours of the admission.
- 89 patients were included in the study
  - 27 patients (30.3%) Xpert Carba R positive
    - 9 deaths
    - 18 alive
  - 62 patients (60.7%) Xpert Carba R negative
    - 6 deaths
    - 56 alive

Figure 1.- Distribution of patients tested with Xpert Carba R for rectal colonization.

Risk Factors for Colonization	Odds Ratio (CI 95%)
Previous exposure to carbapenems (3 months)	9.82 (3.29-29.80
qSOFA ≥ 2 points at the admission	7.36 (2.60-20.76)

Table 1.- Risk factors for rectal colonization with organisms resistant to carbapenems

Clinical Outcomes	Carba R Positive n= 27	Carba R Negative n= 62	p
Admission to ICU	13 (48.1%)	15 (24.2%)	0.02
Days of stay at ICU (mean ± SD)	11.0 ± 7.6	2.1 ± 1.5	0.001
Deaths	9 (33.3%)	6 (9.6%)	0.006

Table 2.- Clinical outcomes and colonization by organisms resistant to carbapenems

HEALF: NDM, VIM, KPC
HRCG: NDM
HIMJR: VIM
HRH: NDM
HAN: NDM
HBCR: NDM
SUMEDICO: VIM

Somoto: NDM
Chinandega: NDM
Siuna, Puerto Cabezas, Bilwi: NDM, VIM, KPC
Matagalpa: NDM
Juigalpa: NDM
Río San Juan: NDM
Boaco: NDM

Figure 2.- Map of Nicaragua with geographic distribution of procedence of patients colonized with bacterias with resistance genes for carbapenems.

Risk Factors for Mortality	Odds Ratio (CI 95%)
Previous hospitalization	10.0 (1.0 – 97.5)
Any comorbidity	10.0 (1.0-97.5)
qSOFA ≥ 2 points at the admission	12.2 (1.7-83.9)
Colonization with organisms resistant to carbapenems	4.6 (1.4-14.9)

Table 3.- Risk factors for mortality in patients evaluated for colonization with Xpert Carba R

Conclusion: The prevalence of rectal colonization by organisms resistant to carbapenems in patients transferred to a referral hospital in Nicaragua is high. The most frequent gene detected was NDM. There are presence of these genes in countrywide hospitals. The previous use of carbapenems and the severity of the illness at the admission were risk factors for colonization. To be colonized with this microorganism increased the risk to die.

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