RESEARCH ARTICLE

ISSN: 0331 - 670X

https://doi.org/10.51412/psnnjp.2022.28

The Nigerian Journal of PHARMACY
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THE OFFICIAL ORGAN OF THE PHARMACEUTICAL SOCIETY OF NIGERIA FOUNDED 1927

Antimicrobial Drug Prescription Patterns for Respiratory Tract Infections in Military Hospitals Lagos Nigeria.

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ARTICLE INFO

Article history:

Received 28 July 2022
Revised 21 August 2022
Accepted 30 August 2022
Online Published 30 October 2022

Keywords:

Prescription patterns,

Respiratory tract infections,

Antimicrobials

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ABSTRACT

Background: Antibiotics are powerful and effective medicines used for treating infections caused by bacteria. Of all the challenges faced due to antibiotics abuse, the greatest is antibiotic resistance. A major cause of antibiotic resistance is the wrong use of antibiotics in the management of diseases not caused by bacteria. Antibiotics are irrationally used in the treatment of viral infections as seen in many cases of respiratory tract infections. This study aims to evaluate the frequency of various RTIs, the management and factors that influence antimicrobial prescription patterns for various RTIs in Military Hospital Lagos, Lagos State, Nigeria.

Methods: A cross-sectional study was conducted in Military Hospital Lagos where Data was obtained, using two designs of questionnaires, from prescribers and patient records. The target population was all patients treated for RTIs within a period of seven years and all prescribers who had treated patients for RTIs in Military Hospital Lagos. Post-Hoc Power Analysis with Dichotomous Endpoint was utilized in obtaining the sample size. Reliability tests of the instruments was obtained using Cronbach's Alpha. This involved descriptive statistical analysis, Chi-Square test, Binary Logistic regression analysis. The data used in the study were obtained from 209 patient records and 30 physicians.

Results: In this study, it was observed that 196(93.8%) patients admitted at Military Hospital Lagos for RTI presented with Upper Respiratory Tract Infections (URTIs; cough, common cold, pharyngitis, tonsillitis), 11(5.3%) with Lower respiratory tract infections (LRTIs; pneumonia and bronchitis) and 2(0.9) with COVID. Young patients<45years (125) made up about 60% of the admissions. RTIs were more prevalent in females (111, 53.1%) than in males (98, 46.9%). It was observed that 21 (70%) physicians followed the Standard Treatment Guidelines (STG) in prescribing antibiotics for RTIs, 11(36.7%) physicians modelled their choice of antimicrobials after the senior consultants, 4(13.3%) on sensitivity results, 1(3.3%) on period preferences and 3(10%) on other factors. Out of 209 patients' records sampled, only 6(3%) patients underwent tests as ordered by their physicians before antibiotics were prescribed even though 21(70%) physicians claimed to follow the STG. Results of the laboratory investigation ordered implicated 6 individual organisms: Gram negative *cocci, Enterobacter cloacae, E. coli*, SARS CoV-2, Streptomyces pyogenes and Staphylococcus species.

Conclusion: The gender of patient, physician educational qualification, observation of RTIs and frequency of RTIs significantly influence the antimicrobial prescription pattern for various RTIs in Military Hospital Lagos. In order to increase prescription quality, improve the rationality of drug use and reduce the prevalence of antibiotic resistance, we recommend the development of targeted intervention programs including but not limited to continuous enlightenment of physicians on strict compliance to the guidelines in the management of RTIs.

1. Introduction

Antibiotics are powerful and effective medicines used for treating infections caused by bacteria. Also known as antimicrobial drugs, antibiotics have saved countless lives[1]. In spite of their effectiveness to treat many bacterial infections, they are frequently used irrationally to treat viral infections as in many cases of upper respiratory tract infections[2]. Antimicrobial resistance is currently the greatest challenge to the effective treatment of infections globally. Antibiotic resistance not only leads to waste of health resources but also increases morbidity and

mortality[3].

Respiratory tract infections (RTIs) are the most common, and potentially most severe, of infections treated by healthcare practitioners[4]. Respiratory tract infections (RTIs) are the leading cause of morbidity and mortality in children younger than 5 years worldwide, with the highest rates occurring in the first year of life[5]. Respiratory tract infection (RTI) was a major public health challenge during the Muslim pilgrimage to Macca[6].

Upper respiratory tract infections (URTIs) are the most common symptomatic human infections in developed countries and the most common reason for patients to consult a healthcare professional[7]. The vast majority are managed by self-care, with annual consulting rates in primary care varying from 125 to 1110 per 1000 registered patients[8]. Indeed, upper respiratory tract infections are the most common reason for antibiotics to be prescribed. Widespread unnecessary antibiotic prescribing not only wastes healthcare resources and leads to a cycle that encourages further consulting in the future, it is also the main driver of increasing antibiotic resistance[9].

Acute respiratory tract infections (ARTIs), including the common cold, pharyngitis, sinusitis, otitis media, bronchiolitis and pneumonia are the most common diagnoses among patients seeking medical care in western countries, and account for most antibiotic prescriptions. Empiric antimicrobial treatment remains common, because viral symptoms are often clinically similar and difficult to distinguish from those caused by bacteria. As a result, inappropriate antibiotic prescriptions are high and in certain settings likely higher than the commonly estimated 30%[10]. Most of the ARTIs are caused by viruses, but the unnecessary prescribing of antibiotics like penicillins, cephalosporins, and macrolides in children suffering from ARTIs is a common practice globally [11]. In many healthcare settings, the antibiotic prescribing rate is twice as much as the expected rate of antimicrobial needed[12]. Although various international guidelines recommend the limited use of antibiotics in ARTIs, the noncompliance of these guidelines and the frequency of prescribing antibiotics in these infections is common in the healthcare system of Pakistan [13]. Evidence suggests that the inappropriate use of antibiotics (e.g., cephalosporins) in pneumonia and bronchitis has economically burdened the healthcare system by causing a significant increase in the incidence of antimicrobial resistance, prescribing errors, and patients' length of stay (LOS) in hospital[14]. According to the Centre for Disease Control and Prevention Guidelines (CDC), acute upper respiratory tract infections resolve spontaneously without the need for antimicrobial therapy. The treatment with antibiotics is indicated only when the patient has symptoms sustained for at least 10- 14 days without showing any improvement[15].

The current study is aimed to analyse the prescription pattern of antimicrobials used in patients with upper and lower respiratory tract infections visiting Military hospital Lagos. This will help us gain knowledge on prevalence of respiratory tract infections in our locality, the most common respiratory tract infection, current prescribing trends of antimicrobials and finally assessing the rationality of the prescriptions. To increase prescription quality and improve the rationality of drug use, we need to investigate the subjective and objective factors that affect doctors' prescription patterns.

According to the World Bank, governments in developing countries spend between 20% and 50% of their national health budgets on drugs and medical sundries[16]. Therefore, appropriate use of antibiotics is an essential ingredient in the provision of quality health care, patient safety, and the rational use of health resources especially in a resource constrained nation like Nigeria. This underscores the need to monitor antibiotics use in the scheme where the tendency for overuse is higher to ensure rational prescribing and use among health care providers and beneficiaries respectively. With rates of antimicrobial increasing worldwide, and very few new antibiotics being developed, existing antibiotics are becoming a limited resource. It is therefore essential that antibiotics only be prescribed – and that last-resort antibiotics (AWaRe RESERVE group) be reserved – for patients who truly need them[17].

In Nigeria, military medical facilities serve military personnel and their families. However, they also serve the contiguous civilian population. The military employs many of the skilled human resources of the national health system. Thus, it is an essential component of the national healthcare service[18]. In view of the importance of the military health institutions to national security and overall health, this research presents pooled data on antimicrobial drug prescription patterns for respiratory tract infection for review with national and international findings. Also, to advise on effective strategies for more rational prescribing of antibiotics, a better understanding of factors with higher likelihood for an individual to have an antibiotic prescription is essential and development of targeted intervention programmes aimed at optimizing their use in those conditions is warranted.

2. Methods

2.1 Study Design, Setting and Ethical Approval

The Nigerian army medical system is organized into primary, secondary and tertiary levels. Tertiary health care is provided at the reference hospitals. The reference hospitals for the army are 44 Nigerian Army Reference Hospital, Kaduna (44 NARHK), 68 Nigerian Army Reference Hospital, Yaba, Lagos (68 NARHY) and Military Hospital, Ikoyi-Lagos (MHL). Between themselves, these 3 hospitals have more than 50% of skilled medical human resources of the Nigerian Army[18]. Also, more than 60% of the military population belong to the Nigerian Army. Apart from providing tertiary care services, these outfits also provide primary care through their general outpatient departments (GOPD). Consultation at the GOPD is by medical doctors on internship under the supervision of senior doctors. A cross–sectional study was conducted in Military Hospital Lagos. Data was obtained from prescribers and patient records. Ethical approval was granted in July 2021 by the Military Hospital Lagos Ethical Committee. The ethical approval assigned number is MHL/G1/300/63

2.2 Study Population

The target population was records of all patients treated for Respiratory Tract Infections such as common cold, cough, bronchitis, pneumonia and sinusitis from 19/03/2014 to 07/09/2021 and all prescribers who had treated patients for Respiratory Tract Infections in Military Hospital Lagos.

2.3 Sampling and Sampling Technique

Post-Hoc Power Analysis with Dichotomous Endpoint was utilized in obtaining the sample size. With a base line incidence of respiratory tract infections at 40 %[19] and confidence level (α) of 95%, p = proportion (expressed as a decimal) 20% = 0.20, N = population size (1290), e = margin of error 5%

The sample size (n) is calculated according to the formula: n = [z2 * p * (1 - p) / e2] / [1 + (z2 * p * (1 - p) / (e2 * N))]

Where: z = 1.96 for a confidence level (α) of 95%, p = proportion (expressed as a decimal), N = population size, e = margin of error.

z = 1.96, p = 0.2, N = 1290, e = 0.05

n = [1.962 * 0.2 * (1 - 0.2) / 0.052] / [1 + (1.962 * 0.2 * (1 - 0.2) / (0.052 * 1290))]

n = 245.8624 / 1.1906 = 206.504

n ≈ 207

The sample size (with finite population correction) is 207. However, the study made use of a sample size of 209.

2.4 Study Instrument

Two questionnaires were designed. One for extraction of patient data from hospital files. The second was administered to prescribers who fit the inclusion criteria. Reliability tests of the instruments was obtained using Cronbach's Alpha. Cronbach alpha is 325.077 and significant at 5%.

2.5 Data Analysis

This involved descriptive statistical analysis, Chi-Square test, Binary Logistic regression analysis.

3. RESULTS

3.1 Socio-Demographic Distribution: Analyses of Socio-Demographic Information

Table 1: Socio-Demographic Characteristics of Respondents

Patients (n = 209)				**Physicians (n = 30)**			
Variable	Option	Frequency	%	Variable	Option	Frequency	%
	Female	111	53.1		Female	17	56.7
	Male	98	46.9		Male	13	43.3
	0-9	0	0.0		25-35	26	86.7
	10-19	61	29.2		35-45	2	6.7
	20 – 29	25	12.0		45-55	2	6.7
	30 – 39	30	14.4				
	40 – 49	25	12.0				
	50 – 59	21	10.0				
	Above 60	47	22.5				

Mean age ± SD	36.4 ± 17.9		Mean age ± SD	32.0 ± 5.4	
Married	106	50.7	GOPD	12	40.0
Not Married	97	46.4	SOPD	7	23.3
Widowed	4	1.9	MOPD	9	30.0
Divorced/ Separated	2	1.0	A/E	2	6.7
Nom-formal	17	8.1	Senior HMO	3	10.0
Primary	38	18.2	MOs	7	23.3
Secondary	154	73.7	House Officers	20	66.7
Igbo	29	13.9			
Yoruba	53	25.4			
Hausa	44	21.1			
Others	83	39.7			
Trader	16	7.7			
Civil servant	71	34.0			
Professional	12	5.7			
Student	48	23.0			
Artisan	2	1.0			
Self-employed	8	3.8			
Unemployed	31	14.8			
Retired	21	10.0			
In-patient	7	3.3			
Out-patient	202	96.7			
Total	209	100.0	Total	30	100.0

Source: Field Survey 2021.

3.2 Determine the frequency of presentation of various respiratory tract infections in Military Hospital Lagos

The test of association of the socio-demographic characteristics and management with Frequency of Respiratory Tract Infections revealed that age and qualification significantly influence the frequency of respiratory tract infections in Military Hospital Lagos at Chi-square value = 14.483 ($p<0.05$) and 9.310 ($p<0.05$) respectively.

Table 2: Frequency of Presentation of various Respiratory Tract Infections in Military Hospital Lagos

	Frequency (in %)					**Mean Response Rating**			
Item	1	2	3	4	5	Mean	SD	Scale	Remark
Frequency of occurrence of RTI's (n=30)	3.3	3.3	20	63.3	10	3.73	0.828	4	Often
Frequency of observing RTI's	3.3	6.7	53.3	20	16.7	3.40	0.968	3	Sometimes
Pooled(n=30)						3.57	0.838	4	Often

Source: Field Survey 2021. n = 30. Scale: 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Always.

3.3 Association of Socio-Demographic Characteristics and Management with Frequency of Respiratory Tract Infections

The test of association of the Antimicrobial prescribed with various Respiratory Tract Infections revealed that Type of RTIs significantly influence the Antimicrobial Prescription Patterns for various Respiratory Tract Infections in Military Hospital Lagos at Chi-square value = 325.077($p<0.039$), A confirmatory analysis is carried out using logistics regression.

Table 3: Association of Socio-Demographic Characteristics and Management with Frequency of Respiratory Tract Infections

Socio-Demographic Characteristics	Option	Frequency		Chi-Square value	df	p-value
		No	Yes			
	Female	0.0%	100.0%			
	Male	7.7%	92.3%			
	25-35	0.0%	100.0%			
	35-45	0.0%	100.0%			
	45-55	50.0%	50.0%			
	Senior HMO	33.3%	66.7%			
	MOs	0.0%	100.0%			
	House Officers	0.0%	100.0%			
	No	0.0%	100.0%			
	Yes	4.8%	95.2%			
	No	0.0%	100.0%			
	Yes	4.8%	95.2%			
Total		3.3%	96.7%			

Test is Significant at 5% level.

Table 4: Management of various Respiratory Tract Infections in Military Hospital Lagos using Antimicrobials

Variable	Option	Frequency	%
Physicians			
	No	9	30.0
	Yes	21	70.0
	No	9	30.0
	Yes	21	70.0
	Senior Consultants	11	36.7
	Standard treatment guidelines	11	36.7
	Sensitivity results	4	13.3
	Period preferences	1	3.3
	Others	3	10.0
	Total	30	100.0

Patients			
	Cough	110	52.6
	Sore throat/ Pharyngitis	25	12.0
	Tonsilitis	8	3.8
	Common cold	53	25.4
	Bronchitis	8	3.8
	Pneumonia	3	1.4
	Covid 19	2	1.0
	No	203	97.0
	Yes	6	3.0
	None	203	97.1
	Gram Negative Cocci	1	.5
	Enterobacter Cloacae	1	.5
	E.coli	1	.5
	SARS CoV-2	1	.5
	Strep. Pyogenes	1	.5
	Staphylococcus Species	1	.5
	Total	209	100.0

Source: Field Survey 2021.

Table 5: Respiratory Tract Infections and Frequency of Antimicrobials Prescribed.

ANTIMICROBIAL PRESCRIBED		**UPPER RTIs(Common Cold, Cough, Pharyngitis and Tonsillitis)**	**LOWER RTIs (Pneumonia and Bronchitis)**	**TOTAL**
	Frequency	4	0	4
	% Frequency	100.0%	0.0%	100.0%
	Frequency	5	0	5
	% Frequency	100.0%	0.0%	100.0%
	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%
	Frequency	6	0	6
	% Frequency	100.0%	0.0%	100.0%
	Frequency	2	2	4
	% Frequency	50.0%	50.0%	100.0%
	Frequency	0	1	1
	% Frequency	0.0%	100.0%	100.0%
	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%

IV CoAmoxiclav 1.2g, Tab CoAmoxiclav 625mg, Tab Azithromycin 500mg	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%
	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%
	Frequency	3	0	3
	% Frequency	100.0%	0.0%	100.0%
	Frequency	14	0	14
	% Frequency	100.0%	0.0%	100.0%
	Frequency	2	0	2
	% Frequency	100.0%	0.0%	100.0%
	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%
	Frequency	3	1	4
	% Frequency	75.0%	25.0%	100.0%
	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%
	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%
	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%
	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%
	Frequency	3	0	3
	% Frequency	100.0%	0.0%	100.0%
	Frequency	3	0	3
	% Frequency	100.0%	0.0%	100.0%
	Frequency	3	0	3
	% Frequency	100.0%	0.0%	100.0%
	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%
	Frequency	3	0	3
	% Frequency	100.0%	0.0%	100.0%

Tab Azithromycin 250mg, Tab Levofloxacin 500mg	Frequency	2	0	2
	% Frequency	100.0%	0.0%	100.0%
	Frequency	12	0	13
	% Frequency	92.3%	0.0%	100.0%
	Frequency	1	1	2
	% Frequency	50.0%	50.0%	100.0%
	Frequency	2	0	2
	% Frequency	100.0%	0.0%	100.0%
	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%
	Frequency	5	0	5
	% Frequency	100.0%	0.0%	100.0%
	Frequency	11	1	12
	% Frequency	91.7%	8.3%	100.0%
	Frequency	7	0	8
	% Frequency	87.5%	0.0%	100.0%
	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%
	Frequency	2	0	2
	% Frequency	100.0%	0.0%	100.0%
	Frequency	5	1	6
	% Frequency	83.3%	16.7%	100.0%
	Frequency	67	3	70
	% Frequency	95.7%	4.3%	100.0%
	Frequency	3	1	4
	% Frequency	75.0%	25.0%	100.0%
	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%
	Frequency	3	0	3
	% Frequency	100.0%	0.0%	100.0%
	Frequency	2	0	2
	% Frequency	100.0%	0.0%	100.0%

Tab Erythromycin 500mg	Frequency	4	0	4
	% Frequency	100.0%	0.0%	100.0%
	Frequency	4	0	4
	% Frequency	100.0%	0.0%	100.0%
	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%
	Frequency	1	0	1
	% Frequency	100.0%	0.0%	100.0%
Frequency	**196**	**11**	**209**	
%Frequency	**93.8%**	**5.3%**	**100.0%**	

*Test is Significant at 5% level.

Chi -Square Tests

	Value	df	Asymptotic Significance (2 -sided)
Pearson Chi -Square	325.077 [a]	94	.039 *
Likelihood Ratio	41.094	94	0.040*
N of Valid Cases	209		

a. 137 cells (95.1%) have expected count less than 5. The minimum expected count is .01.

1.4 Association of Socio-Demographic Characteristics and Management with Antimicrobial Prescription Patterns for various Respiratory Tract Infections

The test of association of the socio-demographic characteristics and management with Antimicrobial Prescription Patterns for various Respiratory Tract Infections revealed that gender, educational qualification, observation of RTIs, and frequency of RTIs significantly influence the Antimicrobial Prescription Patterns for various Respiratory Tract Infections in Military Hospital Lagos at Chi-square value = 5.851($p<0.05$), 7.959 ($p<0.05$), 5.443 ($p<0.05$) and 10.313 ($p<0.05$) respectively. A confirmatory analysis is carried out using logistics regression.

Table 6: Association of Socio-Demographic Characteristics and Management with Antimicrobial Prescription Patterns for various Respiratory Tract Infections

Socio-Demographic Characteristics	Option	Antimicrobial Prescription		Chi-Square value	df	p-value
		No	Yes			
	Female	17.6%	82.4%			
	Male	46.2%	53.8%			
	25-35	34.6%	65.4%			
	35-45	0.0%	100.0%			
	45-55	0.0%	100.0%			
	Senior HMO	0.0%	100.0%			
	MOs	71.4%	28.6%			
	House Officers	20.0%	80.0%			
	No	0.0%	100.0%			
	Yes	31.0%	69.0%			
	Never	0.0%	100.0%			
	Rarely	100.0%	0.0%			
	Sometimes	16.7%	83.3%			
	Often	26.3%	73.7%			
	Always	66.7%	33.3%			
	No	22.2%	77.8%			
	Yes	33.3%	66.7%			
	Senior Consultants	36.4%	63.6%			
	Standard treatment guidelines	36.4%	63.6%			
	Sensitivity results	0.0%	100.0%			
	Period preferences	0.0%	100.0%			
	Others	33.3%	66.7%			
Total		30.0%	70.0%			

Test is Significant at 5% level.

3.5 Binary Logistic Regression Model to Determine factors that influence antimicrobial prescription patterns for various respiratory tract infections in Military Hospital Lagos.

The dependent variable (Antimicrobial Prescription) is a binary variable based on scale (No and Yes) and took the value (No = 0, Yes = 1). The socio-demographic variables and management factors were used to determine antimicrobial prescription patterns for various respiratory tract infections.

Table 7: Logistics Regression Model

Predictors	Coefficients	S.E.	Wald	Odds Ratio (95%CI)	p-value
Gender	3.204	4.102	4.002	24.631 (4.212, 102.400)	.023*
Age	-2.280	1.335	2.918	.102 (.007, 1.399)	.088
Education Qualification	3.961	1.631	5.894	52.494 (2.145, 128.475)	.015*
Do you see RTI's (Observation)	3.222	5.742	5.110	25.078 (3.165, 109.632)	.019*

Frequency of RTIs	4.713	1.160	6.179	111.386 (2.019, 401.753)	.008*
Do you use standard treatment guidelines?	.480	1.826	.069	1.616 (.045, 57.862)	.793
What else informs your advice of antimicrobials?	.102	.599	.029	1.108 (.343, 3.582)	.864
Constant	-5.458	6.503	2.001	.004	.098

Model Summary: Nagelkerke R Square = 0.765, Omnibus test of model coefficients: Chi-squares value = 17.431 ($p<0.05$)

Hosmer and Lemeshow Test: Chi -squares value = 7.474, Sig. = 0.033, Overall percentage prediction = 83.3% > 50.0%

*Significant at 5% level.

Binary Logistic regression analysis was employed to identify factors that influence antimicrobial prescription patterns for various respiratory tract infections. Model assessment and goodness-of-fit was carried out using Hosmer–Lemeshow test and Nagelkerke R squared. The Nagelkerke R squared = 0.765, meaning that the model explained 76.5% of the variance in antimicrobial prescription for respiratory tract infections, which suggests a good prediction power. The Hosmer–Lemeshow test at Chi-square value = 7.474 ($p<0.05$) for this model showed good agreement between the predicted and observed values on 95% of the imputed datasets and therefore supports the model's adequacy for fitting the data. The prediction power is adequate, supported by the overall percentage prediction of 83.3%, which indicated that about 83.3% of cases were correctly classified or predicted by the model at 0.50 (50.0%) cut-off value. The model is correct, at Chi-square value = 17.431 ($p<0.05$); indicating correct specification and adequate ability to distinguish prescription patterns for respiratory tract infections (RTIs). The logistic regression results indicated that gender, education qualification, observation of RTIs and frequency of RTIs have significant influence on antimicrobial prescription patterns for various respiratory tract infections in Military Hospital Lagos at Wald = 4.002, 5.894, 5.110 and 6.179 respectively.

4. Discussion

In this study, the overall presentation of RTIs were as follows; Upper respiratory tract Infections (URTIs; cough, common cold, pharyngitis, tonsillitis) 196(93.8%), Lower respiratory tract infections (LRTIs; pneumonia and bronchitis) 11(5.3%) and COVID 0.9%. This distribution agrees with that URTIs are the most common infections and accounts for almost all the RTIs (>90%).[20] In addition, RTIs cases were slightly greater in women (53,1%) than in male (46.9%). This outcome is similar to a study done in Ekiti State, Nigeria.[21] The cause of this female predisposition is unknown, however, its prevalence might be explained by frequent exposure to indoor air pollution from the combustion of biomass fuels used for cooking. The biomass gases generated from the burning and combustion of organic material often impairs the physiological function of the lungs[21] Another study suggested that it might be attributed to females having more sensitive cough receptors than males[22]. Others have attributed it to the modulator effect of estrogen and progesterone on the cough reflex[23] However, the gender distribution is different from that seen in other studies conducted in Egypt and Europe where RTIs were more in males[24,25] Also it was observed that cough alone accounted for more than half (52.6%) of all the cases followed by common cold. However, cough cases presenting even more than the common cold cannot be explained but perhaps it may be due to the fact that the cases most often seen in the facility were predominantly Military personnel and their family members who often live in accommodations limited in space, quality and ventilation in Nigeria. This is in agreement with a study done in Chile estimating the indoor risk factors for cough[26]. In addition, it was observed that younger patients <45years accounted for more admissions (60%) than their elderly counterparts. This is similar to the observation in Ekiti State[20] This may not be unrelated to the fact that very few elderly cases >60yrs (22.5%) were sampled in this study. This pattern however contrasts what was observed in other climes such as a study in Saudi Arabia.[27,28]

In understanding the prescription pattern of physicians,

there was a huge discordance as 70% of physicians agreed to conducting a laboratory investigation before management of RTI however only 6 out of 209 (2.87%) of the cases were laboratory investigation ordered for. This implies that almost all the treatment of RTIs in the study was done empirically (96.2%). With viruses implicated as the leading cause of most URTIs as stated earlier, this empirical practice could potentially promote antimicrobial resistance in this setting. However understanding antibiotics prescribing is complex as multiple factors must be considered asides from ordering laboratory investigations for example, the case presentation of the RTI.[29] The six individual organisms identified respectively; Gram negative cocci, Enterobacter cloacae, E.coli, SARS CoV-2, Strep pyogenes, Staphylococcus species and are all causal microorganisms for RTIs[30] These pathogens cannot be seen as the only organisms responsible for RTIs in this facility as the outcome is from only approximately 3% of laboratory investigations. Amoxicillin/clavulanic acid 625mg tablets were, the most prescribed antibiotics in this study (33.5%) and is in line with recent guideline (the first line drug) for RTIs management[31,32] All the classes of antibiotics observed in the cases seen in this study; penicillin, quinolones, cephalosporin, macrolides and carbapenem are all approved to treat RTIs.[31] The metronidazole observed was for a non RTI co ailment in the cases seen. Of all the twelve antibiotics used in cases seen, the only questionable prescription is meropenem(8.3%) which was used in a cough case. Meropenem a broad-spectrum carbapenem is not indicated for management of URTIs and its use is reserved for complicated, skin, UTI, abdominal cases and hospital acquired pneumonia[31] However, full review of the case with the physician was not done to aid further understanding on the reason behind that decision. This study only suggests that only 8.3% of antibiotics prescription for RTIs were not concurrent with guideline recommendation [31,32] Analyzing appropriate prescribing of antibiotics should follow a complex cascade or algorithm from diagnosis ,case presentation, isolating the causal organism, patient idiosyncrasy, order of use of these antibiotics among other factors.[29] Amoxiclav(Amoxicillin/Clavulanic Acid), azithromycin and cefpodoxime are all in the guideline for LRTIs in adults.[31,32]No antibiotic was prescribed for the two COVID cases as WHO stipulated[33] This concordance with NICE and WHO guideline may be attributed to 70% of the prescribers admitting to following treatment guidelines however this study did not probe the actual treatment guidelines the prescribers use.

Logistic regression analysis shows that gender of patient, physician educational qualification, observation of RTIs and frequency of RTIs significantly influence the antimicrobial prescription pattern for various RTIs in Military Hospital Lagos. For instance, the senior HMO prescribing more antibiotics than the house officers may be attributed to their more knowledge and experience in diagnosis and management of RTIs. Measures should be taken to ensure continuous education for junior physicians and even more the seniors, as the juniors admit to also prescribing in line with their superior doctors' preferences.

4.1 Limitation of the study

Firstly, a "social desirability bias" may have been introduced because physicians may have reported practices not consistent with their real behaviours to appear more responsible than they really were or a fear of judgement as seen above. Secondly, the study analyzed the prescription appropriateness limited only on medications present in two major guidelines (WHO and NICE 2017) and not in accordance with the full treatment guidelines functionality. The short interval of time in which this study was carried out does not accurately reflect changing prescription patterns. We, therefore, recommend further studies to identify the rationality of prescription patterns for RTIs in Military Hospital Lagos.

5. Conclusion

This study showed that only 8.3% of antibiotics prescribed for RTIs in MHL were not recommended for that ailment. This shows that the prescribers are knowledgeable about guidelines recommended medications for RTI management. However, these prescribers were observed to treat almost all RTI cases empirically (96.2%) of the time. The clinical implication of this prescribing practice is potentially promoting antimicrobial resistance in the facility as most RTIs especially the URTIs are viral. This study highlights those women and children (10-19yrs) account for most RTIs cases in this facility. This should stimulate the leadership of the Military to improve the accommodation living standards for their personnel and their vulnerable wives and children who spend more time there. This study recommends further training for all the Physicians on current guideline for empirical management of RTIs, especially the very senior ones because as was observed, they model prescription patterns for the younger ones.

ACKNOWLEDGEMENT

We thank the almighty God for helping us bring this project to completion. While not forgetting Dr. Margaret Ilomuanya for initiating and supporting this project to fruition. We also thank the hospital's record department for their support.

CONFLICT OF INTREST

The authors declare no conflict of interest.

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