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Research Article

Evaluation of six widely Prescribed Antibiotics using ATC/DDD method in the Indonesian Hospital in Palestine: Retrospective study

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Abstract

Purpose: The aim of this study to measure consumption of AB in ICU and medical department using defined daily dose which is an accepted standard method and provide data for rational use of antibiotics to decrease morbidity, mortality and resistance.

Methods: The study was a retrospective in a state hospital with 120 beds. All patients treated with specific antibiotics on 1st December 2019 until 1st March 2020 were included in the study. Indications for antibiotic use and information about the patients were recorded on special forms. Antibiotic use were evaluated using the ATC/DDD index, which is also suggested by the WHO to be used in similar studies.

Results: 234 patients were admitted to the medical and ICU department hospital, of whom 46 patient in the ICU. 96% OF the patients in ICU received AB and 92% of the patients in the medical department received AB. Those identified to use antibiotics with appropriate indications 40.7% in the medical department and 65.5% in the ICU department. The mean hospital stay was 3.4 days, of the total patients 42% of patient received AB less than three days.

Conclusion: The rate of consumption of antibiotics is very high in our hospital and most of the prescribed drugs were irrational. Antibiotic stewardship should be constructed and activated in our country to control AB use, as this will decrease the emergence of resistant strains and decrease budget in hospitals and on the patients.

Keywords: antibiotic; defined daily dose; appropriate use; resistant; vancomycin

Introduction

Antibiotics (AB) drugs are the most popularly prescribed in our country with the absence of anti-biotic stewardship to control these medications [1,2]. Irrational use of the AB associated with the emergent of resistant strains of bacteria, adverse effects and increase treatment burden [3-5]. Rationale use of antibiotic with improving policies result in better outcome with less side effects and cost effectiveness [6,7]. Globally there is an increase in anti-biotic consumption resulting in increased morbidity and mortality but it helps developing an antimicrobial stewardship program and increase awareness of resistance, adverse drug reaction and drug interaction of antibacterial drugs [8,9]. A systematic review found that the highest consumption of anti-biotic was in the intensive care unit at western European hospitals [10]. A study conducted in Germany found that there is increase in AB prescription beyond the second day which result in increased clostridium difficile infections [11]. There was a statistically significant association between consumption of antimicrobials and resistance of Escherichia coli isolates to quinolones, while for Klebsiella pneumoniae, there was a statistically significant association between the resistance rates and consumption of gentamycin, ceftazidime and meropenem [12]. In turkey there was difference between AB consumption between the hospitals due to the absence of antibiotic stewardship with low consumption in teaching hospitals, also in Europe there is increasing consumption of AB in the outpatient clinic [13,14]. Data on in-hospital antimicrobial use vary widely not only due to different antibiotic policies at different institutions but also due to different methods of measures. Adherence to the standard of reporting the methods of measurement is warranted for benchmarking and promotion of rational antimicrobial use [15]. Our review confirms the large variation in antibiotic use even across similar settings and providers, the Italian-speaking region showed a significantly higher consumption density, followed by the French- and German-speaking regions while in acute care hospitals in Switzerland have a relatively low consumption in intensive care units [15,16]. Data from low- and middle-income countries are

under-represented, in addition, the heterogeneity of reported measures clearly shows that there is need for standardization [17]

Aim

The aim of this study to measure consumption of AB in ICU and medical department using ATC/DDD index and provide data for rational use of antibiotics to decrease morbidity, mortality and resistance.

Material and methods

The study was a retrospective conducted in the Indonesian teaching Hospital with 120 beds. The data of this study were obtained from departments of internal medical department that includes (internal medicine, chest diseases, cardiology, infectious diseases), and intensive care units (cardiology, internal medicine). Data concerning antibiotic use in the hospital were collected on the 1st of December 2019 to 1st March 2020 by clinical pharmacist. All patients receiving antibiotics were included to the study. Data were collected from patient charts using a standard form; patients personal information, underlying disease, the name of the antibiotic in use, dosage, duration, reason of antibiotic use (prophylaxis, empirical, microbiologically proven infection) and microbiological test results were recorded on the form. Patients matching all criteria were accepted as "suitable", and in the absence of even one criteria the patient was "non-suitable" excluded.

The existence of an infectious disease was detected by evaluating patient's clinical complaints, physical examination findings and laboratory findings all together.

Study population

Patients who received parenteral ceftazidim, vancomycin, ciprofloxacin, cefotaxim, ceftriaxone, and amikacin from December 2019 to March 2020 were enrolled in this study. The data extracted from Hospital information system included record number of patients who received study drugs, Clinical data retrieved from patient charts.

Data collection

Patient's data including, length of Hospital stay, drug allergy, first and final diagnosis were recorded in a predesigned data collection form. Drug's indicator including treatment regimen, dosing, microbiological culture/sensitivity testing. Clinical outcome and adverse drug reaction verified as study outcome.

Statistical Analysis:

Defined Daily Doses (DDDs) The DDD is the assumed average maintenance dose per day for a drug used for its main indication in adults. It calculated separately for every antibiotic, the average maintenance dose for an adult weighing 70 kg is prepared in main indications and the active substance should be taken as grams (or I.U.)[18]. In this calculation method, the form used is the ratio of the total DDD per 1000-bed-days. Also, the antibiotic consumption index of a country or geographical area at a certain period of time is calculated by DDD per 1000 people. In this study, DDDs of anti-infective agents are listed for systemic use according to ATC/DDD 2010 Index.

DDD= (DDD*1000)/number of days

Results

The study conducted in the Indonesian hospital-Gaza. Data concerning antibiotic use in the hospital were collected on the 1st of December 2019 to March 2020 by clinical pharmacist.

The total number of patients included in this study was 234 with total hospital stay 573 days. Those patients on the drugs mentioned above were included despite the medical illness as diabetes with the exception those with acute or chronic kidney disease excluded**.** The mean age of the patients was 60± 15. Of the patients included to the study, 112 were male (48%) and 123 were female (52%) see (Table 1) patient characteristics. All the patients, received antibiotics for any reason as empirical antimicrobial therapy none of them received antibiotics based on microbiological data. There was 46 patient were ICU and the remain internal.

When evaluating the 234 patients using antibiotics, 42.7% were evaluated as "appropriate" in the medical department and 65.5% in the ICU. According to the microbiological data, none of patients receiving antibiotics in both departments based on culture sensitivity. The rate of antibiotic use in the departments for internal diseases was 92%, and in the intensive care units 96% (Table 2). While the highest rate of antibiotic use in the departments for internal diseases was in the department for pulmonary disease 30.3%, in infectious diseases 30% the lowest rate was found to be in the cardiology with 4.3% and the neurology clinic with 9.4%. (Table 2).

The mean duration was 3.4 days (minimum 1, maximum 13 days). Duration of treatment based on the number of days (14.7% one day, 26.9% two days, 19.2% three days,26.2% five days, 6.4% nine days and 4.5% more than 10 days), respectively(Table 3). The third generation cephalosporin's were the mostly prescribed drugs. In our study, cephalosporin's were found to be the most frequently used antimicrobials among all antibiotics, with a rate of 84.6%. Among the cephalosporin's, 3rd generation cephalosporin's was the most commonly prescribed, Flouroquinolones were the second preferred after cephalosporins. For those in the medical department most frequently preferred 3nd generation cephalosporins was (ceftriaxone) in addition to fluoroquinolones, while in the intensive care units 3rd generation cephalosporins notably ceftazidim in addition to vancomycine(Table 4).

variable	**%**
Gender	52 females 48 males
Age	More than 70 years 39.1 45-70 years 35.4 Less than 45years 25.5
Fever	10.2
Leukocytosis	20.5
c/s	0
Patients with chronic disease	35

Table 1: *patient characteristic variables*

Internal medicine unit	percent of patients	ICU	Percent of patients
cardiology	4.3	cardiology	13.7
Pulmonary disease.	30.3	Pulmonary disease.	41.6
Neurology	9.4	Neurology	0
Infectious disease	30	Infectious disease	24.6
others	18	others	16.1
Total	100		100

Table 2: *Distribution of patients based on clinical condition*

Days of treatment	%
One day	14.7
Two days	26.9
Three days	19.2
Four to seven days	26.2
Eight to ten days	6.4
More than ten days	4.5

Table 3: *Distribution of antibiotic use based on duration of therapy.*

variable	ATC code	I.C.U		Internal	
		DDD	DDD/patient days	DDD	DDD/patient days
Cefotaxime	J01DD01	0	0	6.75	15.3
Ceftazidime	J01DD02	19.6	120.9	22.6	51.2
Ceftriaxone	J01DD04	38	234.5	125.5	284
Ciprofloxacin	J01MA02	58.7	362.3	73.7	179
Amikacin	J01GB06	0	0	13	29.5
Vancomycin	J01XA01	34.5	212.9	15	34

Table 4: *Anti bIotic use based on defined daily dose*

Discussion

Antibiotic prescription differ between countries and hospitals in the same country. This difference depends on the diseases and epidemiology of infectious disease in this country. The absence of antibiotic protocols and policies or the absence of antibiotic stewardship can result in catastrophic emergence of antimicrobial resistance. Antibiotics does not only diverse between countries, but also diverse between the hospitals of a same country. Sometimes physicians preferences and differences in educational and health systems participate in this problem [19]. Antimicrobial agents are the most frequently used drugs in Palestine and they after none steroidal anti-inflammatory drugs. With the absence of data about AB consumption rate, the author estimate nearly 90% of our in-hospital patients receive AB.

In our study, the percent of prescribed antibiotics in the ICU department was 96% and the medical department 92% which is very high compared to other countries. In Europe antibiotic prescription range from 16 to 25% [20] while in turkey it is higher between 50 -60% [21].

In this study there was zero of antibiotics prescribed based upon culture sensitivity and the highest antimicrobial drugs prescribed for pulmonary disease 30.3% in the medical department and 41.6% I.C.U department.

The infectious disease represent 30% in the medical dept., and 20.6 in the I.C.U. while the lowest prescription of antibiotics was cardiology in both departments, other indication such as organ phosphorous poisoning 18% in the internal department and 16 I.C.U (Table)]. High rate of anti-microbial prescription in pulmonary disease is irrational since most of asthma patient and upper respiratory tract infections are viral. When evaluating the duration of antibiotic therapy it was as follow (14.7% one day, 26.9% two days, 19.2% three days,26.2% five days, 6.4% nine days and 4.5% more than 10 days), this mean 41.3% have only two days anti biotic in other words it was not necessary since anti biotic needs more than two day to produce its effect. This mean none scientific or irrational use of antibiotics, while those take four days of treatment (have benefit of antibiotic administration) was 40% see (Table 3). The mean duration of antibiotics was found to be 3.4% days. According to the calculation using DDD per 1000 bed the third generation cephalosporines was most prescribed drugs with ceftriaxone was the most extensively prescribed one 284 and cefotaxime was the lowest prescribed from this generation15.3. The second most prescribed antibiotic was ciprofloxacin 179 then ceftazidime 51.2 and the least was vancomycin 50. In the I.C.U department the problem was greater ciprofloxacin was the most prescribed 362.3, then ceftriaxone 234.5. also in the I.C.U department there is extensive use of vancomycine 212.9 which is the main weapon against methicillin resistant strains worldwide and ceftazidime 120.9 which is the most important drug against P.aergenosa while zero prescribtion of cefotaxime. This mean overestimated diagnosis of MRSA and P.aergenosa. The antibiotic use according to 'evidence based' in our hospital consist only 42.7-65.6% of the total antibiotic based on the data from the two departments. In order to improve the use of antibiotics, educational activities should be performed periodically, policies of current antibiotic use should be formed by the infection committees of the hospitals and the clinical practices should be controlled.

Conclusion and recommendation

The results of our study clarify that there is irrational of antibiotic prescription and reflects the important of construction of antibiotic stewardship for controlling these medications based upon scientific way.

There were some limitations of this study as it was conducted in a single referred center with a small sample size. However, the accuracy of data give strength to the results and make the study more representative of the patients on antibiotics and make it a real world in our region.

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Conflict of interests

The authors have no conflicts of interest to declare that are relevant to the content of this article.

Data transparency

All the data and materials as well as software application or custom code support their published claims and comply with field standards.

Ethics approval

The study have ethical approval from Helsinki Committee on 7/10/2019.

Approval Number PHRC/HC/614/19.

References

1- Hamdi Sözen1, Ibak Gönen, Ayse Sözen, Ali Kutlucan, Serdar Kalemci and Murat Sahan6Sözen et al. Application of ATC/DDD methodology to evaluate of antibiotic use in a general hospital in Turkey Annals of Clinical Microbiology and Antimicrobials 2013, 12:23

2- Usluer G, Ozgunes I, Leblebicioglu H, Turkish antibiotic utilization study group: A multicenter point-prevalence study: antimicrobial prescription frequencies in hospitalized patients in Turkey. Ann Clin Microbiol

3- Drug Use Evaluation of Three Widely Prescribed Antibiotics in a Teaching Hospital in East of Iran Mehdi Mohammadi1, Bahador Mirrahimi1, Sarah Mousavi1, Mandana Moradi2* Antimicrob 2005, 4:16–21.

4- Alanis AJ. Resistance to antibiotics: are we in the post-antibiotic era? Arch Med Res 2005; 36(6): 697-705.

5- Cizman M: The use and resistance to antibiotics in the community. Int J Antimicrob Agents 2003, 21:297–307.

6- Berrington A: Antimicrobial prescribing in hospitals: be careful what you measure. J Antimicrob Chemother 2010, 5:163–16

7- Eili Y. Kleina,b,c,1, Simon A. Levind,e,f, and Ramanan Laxminarayana,e,gPNAS | August 28, 2018 | vol. 115 | no. 35 | E8111–E8112 Improved policies necessary to ensure an effective future for antibiotics

8- Ivan S. Pradipta, Elis Ronasih, Arrum D. Kartikawati, Hartanto Hartanto, Rizki Amelia, Ellin Febrina, Rizky Abdulah Three years of antibacterial consumption in Indonesian Community Health Centers: The application of anatomical therapeutic chemical/defined daily doses and drug utilization 90% method to monitor antibacterial use Journal of Family and Community Medicine | May 2015 | Vol 22 | Issue 2

9- Eili Y. Kleina,b,c,, Thomas P. Van Boeckeld, Elena M. Martineza, Suraj Panta, Sumanth Gandraa, Simon A. Levine,f,g, Herman Goossensh, and Ramanan Laxminarayana, f, iPNAS Global increase and geographic convergence in antibiotic consumption between 2000 and 2015 | vol. 115 | no. 15 | E3465www.pnas.org/cgi/doi/10.1073/pnas.1717295115

10- R. Bitterman, K. Hussein, L. Leibovici, Y. Carmeli, and M. Paul Systematic review of antibiotic consumption in acute care hospitals. Clin Microbiol Infect 2016 Jun;22(6):561.e7-561.e19. doi: 10.1016/j.cmi.2016.01.026. Epub 2016 Feb 17

11- W V Kern, M Fellhauer, M Hug , T Hoppe-Tichy , G Först, M Steib-Bauert, K de Recent antibiotic use in German acute care hospitals - from benchmarking to improved prescribing and quality care Dtsch Med Wochenschr 2015 Nov;140(23):e237-46. doi: 10.1055/s-0041-105938. Epub 2015 Nov 19

12- Noyal Mariya Joseph1, Bhanupriya B.2, Deepak Gopal Shewade3, Belgode Narasimha Harish4Department Relationship between Antimicrobial Consumption and the Incidence of Antimicrobial Resistance in Escherichia coli and Klebsiella pneumoniae Isolates DOI: 10.7860/JCDR/2015/11029.5537

13- Nebyu Daniel AmahaID, Dawit G. WeldemariamIDYohana H. Berhe Antibiotic consumption study in two hospitalsin Asmara from 2014 to 2018 using WHO'sdefined daily dose (DDD) methodology PLOS ONE | https://doi.org/10.1371/journal.pone.0233275 July 2, 2020

14- Robin Bruyndonckx, Niel Hens, Marc Aerts, Herman Goossens, Geert Molenberghs, Samuel Coenen antibiotic use in Europe: jointly modelling longitudinal data in defined daily doses and packages Journal of Antimicrobial Chemotherapy, Volume 69, Issue 7, July 2014, Pages 1981–1986, https://doi.org/10.1093/jac/dku063

15- Kuster SP, Ruef C, Ledergerber B, Hintermann A, Deplazes C, Neuber L, Weber R. Quantitative antibiotic use in hospitals: comparison of measurements, literature review, and recommendations for a standard of reporting Infection. 2008 Dec;36(6):549-59. doi: 10.1007/s15010-008-7462-z. Epub 2008 Nov 13.PMID: 19011740

16- C Plüss-Suard , A Pannatier, A Kronenberg, K Mühlemann, G Zanetti Hospital antibiotic consumption in Switzerland: comparison of a multicultural country with Europe J Hosp Infect. 2011 Oct;79(2):166-71. doi: 10.1016/j.jhin.2011.05.028. Epub 2011 Aug 4

17- Veronica Zanichelli , Annelie A Monnier, Inge C Gyssens, Niels Adriaenssens, Ann Versporten , Céline Pulcini, Marion Le Maréchal , Gianpiero Tebano, Vera Vlahovic-Palcevski, Mirjana Stanic Benic, Romina Milanic, Stephan Harbarth, Marlies E Hulscher, Benedikt Huttner Variation in antibiotic use among and within different settings: a systematic review J Antimicrob Chemother 2018 Jun 1;73(suppl_6):vi17-vi29. doi: 10.1093/jac/dky115

18- WHO collaboration center for drug statistics methodology Last updated: 2018-02-07

19- Monnet DL, Molstad S, Cars O: Defined daily doses of antimicrobialsreflect antimicrobial prescriptions in ambulatory care. J Antimicrob Chemother 2004, 53:1109–1111.

20- Vlahovic-Palcevski V, Morovic M, Palcevski G: Antibiotic utilization at the university hospital after introducing an antibiotic policy Pharmacol 2007, 56:97–101

21- Akalin S, Caylak S, Ozen G, Turgut H: Antimicrobial consumption at auniversity hospital in Turkey. African J of Mic Research 2012, 6:4000–4005.