CP 03

Pattern of parenteral antibiotic consumption in in-patient units over five years at Teaching Hospital Jaffna

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Abstract

Background and objective: Inappropriate use of antibiotics increases the risk of antimicrobial resistance. Data on antibiotic consumption provides basic information for surveillance. This study describes the pattern of parenteral antibiotic consumption in in-patient units at Teaching Hospital Jaffna (THJ) over a period of five years.

Methods: It was a retrospective analysis of parenteral antibiotic consumption from 2018 to 2022. Data were extracted from the pharmacy database of THJ. The consumption volume of antibiotics was expressed in defined daily dose (DDD) which was calculated using the Anatomic Therapeutic Classification (ATC)/DDD system of the World Health Organization Collaborating Centre for Drug Statistics Methodology. Inpatient antibiotic consumption was expressed in DDD/100 admissions/ year. The WHO's AWaRe classification (Access, Watch, Reserve) for antibiotics was used to describe the pattern of antibiotic consumption. One-way ANOVA was performed to determine the significance of changes over a period of time. A p value ≤ 0.05 was considered statistically significant.

Results: Almost all parenteral antibiotics (99.3%) were consumed by in-patient units. Proportion of consumption of oral and parenteral antibiotics in in-patient units was 1:1. Consumption of Access, Watch and Reserve groups of parenteral antibiotics were 60.7%, 38.3% and 0.3% respectively, during the five-year period, consistent with WHO recommendations. Penicillin was the most commonly consumed parenteral antibiotic group and amoxicillin+clavulanic acid was the most frequently consumed single antibiotic. Parenteral antibiotic consumption rate was on the decline except in 2020 and 2021 during COVID-19 pandemic, when an increase was observed. An overall decline in the rate of consumption of parenteral antibiotics was observed (from 180.7 to 125.7 DDD/100 admissions between 2018 and 2022). These changes were not statistically significant.

Conclusions: Parenteral antibiotic consumption rate at THJ was in line with World Health Organization's recommendation based on the AWaRe framework.

Keywords: Parenteral antibiotics, Antibiotic consumption, Defined daily dose, AWaRe classification

Introduction

Antibiotics are one of the most commonly prescribed medications and their consumption increased by 65% globally between 2000 and 2015 [1]. The major concern with antibiotics is the development of antibiotic resistance. The burden of infectious diseases is high in low- and middle-income countries (LMICs), which also contributes to the risk of developing antibiotic resistance [2]. Overuse of antibiotics in LMICs is a global health concern [3].

Surveillance of antibiotic consumption is important to optimise antibiotic use. Consumption data provide basic information for surveillance and monitoring [4]. Recognising the need for global guidance on appropriate use of antibiotics, the World Health Organization (WHO) has introduced the AWaRe (Access, Watch, Reserve) classification of antibiotics, which is used as a monitoring tool for antibiotic stewardship. The Access group includes narrow spectrum antibiotics generally recommended as first- and second-choice agents for commonly encountered infections. They should be available and affordable in all countries. The Watch group includes broad-spectrum antibiotics with a higher resistance potential that are recommended for a specific, limited number of indications. The Reserve group represents last resort antibiotics that should only be used if other antibiotics do not work anymore. The WHO recommends that the Access group should represent at least 60% of overall antibiotic use [4-5].

Parenteral antibiotics are generally used in severe infections and in patients who are unable to take oral medications [6]. Use of parenteral antibiotics is not only associated with increased cost but also the risk of unwanted effects [6-7]. Information on parenteral antibiotic consumption would help to take measures to optimise the use of parenteral antibiotics.

A few studies have evaluated antibiotic consumption in Sri Lanka [8-9]. They suggest that more than 60% of antibiotics consumed in the public sector belong to the Access group [8-9]. None of these studies have described parenteral antibiotic consumption in Northern Sri Lanka. This paper describes the pattern of parenteral antibiotic consumption in in-patient units at Teaching Hospital Jaffna (THJ), the largest tertiary hospital in the Northern Province, over a five-year period.

Methods

It was a retrospective analysis of parenteral antibiotic consumption from 2018 to 2022. We extracted the supply data from the pharmacy database of THJ. The consumption volume of antibiotics was expressed in defined daily dose (DDD) at level 5 of the Anatomic Therapeutic Classification (ATC). Number of daily doses were calculated using the ATC/DDD system of the WHO Collaborating Centre for Drug Statistics Methodology. In-patient antibiotic consumption was expressed in DDD/100 admissions/year [4]. One-way Analysis of Variance (ANOVA) was performed to determine the significance of changes over time. A p value ≤ 0.05 was considered statistically significant.

Results

We analysed parenteral antibiotic consumption from 2018 to 2022 at THJ. Table 1 shows the antibiotic consumption (total, oral, parenteral consumption) by year. Overall, parenteral antibiotics contributed to 14% of total antibiotic consumption during the five-year period. Almost all parenteral antibiotics were consumed by in-patient units, with less than 2% consumed in the outpatient department. Therefore, subsequent analysis focused on in-patient parenteral antibiotic consumption. In in-patient units, consumption of oral (47.7%) and parenteral (52.3%) antibiotics was more or less equal.

Table 1 Antibiotic consumption at Teaching Hospital Jaffna

	Defined daily dose-DDD (%)				
	2018	**2019**	**2020**	**2021**	**2022**
Total consumption	1212995.8 (100)	1301399.2 (100)	1119255.9 (100)	954264.8 (100)	1124770.3 (100)
Oral antibiotics	1054708.6 (87.0)	1133728.9 (87.1)	968512.5 (86.5)	799450.5 (83.8)	951096.7 (84.6)
Parenteral antibiotics	158287.2 (13.0)	167670.3 (12.9)	150743.5 (13.5)	154814.3 (16.2)	173673.6 (15.4)

Proportion of Access and Watch parenteral antibiotics ranged from 56.2% to 65.2% and from 33.5% to 43.3%, respectively, during the five-year period (Fig. 1). The changes in the proportions of Access and Watch group antibiotics over the five-year period were not significant. Reserve group (0.3%) and unclassified (0.7%) antibiotics contributed to around 1% of the total consumption during the five-year period.

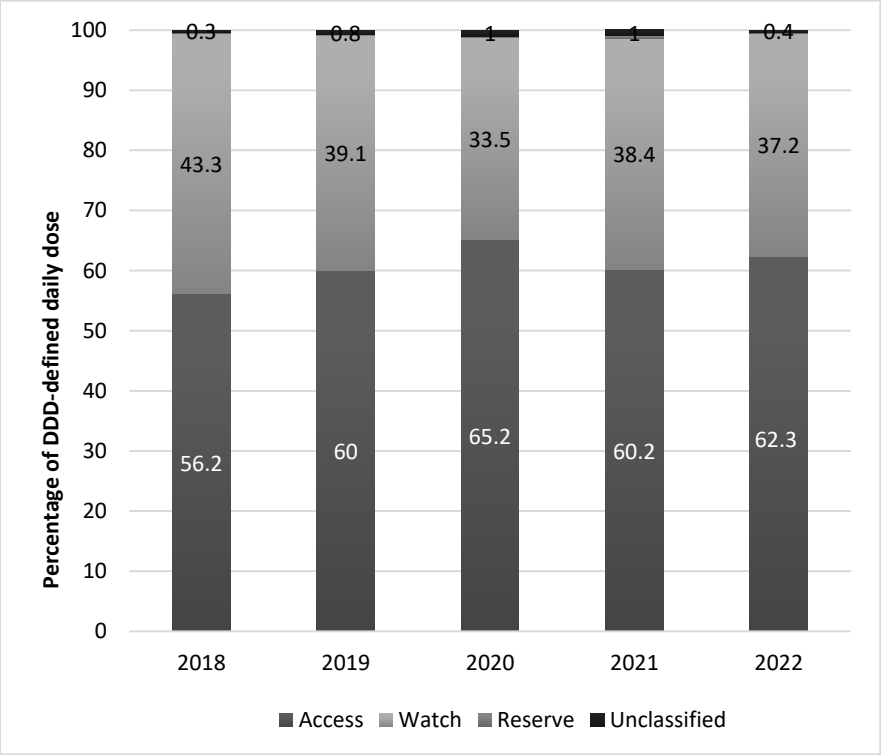

Fig. 1 Consumption of parenteral antibiotic in the Access, Watch and Reserve groups over a five-year period

The top ten antibiotics contributed to more than 80% of total parenteral antibiotic consumption (Fig. 2); the same ten antibiotics were consumed in all years except 2020 and 2022. When considering ATC level 3, beta lactam antibiotics contributed to about three-fourths of the total parenteral antibiotic consumption. Penicillin (30%-50%) was the most commonly consumed antibiotic group followed by cephalosporins (15%-30%). The most consumed single antibiotic was amoxicillin+ clavulanic acid, except in 2018, when metronidazole was the most consumed.

Trend of parenteral antibiotic consumption in in-patient units over the five-year period is shown in Fig. 3. Although there was an increase in the rate of parenteral antibiotic consumption in 2020 and 2021, an overall decline in the rate of consumption of parenteral antibiotics was observed (from 180.7 DDD/100 admissions in 2018 to 125.7 DDD /100 admissions in 2022). These changes were not statistically significant.

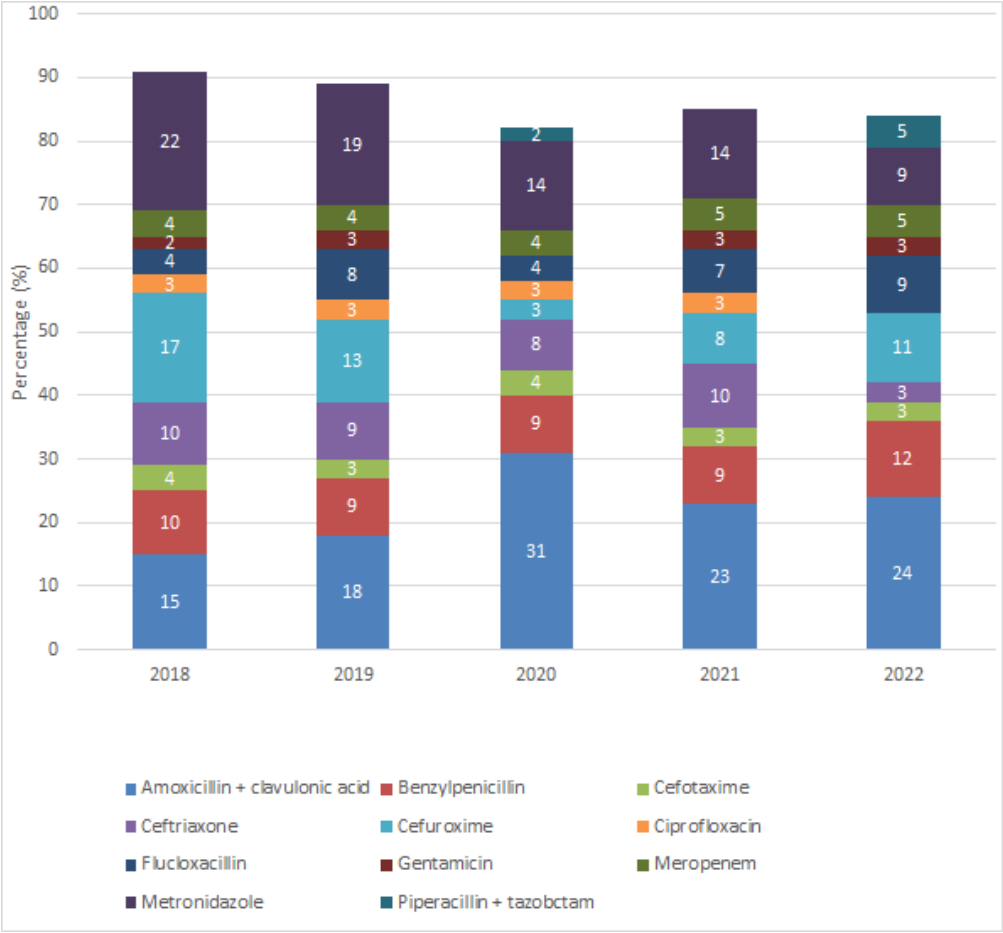

Fig. 2 Parenteral antibiotics consumed in in-patient units from 2018 to 2022

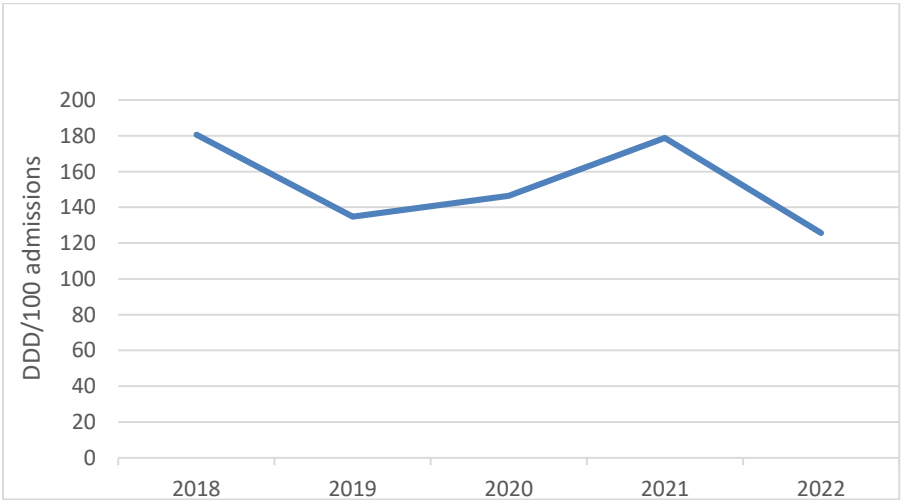

Fig. 3 In-patient parenteral antibiotic consumption rate

Discussion

In this study parenteral antibiotics contributed to less than one fifth (14%) of total antibiotic consumption at THJ. A similar finding (12%) was reported from a secondary healthcare facility in Ghana [10]. Consumption of oral and parenteral antibiotics in-patient units was almost equal in our study. Studies conducted in China and Azerbaijan have also reported equal utilisation of oral and parenteral antibiotics among in-patients [11-12]. This observation is not unexpected as in-patient care is required for serious infections which are often treated with parenteral antibiotics. The overall consumption of parenteral antibiotics at THJ is on the decline although there was a rise in 2020 and 2021 (Fig. 2). Similarly, a rise in antibiotic consumption was reported during the COVID-19 pandemic in other parts of the world [13].

Our study indicates that parenteral antibiotic consumption at THJ was in line with the WHO target during the five-year period [5]. We found that majority (60%) of parenteral antibiotics consumed belonged to the Access group and that the Watch group contributed to 40%. In contrast, the Watch group of parenteral antibiotics were the most frequently consumed in a tertiary care hospital in Nepal (57.4%). Meanwhile, only about 0.3% of parenteral antibiotics belonged to the Reserve group in our study whereas in the Nepal hospital, 4.9% was in the Reserve group [7].

The top ten parenteral antibiotics consumed in THJ were amoxicillin+clavulanic acid, metronidazole, cefuroxime, benzylpenicillin, ceftriaxone, flucloxacillin, meropenem, cefotaxime, ciprofloxacin and gentamicin. Likewise, the above-mentioned antibiotics were the most frequently consumed antibiotics reported in a study on antibiotic consumption in the state sector of Sri Lanka [8] and two studies conducted in Nepal and Romania [7, 14].

In the present study, a substantial reduction of parenteral antibiotic consumption was observed in 2022 (125.7 DDD/100 admissions) when compared to 2018 (180.7 DDD/100admissions). Unlike our finding, an increase in the rate of consumption of parenteral antibiotics (172.1 DDD/100 admissions in 2017 and 190.2 DDD/100 admissions in 2019) was observed in a study describing the 3-year annual consumption of parenteral antibiotics at a tertiary hospital in Nepal [7]. These observations may indicate more rational consumption of antibiotics at THJ, although reduced availability due to the economic crisis could have also contributed to the reduction in consumption rate of parenteral antibiotics in 2022.

Conclusion

Though there was an increase during the COVID-19 pandemic, overall, the rate of consumption of parenteral antibiotics in in-patient units at THJ has shown a decreasing trend over a period of five years. Pattern of consumption of parenteral antibiotics was on par with WHO's AWaRe target. A sustainable antibiotic stewardship and surveillance system would further improve antibiotic utilisation.

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Conflict of interest

None of the authors have any conflict of interest.

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