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Point prevalence survey of antimicrobial prescriptions in selected units of National Hospital Kandy, Sri Lanka.

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Abstract

Background: Lack of feedback to the prescribers might affect the core of the Antibiotic Stewardship Programme (ASP). Point prevalence surveys on antibiotic use and feedback will improve the rational use of antibiotics and prevent the emergence of multidrug-resistant bacteria.

Objectives: We aim to describe the antibiotic use and compliance with standard antibiotic guidelines at selected units in National Hospital, Kandy (NHK).

Methods: Data were collected from selected units at NHK. An interviewer-administered questionnaire was used to collect data. All patients who were in the ward at 9 am on the day of the survey were included in the study. Observations were analyzed to find out the rational use of antibiotics.

Results: Among 214 patients, 103(48.1%) were on antibiotics. The highest usage was observed in surgical units. The most common antibiotic used was amoxicillin-clavulanate and sparing of carbapenems was observed. Even though 71(68.9%) bed head tickets (BHT) carried indications for antibiotic use; only one patient was on targeted treatment. Fifty-seven (80.2%) received antibiotics according to the National Antibiotic Guideline considering site of infection and 14(19.8%) did not comply with the guidelines.

Conclusion: Compliance rate with guidelines and documentation has room for improvement through implementing ASP, availability of user-friendly guidelines and the periodic audit in the hospital.

Keywords: Antibiotic resistance, Antibiotic consumption, Point prevalence survey, AMR, Antibiotic stewardship

INTRODUCTION

Infections with antibiotic-resistant bacteria are associated with high morbidity and mortality[1]. Since 1985 a few antibiotics have been discovered and the pipeline of novel antibiotics remains dry[2]. There are many factors involved in the emergence of antimicrobial resistance (AMR), such as, overuse of antibiotics in livestock and fish farming, poor infection control in health care settings, poor hygiene and sanitation and poor compliance of patients. However, misuse of antibiotics, for

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example, excessive and inappropriate antibiotic use in healthcare, has been recognized to be a well-known factor involved in the emergence of AMR[3]. Thus, the World Health Organization (WHO) has encouraged national strategies to mitigate the emergence of AMR such as introducing antibiotic stewardship programmes[3]. However, guiding all antibiotic prescribers is a major challenge.

Though it is late, we are not too late to control antibiotic misuse. Organizing antibiotic consumption surveys at the institutional level will provide the evidence needed for programmes and will give effective feedback to prescribers as well. Further, these audits will enable each hospital to identify targets for quality improvement in the antibiotic prescription[4].

Our main aim was to assess the usage of antibiotics at the patient level at a tertiary care centre in Sri Lanka.

MATERIALS AND METHODS

Study design and setting:
Patients were enrolled for this survey from medical, surgical, and gynaecology and obstetrics wards of the National Hospital Kandy (NHK) during a one-month period from 1st of April 2020 through 30th of April 2020. The study team visited each ward once to capture information on post-admission days. Ethical clearance was obtained from Ethical Review Committee/NHK (No. THK/ERC/20/2020). Details were collected from 214 patients after informed written consent was obtained from the unit consultant, director of the hospital and patients.

Study population:

Inclusion criteria
All patients who were in the ward at 9 am of the day of the survey were included in the study.

Exclusion criteria
Patients admitted after 9 am or patients who were not clerked for the day by the house officer until the end of the survey were excluded from the study.

Data collection and analysis:
An interviewer-administered questionnaire was used to collect data. Details were collected from bed head tickets (BHTs- paper-based data).
We collected the following details; antimicrobials given or not, sex, weight included in the BHT or not, on bed or floor, ambulant or not, ill with a fever or not ill, functioning status of the kidneys (assessed by monitoring serum creatinine), on intravenous fluid (IVF) or oral fluid and whether the indication for antibiotics was mentioned or not. We checked to see if the treatment was therapeutic or prophylactic in nature.

A patient was considered to be ill if suffering from any disease or feeling unwell. We assessed the following parameters according to the given definitions. On antimicrobial treatment or not – (any patient on any antimicrobial agent including antibiotics, antifungals and antivirals was considered to be on antimicrobial treatment),
on therapeutic or prophylactic treatment – (therapeutic treatment is designed to treat a particular syndrome rather than to prevent an infection. Prophylactic treatment is designed to prevent an infection from occurring[5]), for prophylactic treatment, we checked to see if it was for medical or surgical prophylaxis.

For those on therapeutic treatment – if the treatment is empirical or definitive. For this, we assessed to see if treatment was based on microbiology laboratory investigations such as blood culture (BC), urine culture (UC) or sputum culture (SC). If such evidence was available, treatment is considered as definitive treatment. All other instances were considered as empiric treatment[6].

For those on therapeutic treatment – if the patient is on treatment for a community acquired infection (CAI) or hospital acquired infection (HAI). CAIs were defined as infections manifesting and diagnosed within 48 hours of admission[7] and HAIs are defined as infections that patients get while receiving treatment for medical or surgical conditions[8].

We collected the following information from patients on antibiotics– name/s of the drugs, dose (mg/g/IU), route, doses per day and any

subsequent changes. Information on antibiotic use in the preceding month was collected by talking to patients.

Patients were considered to be prescribed according to the national guidelines if they received antibiotics and dosage according to the given syndrome as mentioned in National Guidelines[4].

Statistical analysis:

Categorical variables such as the proportion of each sex, weight measured or not, physiological status of patients and renal function status were compared by using Chi-square or Fisher Exact tests while continuous variable; duration of stay was compared using Mann Whitney U test.

RESULTS

Demographic details

A total of 5 wards (2 medical, 2 surgical and 1 gynaecology and obstetrics) in NHK were included in the survey. The 5 wards included had a total of 341 beds on the day of the survey.A total of 214 subjects were enrolled in the survey. There were 78(36.4%) male and 136 (63.6%) female patients. 103 (48.13%) patients were receiving antimicrobials.

There was a significant difference in the proportion of patients on antibiotics within the study unit categories (Surgical - 48(71.6%), Medical - 40(46%), Gynecology and Obstetrics -15(25%), P<0.005, Chi-square test). Further, of the variables studied, there was a significant difference in the duration of stay (those on antibiotics had a mean duration of 6.02 days, (SD 5.2), median 3 days while those not on antibiotic had a mean duration of hospitalization of 3.27 days (SD 3.3) and median of 2 days (P<0.005, Mann-Whitney U test) (Table 1)

Table 1 Demographic and clinical details of patients

Variables	Antimicrobial treatment		P value
	Yes (n=103)	No (n=111)	
Medical wards (n=87)	40 (46.0%)	47 (54.0%)	P<0.005
Surgery (n=67)	48 (71.6%)	19 (28.4%)	Chi square test
Gyn & Obs (n=60)	15 (25.0%)	45 (75.0%)	
Male sex (n=78)	43 (55.1%)	35 (44.9%)	P=0.155
Female sex (n=136)	60 (44.1%)	76 (55.9%)	Chi square test
Duration of hospital stay	Mean 6.02	3.27	P<0.005
	Median 3.00	2.00	Mann-Whitney U test
	Max 35	1	
	Min 1	19	
Ambulant patient (n=196)	89 (45.4%)	107 (54.6%)	P=0.012 Chi square test
Bed bound patient (n=18)	14 (77.8%)	4 (22.2%)	
Weight measured(n=57)	13(22.8%)	44(77.2%)	P<0.005 Chi square test
Weight not measured(n=157)	90(57.3%)	67(42.7%)	
Ill with fever (n=28)	25 (89.3%)	03 (10.7%)	P<0.005
Ill with no fever (n=109)	52 (47.7%)	57 (52.3%)	Chi square test
Not ill (n=77)	26 (33.8%)	51 (66.2%)	
Patient on IVF	48 (88.9%)	06 (11.1%)	P<0.005
Patient not on IVF	55 (34.4%)	105 (65.6%)	Chi square test

*__IVF__- Intra venous fluid

Antimicrobial use

The treated patients received a total of 17 different antibiotics and no one was on antivirals. Only one patient received an antifungal local application for vaginal candidiasis. When we consider the overall use of antibiotics, the commonest antibiotic used was amoxicillin-clavulanate. This was used in 59 patients out of the 103 (57.2%) on antimicrobials. Followed by metronidazole 30(29.1%), clindamycin 17((16.5%), clarithromycin 17(16.5%), ceftriaxone 16(15.5%) and cefuroxime 14(13.5%). By contrast, meropenem 9(8.7%), levofloxacin 6 (5.8%) and ciprofloxacin 5(4.8%) were prescribed relatively low in number (Figure 1).

Among those who received antibiotics, 54(52.4%) were on a combination of antibiotics and 49(47.5%) were on a single antibiotic.

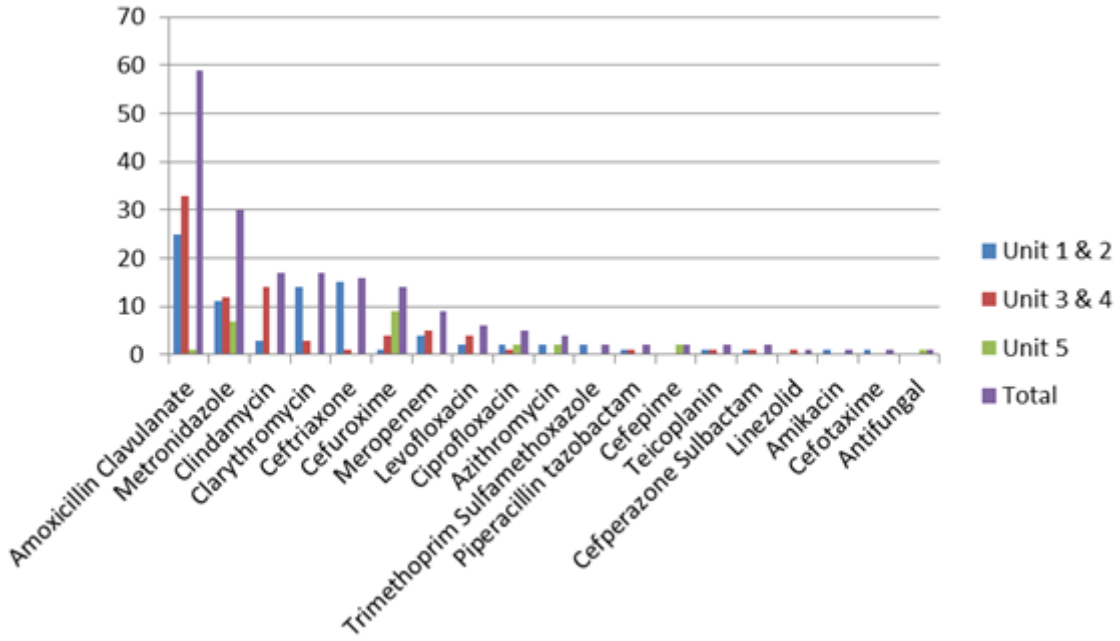

Figure 1: Number of patients receiving each antibiotic in different wards (Including combination of antibiotics)
Unit 1&2- Medical ward, Unit 3&4- Surgical ward, Unit 5 – Gynecological & obstetric ward

Indication for antibiotic use

Among the 103 patients on antibiotics, 71 (68.9%) had the indication mentioned in the BHT while 32 (31.1%) did not have the indication mentioned (Figure 2).

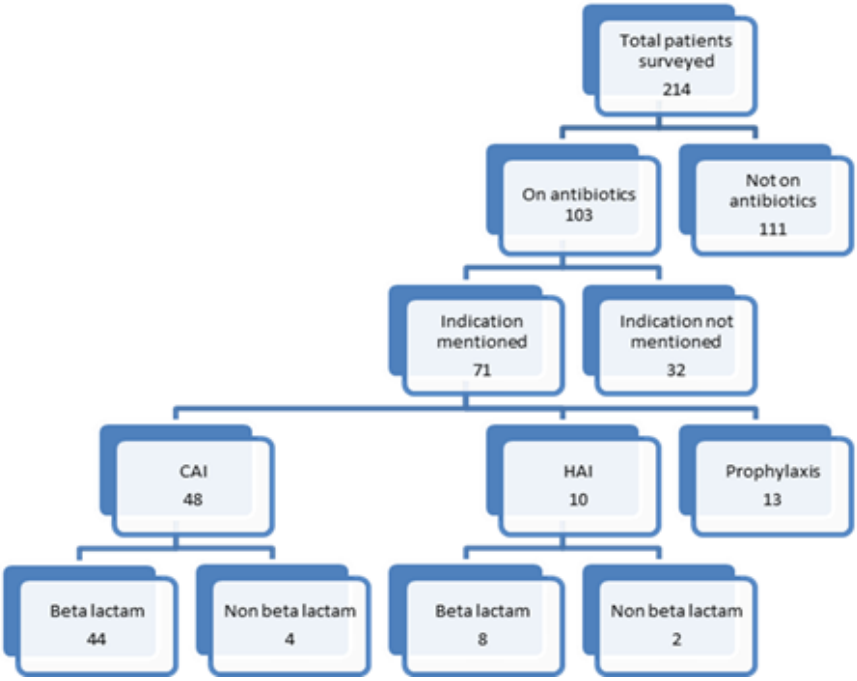

Figure 2 General descriptions of patients with antimicrobials
CAI-Community acquired infection, **HAI-**Hospital acquired infection

Among the 71 with indications mentioned, 57(80.2 %) were on therapeutic treatment and 13(18.3%) were on prophylaxis. Only one patient was on targeted treatment because of the positive blood culture and urine culture.

Among the 71 patients in whom indications for antibiotic use was mentioned, the commonest causes were urinary tract infection/pyelonephritis (n=15, 21.1%), respiratory tract infection (n=15, 21.1%), skin and soft tissue infection (n=11, 15.4%) and intra-abdominal infection (n=8, 11.2%).

Prophylaxis use of antibiotics
Among 71 who were on antibiotics with specific indication post-surgical prophylaxis was given for 13 (18.3%) and no patient was on medical prophylaxis. Among those who were on surgical prophylaxis 9(69.2%) were given cefuroxime, 7(53.8%) were given metronidazole and 5(38.4%) were given co-amoxiclav (including combination treatment).

All surgical prophylaxis patients were receiving >24 hours of prophylaxis at the time of the survey.

Seventy-eight (78) doses were given to the 5 patients on Amoxicillin Clavulanate (mean 15.6 doses, median 9, range 6-27). Metronidazole 69 doses were given (Mean 9.8, Median 9, Range 6-21) and Cefuroxime 135 doses were given (Mean 13.5, Median 12, Range 6-36).

Antibiotic according to anatomical system
Among 103 patients who were on antibiotics, details on the suspected anatomical site of infection were mentioned in 71(68.9%). Seventeen (16.5%) patients had respiratory diseases, 15(14.5%) had renal diseases and 14(13.5%) had skin or soft tissue infections (SSTI) and only one (0.97%) was treated for sepsis.

Prescription according to national guidelines
Among the 71 patients, where indications for antibiotics were given, 57(80.2%) received antibiotics according to the National Antibiotic Guideline. However, 14(19.8%) did not comply with the guideline.

Duration of treatment
The average duration of antimicrobial therapy on the day of the survey was 4.3 days (SD 4.5) while the median duration of treatment was 2 days. Twenty-four (23.3%) patients were treated for >7 days.

CAI vs HAI

Out of 58 who were on therapeutic treatment 48(46.6%) were treated for CAI and 10(9.7%) patients were treated for HAI (figure 2).

Among forty-eight patients who were on treatment for CAI, 34(79%) patients received amoxicillin-clavulanate. Clindamycin and metronidazole were given to 10 (20.8%) and 8 (16.6%) patients respectively (Table 2).

Table 2 Antibiotics used for Community Acquired Infection (n=48)

Antibiotics	Number , %
Amoxicillin Clavulanate	**34 (70.8%)**
Clindamycin	**10 (20.8%)**
Metronidazole	**8 (16.6%)**
Ceftriaxone	**9**
Clarythromycin	**7**
Meropenem	**5**
Ciprofloxacin	**3**
Azithromycin	**1**
Trimethoprim Sulfamethoxazole	**2**
Levofloxacin	**2**
Cefuroxime	**1**
Cefepime	**1**
Antifungal	**1**
Cefotaxime	**1**

DISCUSSION

To our knowledge, this is the first study to date in the Central province, Sri Lanka to evaluate antibiotic use at the hospital level.

In our study 103(48.1%) patients were on antibiotics. In a study done in Northern Ireland 44.1% of patients were given antibiotics[9] and in a study done in Sri Lanka 54.7% of patients were given antibiotics[10]. These studies had overall rates of prescription of antibiotics at similar levels to our study. However, our study included ante-natal units where healthy maternal patients who are not on any antibiotics are frequently found. This contributed to the significant difference in antibiotic use in the study units included. According to a study done by Tianchen, et al, in 2019 antibiotics used in surgical and medical wards were 68% and 43.1% respectively. Exactly the same pattern was observed in our study but the reason for the high use of antibiotics in the surgical wards needs to be further evaluated.

Among patients who were receiving antibiotics, 90 (87.3%) did not have measured weight. This can lead to overdose and side effects or underdose and emergence of resistance. In addition, among those who were ill but without fever, 52 (47.7%) received an antibiotic. However, we did not collect data on inflammatory markers or exclude other symptoms and signs for infection and none of the previous studies analyzed this factor.

According to a study done by Robert et al., β-lactam was the most common antibiotic used in hospital settings. Tianchen et al, in a study done in Sri Lanka, found that the most commonly prescribed antimicrobial was amoxicillin/clavulanic acid. However, treating the patients with β- lactam- β- lactam inhibitor combination is recommended for a few conditions, for example, community-acquired pneumonia[10]. Therefore, adherence to the national and international guidelines should be emphasized in this circumstance. In Asia, carbapenem use is common may be due to peer or patient pressure[12] and it was the same in the study done by Tianchen, et al. However, interestingly only 9(8.7%) patients had been treated with meropenem and none of them with imipenem. This indicates our prescribers sparing the use of carbapenem because of the detrimental effects to the body with inappropriate use and high cost.

According to the study done by Tianchen, et al, in 2017 in the southern part of Sri Lanka among patients receiving antimicrobial therapy, nearly 40% did not have a clear indication documented in the medical chart, and another 15% did not have an indication that was documented or could be inferred. In our study 32 (31.1%) patients received antibiotics without clearly documented indication. Infectious disease society of America's (IDSA), Antibiotic Stewardship Programme (ASP) implements interventions to improve antibiotic use and clinical outcomes that target patients with specific infectious diseases syndromes[13]. Therefore, implementing all strategies including

targeted treatment proposed by this forum will improve the prescription pattern.

Because of the paucity of data in the BHTs, it is exceedingly difficult to find whether it was rational or not. A previous study, which was done in Sri Lanka in 2019 also found inappropriate use of antibiotics in the ward setting, where 31% of antibiotic prescriptions were irrational[10]. However, here when compared with our national guidelines[4], among 71 patients who had indications for the treatment, 80.2% of antibiotics use complied with guidelines. In addition, most of the antibiotics were first-line and basic and the use of carbapenem was very low. But, still, 19.8% did not comply at all.

In our study, 103 patients were treated with antibiotics but only one patient had culture evidence. According to our study design, we did not trace back whether samples were actually taken or not. However, BHTs had no evidence of collection of blood or any other samples for culture (either taken or not taken). This is a major drawback of a paper-based system. ASP proposed by IDSA clearly mentioned that Health care information technology in the form of electronic medical records, computer physician order entry and clinical decision support can improve antimicrobial decisions through the incorporation of data on patient-specific microbiology cultures and susceptibilities[14].

Our national antibiotic guideline clearly states surgical prophylaxis should not be continued for more than 24 hours [4]. However, in our study, almost all antibiotics were used more than 24 hours and for example, Amoxicillin Clavulanate had been given for more than 5 days. IDSA suggests the use of strategies such as antibiotic time-outs and stop-orders to encourage prescribers to perform the routine review, which will prevent unnecessary prolonged use of antibiotics.

We piloted the first survey of antimicrobial usage at the patient level in NHK, Sri Lanka. As this is a national tertiary hospital that filters most patients from the Central province and has one of the highest rates of antibiotic use in Sri Lanka, data were collected from here might reflect the actual situation of Sri Lanka. However, the collection of data was labour-intensive unlike in the western world because all the records were paper-based, whereas in other countries it is electronic-based. Therefore, doing a national survey including all hospitals is a great challenge in Sri Lanka. Even though, a total of 341 beds were available in the surveyed unit we could collect 214 patients during this period because of fear of COVID 19 disease among the public during our survey period.

Limitation

Upper respiratory infection, which is usually viral in aetiology, was the fifth most common indication for antimicrobial use[7]. However, because of the paucity of information in the BHTs and the lack of rapid virology tests for respiratory pathogens in Sri Lanka, we failed to assess these criteria in our study. Consider this issue in a future study might give good insight about appropriate use. In addition, as we mentioned earlier all data were collected from the paper-based document and it was a major limitation in our study.

Conclusion and recommendation

Point prevalence survey is an effective method to analyses the use of antibiotics in hospital settings. Moreover, precise survey and feedback to the prescribers are one of the ways to implement the ASP.

Electronic-based point-prevalence survey methodology is the best way to collect accurate data for proper analysis of the rational use of antibiotics.

Author declaration

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Availability of data and materials

On request from the corresponding author.

Ethics approval and consent to participate

Ethical clearance was obtained from Ethical Review Committee/NHK (No. THK/ERC/20/2020). Details were collected from 214 patients after informed written consent was obtained from the unit consultant, director of the hospital and patients.

Competing interests

Liyanapathirana. V has received research funding from the industry for a different study.

Others declare no conflicts of interest.

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