Antibiotic prescribing patterns in patients hospitalized with COVID-19, lessons from the first wave

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Aim:

Primary aim: To examine factors associated with antimicrobial prescribing (commencement, escalation, de-escalation and overall duration) in patients hospitalized with COVID-19 treated empirically for pneumonia.

Secondary aim: To compare outcomes of three sub-groups; those that did not receive antibiotics, those that received antibiotics for proven bacterial co-infection, and those that received antibiotics empirically

Three subgroups:

group 1 – patients who did not receive antibiotics,

group 2 – patients who received antibiotics for confirmed bacterial infection by microbiological sampling and/or non-respiratory infectious complications like osteomyelitis and cellulitis

group 3 – patients who received empiric antibiotics for undifferentiated pneumonia in which uncomplicated bacterial pneumonia was suspected, or was not out-ruled.

Methods:

A retrospective cohort study examining antibiotic prescribing patterns of 300 patients sequentially diagnosed with COVID-19. Patients were grouped into 3 sub-cohorts. Participants were included if they had confirmed COVID-19 on NP-PCR, were ≥18 years of age, and were hospitalized. The first 300 consecutive confirmed COVID-19 infections were enrolled in the study. Dates of admission were between 9th March and 28th May 2020.

Statistical analysis

IBM SPSS Statistics v.24.0 (IBM Corp., Armonk, NY) was used. Continuous data is presented as median and interquartile range (IQR).

The χ^2 **test** was used for categorical data

The **Mann–Whitney U-test** was performed on non-normally distributed nominal data (LOS, duration of antibiotics)

The **Kruskal–Wallis test:** was used for non-normally distributed data of >2 groups

Linear regression: dichotomous and continuous variables

Results

In total 292 patients were included (63 group 1, 35 group 2, 194 group 3), median age was 60 years (IQR 44-76) and the majority were ethnically Irish (62%). The median duration of antibiotics was 7 days (IQR 5-10).), The most common comorbidities were hypertension n=90(30.8%), dyslipidaemia n=55(18.8%) and cognitive impairment n=47(16.1%). Comorbidities aligned with poor outcomes in COVID-19 like diabetes mellitus and obesity were seen in 45(15.4%) and 14(4.8%) of patients respectively. Number of antibiotic prescriptions
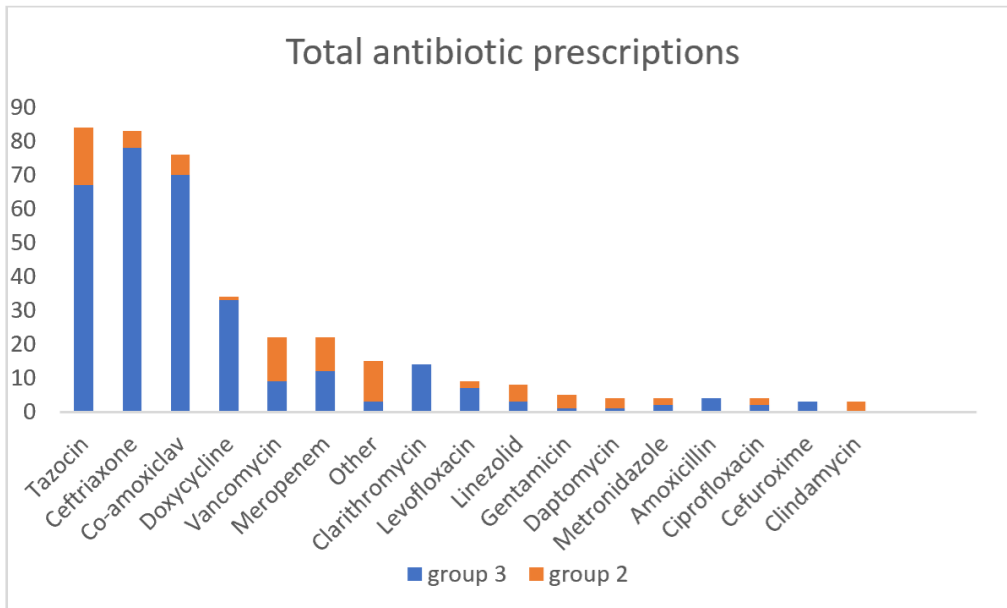

Figure 2: Overall antibiotic consumption. proven bacterial infection (group 2) presumed pneumonia (group 3)

PRIMARY OUTCOMES

Dichotomous logistic regression – dependent variable: IV Antibiotic start or not on admission

Independent variables on admission	p value	Exp(B)	95%CI
qSOFA	**0.016**	2.376	1.171-4.820
C-reactive protein	**0.024**	0.985	0.972-0.998
R^2=0.491	**<0.001**		

Multivariable logistic regression – dependent variable: Total antibiotic duration

Independent variables	p value	Std β coefficient	95%CI
Days of hypoxia	**<0.001**	0.586	0.182-0.299
Maximum respiratory support**	**0.013**	0.185	0.081-0.665
R^2=0.308	**<0.001**		

SECONDARY OUTCOMES	Total	No antibiotics (group 1)	Antibiotics for presumed bacterial pneumonia (group 3)	Antibiotics for proven bacterial infection (group 2)	p value
N(%)	292(100)	63(21.6)	194(66.4)	35(12)	
Oxygen requirements					
Median days of hypoxia(IQR)	1(0-8)	0(0-0)	4(0-9)	8(0-20)	**<0.001**
Outcomes					
Length of stay, days (IQR)	11(6-20)	6(3-12.5)	11(7-18)	28(16-45)	**<0.001**
Complications per group[α]	68(23.4)	6(9.5)	41(21.1)	30(85.7)	
CDI[κ]	2(0.68)	0	0	2(5.7)	
High dependency care	32(10.2)	2(3.2)	20(10.3)	10(28.6)	
Re-admission	23(7.9)	5(7.9)	19(9.4)	3(8.6)	
Death	38(13%)	0	29(14.5%)	9(25.7%)	

Discussion/Conclusion

Duration of hypoxia and need for respiratory support may have acted as surrogate measures of improvement where usual response measures (CRP, neutrophilia, culture clearance) were absent. Continuous review of antibiotic prescriptions should be at the forefront of clinical management of hospitalized patients with COVID-19.