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RESEARCH

Antibiotic use in Namibia: prescriber practices for common community infections

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Background: Despite the threat of resistance, the use of antibiotics globally is high and continues to increase. Much of this use is attributed to overprescribing by physicians. The objective of this study was to assess doctors' management of common community-acquired infections in Namibia.
Methodology: A cross-sectional survey based on a web-based self-administered questionnaire was conducted. Doctors belonging to the local professional associations comprised the study population. Data were collected from March to July 2014.
Results: A 10% (n = 44) response rate was achieved. Respondents were from across the country and practised mainly in the private health sector. Both awareness of local antimicrobial sensitivity rates and ownership of national Standard Treatment Guidelines were poor (20% and 31% respectively). Common practice in managing common infections, with the exception of chronic otitis media, cystitis and pyelonephritis, is to treat empirically. The reported first-line antibiotics of choice were the combination of amoxicillin with clavulanic acid for upper respiratory tract infections and ciprofloxacin for urinary tract infections. Management of infections was the same across all socio-demographic factors and was not influenced by patient workload.
Conclusion: This survey revealed that first-line antibiotic choices of doctors are not informed by the Namibia Standard Treatment Guidelines and the local and regional antimicrobial sensitivity data. Interventions to improve antibiotic prescribing in Namibia should include better dissemination of guidelines and information regarding local antimicrobial sensitivity rates as well as strategies for the implementation of guidelines.

Keywords: antibiotics, antibiotic prescribing, treatment guidelines

Introduction

Antibiotics are pivotal in reducing the burden of infectious disease. Given their effectiveness in fighting infections, their use has become widespread[1–3] and continues to increase. A survey conducted by Princeton University revealed that antibiotic use increased by 36% globally in the past decade (between 2000 and 2010),[4] corroborating the Lancet Infectious Disease Commission Report, which revealed that increased use of antibiotics was observed across all countries regardless of income status[5] with 76% of all increases in antibiotic used globally attributed to the BRICS countries: Brazil, Russia, India, China and South Africa.[4]

High use of antibiotics, especially inappropriate use, is cited as a major driver for the development of resistance. It has further been largely attributed to prescribing practices of physicians.[6–9] Studies have reported that between 20% and 50% of all antibiotic prescriptions are inappropriate.[10–12] Recently, the Lancet Infectious Disease Commission classified prescribers among key players who have the strongest effect on resistance because of their practices.[5]

Given the major role that physicians play in the use of antibiotics, any efforts to decrease the further development of resistance would be advanced if prescribers' practice in prescribing antibiotics were understood. Understanding the attitudes and practices of prescribers can help in determining appropriate interventions to improve antimicrobial stewardship.

Namibia has a dual healthcare system with 82% of the population seeking health care in the public sector and 18% in the private sector. The majority of the health providers, particularly doctors (72%), are practising in the private sector.[13] The sale of medicines is regulated; antibiotics are scheduled drugs and can therefore only be sold upon prescription by an authorised prescriber.[14] In the public sector medicine prescribing is guided by the Namibia Essential Medicines List (NemList) and the Standard Treatment Guidelines (STGs); medicines are obtained from public facilities and are included in the user fee paid at the point of care.[14] The choice of medicines in the private sector is less regulated.

The objective of this study was to determine the doctors' (general practitioners and specialists) behaviour and clinical practice in prescribing antibiotics in Namibia.

Method

Ethical clearance for this study was obtained from the North-West University Research and Human Ethics Committee (Ethical clearance number NWU-00028-13-s1).

A cross-sectional observational study was conducted between March 11 and July 31, 2014 in Namibia through a web-based self-administered questionnaire that was distributed through the medical professional associations. The study target was 455 doctors (general practitioners and specialists) belonging to the medical associations. To increase response rate, the medical telephone directory was used and doctors were called randomly and asked to participate in the survey. The questionnaire was semi-structured with mainly closed-ended questions and a few open-ended questions designed through extensive literature review of studies with similar objectives and guidance from local experts and subjected to a pilot study. The final questionnaire had 20 questions which surveyed the following items: (i) demographic data; (ii) workload; (iii) knowledge and possession of treatment guidelines; (iv) knowledge of local sensitivity data; (v) common practice; (vi) strategies for improving antibiotic prescribing.

Data analysis

Data were collected directly on Survey Monkey. Data analysis was performed in SAS Version 9.1.3 (SAS Institute, Cary, NC). All statistical significance was considered with a probability of $p < 0.05$. The practical significance of results was computed when the p-value was statistically significant ($p \leq 0.05$). Descriptive analysis was used to summarise the data and factors associated with doctors' prescribing practices were then evaluated. Variables (age, gender, education level and employment) were expressed using descriptive statistics such as frequencies (n) and percentages (%). A chi-square test (χ^2) was used to determine whether a statistically significant association exists between proportions of two or more groups. Cramer's V statistic was used to test the practical significance of this association (with Cramer's V ≥ 0.5 defined as practical significance).

Results

Forty-four (44) doctors across the country completed the survey representing a 10% response rate. Majority of the respondents were males (76%), were over the age of 55 years (36%) and were general practitioners (84%). Table 1 gives a summary of the respondents' characteristics.

The respondents were from 12 of the 14 regions of the country with the majority of respondents (57%) from Windhoek, Khomas region. The years in practice of the respondents ranged from 5 years to 44 years with most respondents being in professional practice for 10–30 years.

The majority of respondents (69%) reported not having a copy of the Namibia Standard Treatment Guidelines.

Almost all respondents indicated that they thought that there was a problem with antibiotic usage in the country. The two leading factors for this were indicated as overprescribing by clinicians as well as inappropriate use by patients.

Some 80% of the doctors reported not being aware of the bi-annual aggregate sensitivity data collated by the private laboratory from routinely collected samples obtained from both hospital and ambulatory patients although this is routinely made available to all doctors using the laboratory service.

Treatment of infections

As shown in Figure 1, the common practice in managing common infections, with the exception of chronic otitis media, cystitis and pyelonephritis, is to treat empirically. Only 23% of doctors start treatment after laboratory culture and that is done mainly for chronic sinusitis and nasopharyngitis.

A total of 91% of doctors reported doing laboratory culture when empirical treatment fails. These results were the same across all respondent characteristics.

Choice of antibiotics

For each of the infections mentioned in the preceding section, the doctors were requested to indicate what their usual first choice of antibiotic is. Table 2 shows the respondents' top three antibiotic choices with the first-line antibiotic recommended in the national STGs underlined.

There were no associations between the choice of antibiotic and any of the respondents' characteristics. The practice was the same between those respondents who had guidelines and those who did not.

Monitoring adherence to treatment

Only 36% of doctors reported evaluating antibiotic treatment adherence when seeing a patient for a follow-up visit, while only 12% ($n = 4$) reported having any written material that addressed adherence and compliance with treatment.

Source of information

The main source of information on antibiotics was reported to be the scientific journals (41%), followed by scientific conferences (24%). The pharmaceutical industry was ranked by 38% of

Table 1: Demographic characteristics of respondents

Characteristic	Category	*n* (%)
Gender	Female	10 (24%)
	Male	32 (76%)
Age	< 35	5 (12%)
	35–45	12 (29%)
	46–55	10 (24%)
	> 55	15 (36%)
Provider type	General practitioner (GP)	36 (84%)
	Specialist	7 (16%)
Sector of practice	Private sector	35 (83%)
	Public sector	2 (5%)
	Both	5 (12%)
Average number of patients per day	< 25	20
	26–50	16
	51–75	5
	> 75	0
Belong to professional association	Yes	37 (90%)
	No	4 (10%)

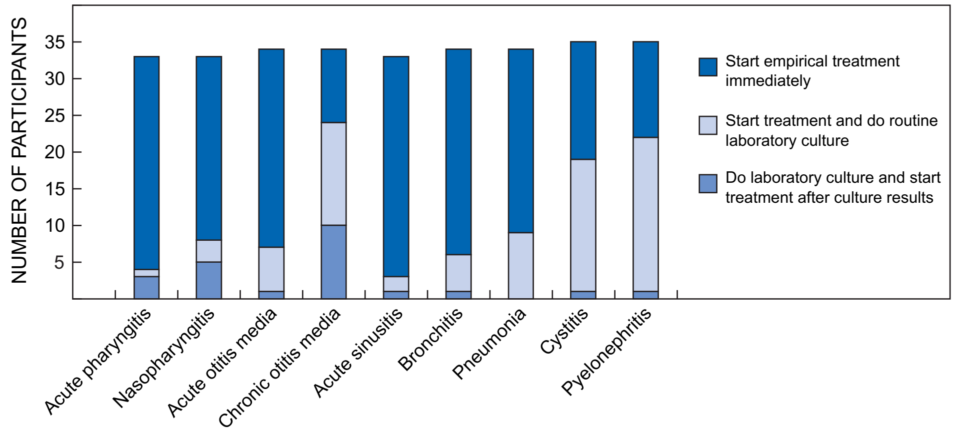

Figure 1: Practice in treating common infections

Table 2: Preferred first choice of antibiotic for different common infections with first-line antibiotics recommended in the national STGs in italics

Infection	First choice of antibiotic (ranked according to # of responses)								
	First	*n*	%	Second	*n*	%	Third	*n*	%
Acute pharyngitis	Amoxicillin	13	44	Amoxicillin/clavulanic acid	5	18	*Penicillin V*	5	18
Nasopharyngitis	Amoxicillin/clavulanic acid	15	35	Amoxicillin	10	26	*Penicillin V*	5	12
Acute otitis media	*Amoxicillin*/clavulanic acid	22	58	Cefuroxime	3	8	Moxifloxacin	3	8
Chronic otitis media	*Amoxicillin*/clavulanic acid	14	38	Cefuroxime	3	8	Moxifloxacin	3	8
Acute sinusitis	*Amoxicillin*/clavulanic acid	10	37	Moxifloxacin	4	15	Azithromycin	4	15
Bronchitis	*Amoxicillin*/clavulanic acid	15	54	Clarithromycin	6	21	Cefuroxime	3	11
Pneumonia	*Amoxicillin*/clavulanic acid	11	36	Ceftriaxone	4	13	Moxifloxacin	3	10
Cystitis	Ciprofloxacin	13	41	*Nitrofurantoin*	4	13	Norfloxacin	4	13
Pyelonephritis	Ciprofloxacin	10	31	*Cefuroxime*	4	13	Amoxicillin/clavulanic acid	3	9

respondents as their second most frequent or priority source of information.

Strategies to improve antibiotic use

The respondents were asked to suggest strategies that could improve prudent use of antibiotics in Namibia. The top 5 strategies suggested by respondents were: provider education (41%), regular updates of local sensitivity data (33%), patient education (26%), treatment guidelines/antibiotic protocols (22%) and restricting antibiotic use (regulation and treatment guidelines) (18%). Other strategies suggested included regular updates on prescription trends, faster laboratory turnaround time and treating only after culture is obtained.

Discussion

While the literature attributes high use of antibiotics to prescribers, information concerning antibiotic prescribing practices in Namibia is minimal, despite the 3rd National Medicines Use survey conducted among 1 132 patients in Namibia demonstrating that the use of antibiotics in the public health sector of Namibia increased from 39% in 1997 to 51% in 2001[15] and a study conducted in the private sector of Namibia in 2013 also showing that 80% of patients reported having used at least one antibiotic in the past year preceding the study (Pereko et al., unpublished). This study was the first to determine the choices clinicians make when faced with common infections in Namibia.

Our study achieved a response rate of 10%, which is comparable and in some instances higher than the response rate reported by others.[15–17] The following discussion therefore must be considered in the context of the low response rate.

The study uncovered that practices relating to antibiotic prescribing were the same across prescribers, largely in private practice, and were not influenced by age, years of practice, provider type, number of patients and region. The practice was also the same regardless of whether respondents had Namibian Standard Treatment Guidelines (STGs) or not. The literature is still divided on whether these factors influence prescribing or not. For example, in line with these findings, some authors found that sex and provider type had no influence on behaviour,[18] while others reported that younger doctors were more likely to prescribe antibiotics than older doctors.[19,20] Similarly, some authors reported that doctors with fewer years of experience were more likely to prescribe antibiotics than their counterparts with longer experience[20,21] while others reported the opposite.[22,23]

Our study found that workload had no effect on antibiotic prescribing practice. However, other studies reported that high patient volumes resulted in high antibiotic prescribing.[6,18,22,24] Similarly, looking at other studies we would have expected to find variations in prescribing practices based on qualifications and region of practice.[7,20–22,25,26]

For all listed infections, doctors treat empirically. This is consistent with literature findings which stated that fear was one of the factors influencing behaviour.[18,20,24,27] In these studies, doctors generally reported fear of the development of serious complications if they waited before starting treatment. This is further supported by the fact that some of our respondents indicated the need for quicker laboratory turnaround time and stated this as a strategy that could reduce antibiotic use. The same sentiments were shared by other authors.[6,18]

While a variety of antibiotics are the reported first-line choice of prescribers, the most commonly used were the combination of amoxicillin with clavulanic acid, hereafter referred to as co-amoxiclav, amoxicillin and ciprofloxacin. The patterns of first choice of antibiotics observed in this study are similar to assessment of antibiotic consumption reported in other studies of different methodologies.[28,29]

For all infections, the reported preferred choices of antibiotics were not in line with the STGs. Most of the deviation was the use of second-line antibiotics instead of the first-line choice according to the STGs. Again, these findings are not peculiar to Namibia.[26,29] It is not clear what informs the doctors in their choice of antibiotic because, for almost all presented infections, their choice is in line with neither the recommendations as set out in the STGs nor the local/regional laboratory data. For example, *Escherichia coli* is the most frequent pathogen for UTI. The STG recommends the use of nitrofurantoin as first-line agent for the treatment of cystitis and the laboratory data show 95% sensitivity of *Escherichia coli* to this agent. Similarly, a study conducted in neighbouring South Africa also reported high sensitivity of *Escherichia coli* to nitrofurantoin (91.7%).[26] Local laboratory data show only 68% sensitivity of *E. coli* to the respondents' first choice, ciprofloxacin. Similarly, the STG recommends amoxicillin as first-line treatment for respiratory tract infections with the exception of pharyngitis. Laboratory data showed high sensitivity to amoxicillin and penicillin of most of these pathogens, thus confirming the STG recommendations.

When it comes to otitis media, the doctors' choice of co-amoxiclav is sensible. *Haemophilus* has shown 80% sensitivity to amoxicillin and 95% sensitivity to co-amoxiclav. Because the doctors treat empirically, the choice of an agent that would cover offending pathogens even though it is not in accordance with the STGs is understandable.

Apart from not being in line with the national guidelines, the reported preference of co-amoxiclav for respiratory tract infections and ciprofloxacin for uncomplicated urinary tract infections is concerning. It indicates unnecessary use of broad-spectrum antibiotics, which could lead to additional selection pressure favouring resistance.

This mismatch between respondents' first choice of agents and STGs and/or laboratory data is not surprising as the majority of respondents had indicated that they did not have STGs and that they also were not aware of the bi-annual sensitivity data made available by the private laboratory in Namibia. This lack of guidelines has been cited by others as a factor influencing practice.[16] The fact that the majority of doctors were not aware and did not have a copy of the STGs suggests that the distribution was not wide enough since these guidelines have been in effect since 2011, as was observed in the United Kingdom.[7] Furthermore, our study noted that there were no differences in choice of antibiotics between those who had STGs and those who did not. This shows that just having guidelines is not enough: there has to be a mechanism for ensuring use of these guidelines. This is supported by the respondents' suggestion to have 'guidelines that are enforced'.

As seen in this study, lack of access to local microbiology data can lead to doctors under-appreciating the prevalent levels of resistance and therefore using antibiotics with lower sensitivity. Second, doctors could overlook effective narrow-spectrum agents in favour of broad-spectrum antibiotics.

In an effort to understand what could be done to improve appropriate use of antibiotics, the study uncovered several factors "affecting prescribing of antibiotics". These factors included knowledge of local sensitivity patterns, restrictions on the availability and use of antibiotics and need for antibiotic guidelines/protocols.

The need for knowledge of local sensitivity patterns is not peculiar to our respondents. Doctors in the Democratic Republic of Congo and Peru expressed the same need and went further to suggest that this was essential for good prescribing.[23,30] A study in Brazil found that physicians generally underestimated the prevalence of resistance in their area.[29] Such underestimation could lead to patients being prescribed ineffective antibiotics. This was proved in this study by the respondents' preferred first choice for treating UTI, which was shown to be not as effective against *E. coli*. In Namibia, the sensitivity data are available. However, few doctors reported being aware of such data. Our recommendation is that sensitivity data be generated regularly and be disseminated through professional associations and also presented through continuing professional development (CPD) training.

The call for restrictions on the availability and use of antibiotics suggests that the choices for doctors are too wide and could therefore favour inappropriate use of antibiotics. It has been reported that increased availability resulted in newer and multiple antibiotics being prescribed.[19,24] In this study we observed that respondents unnecessarily prefer broad-spectrum to effective narrow-spectrum antibiotics, which could lead to antibiotic resistance selection pressure. Dumpis and colleagues also noticed similar preference in their study in Latvia.[31] Our recommendation therefore is for guidelines that would advocate for restriction in the use of antibiotics. The effectiveness of such a strategy, if implemented, has been reported by others. A study conducted in Peru indicated that the need to seek approval to use certain antibiotics was a deterrent that made prescribers seek other alternatives.[30] Similarly, doctors in Scotland and France reported finding the strategy of restricting prescriptions most helpful.[32] Guidelines would then have to be precise regarding the restrictions.

As with the need for local sensitivity patterns, the need for antibiotic guidelines has been expressed by many.[6,19,33,34] Others have also indicated that while there may be international guidelines, local guidelines are most preferable.[23,30] Others have gone as far as to suggest that an antibiotic formulary is among the main intervention methods for reducing the development and spread of resistance.[27] Namibia has both national STGs and antibiotic guidelines developed by the laboratory, which are accessible on the internet. However, the majority of the respondents did not have a copy of these guidelines. This emphasises that having guidelines is not enough; they would need to be well publicised and disseminated.

Our results have identified areas for future interventions to promote appropriate use of antibiotics in Namibia.

Conclusion

Our study uncovered that antibiotic prescribing practice was the same across various demographic groups. The advantage of this is that the same interventions may be introduced without having to tailor for specific groups.

Second, the study uncovered prescribing practices that are not in line with current STGs and/or local sensitivity data. This may be due to the fact that most respondents did not have copies of guidelines and were not aware of the availability of local sensitivity data. This calls for rigorous dissemination of both guidelines and local sensitivity data. However, the study further found that even those doctors who had STGs did not prescribe in accordance with the guidelines, thus indicating the need for training on guidelines and strategies to ensure implementation of guidelines.

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