Antibiotics Drug Use Evaluation Among Patients With Kidney Disorder in PKU Muhammadiyah Hospital of Yogyakarta

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ABSTRACTS

Antibiotic that appropriately as used anti-infective has drug a great success in reducing morbidity and mortality rates resulted from various infectious diseases, leading its increasing usage. Antibiotic are generally eliminated through kidney. Patients with kidney disorder, dosage adjustment is recommended for certain antibiotics. This research aims at evaluating the use of antibiotics among patients with kidney disorder in the inpatient wards of PKU Muhammadiyah Hospital Yogyakarta.

Data collection was done retrospectively based on medical record data of inpatients meeting both inclusion and exclusion criteria in PKU Muhammadiyah Hospital Yogyakarta. Data processing was done by using a descriptive analytical technique.

Result of the study shows that there were 76 patients with kidney disorder using antibiotics and meet inclusion and exclusion criteria. In this study patients wasn't shown an indications of infection is aproximately 75,00% (57 patients) and patient with indication infection were 25,00% (19 patients). From those who have an appropriate indication, it is just 21,05% (16 patient) have an appropriate medication, 23,68% (18 patient) is right patient and 22,37% (17 patient) have an appropriate doses. Clinical outcome of those 19 patient is good (14 patient) with inpatient duration less than 7 days for 12 patient. Total 76 patient with renal disorder who received antibiotics, 21,05% (16 patients) have inappropriate doses which is mean there is no doses adjusment according to the creatinine clearance of each patient.

Keywords: Antibiotics, kidney disorders, rational drug, dose

INTRODUCTION

One of the clinical pharmacy activity is the pharmaceutical care which is one of pharmacy professional responsibility focus in patient need (patient oriented). Kidneys are important organs in the regulation of body fluid, electrolyte balance, disposal the metabolism and excretion of drugs from the body. Kidney failure will lead to changes in pharmacokinetics and pharmacodynamics drugs that is excreted through the kidneys [1]. According to Bennett and Swan (1992), accumulation and toxicity can develop rapidly if dosages are not adjusted in patients with impaired renal function [2].

Antibiotics according to its function as anti-infective drugs that are dramatically successful in reducing morbidity and mortality of various infection diseases, so its use is increasing sharply [3]. Rational use of drugs is important, and requires knowledge about the cause of the syndrome are infective, the spectrum of activity antimicrobial, pharmacokinetic principles, contraindications and drug interactions. Besides can cause risk of adverse drug reaction which is should not occur in patients, inappropriate use of antibiotics will increase the burden selection of antibiotics against resistant strains and may delay start of the right therapy [4]. Antibiotics in generally eliminated through the kidneys. In patients with renal failure dosage adjustments are recommended for certain antibiotics, for example: ceftriaxone, sefoperason, penisillin derivatives, aminoglycosides, vancomycin, acyclovir and ganciclovir [5].

The purpose of this study was to determine the accuracy selection of antibiotics in patients with renal impairment and for find out if there are superficial differences of clinical outcome between the appropriate medicine and inappropriate medicine based on criteria appropriate indication, appropriate medication, right patient and proper dosage. In addition this study also determine dose accuracy in the use of antibiotics in patients with renal impairment on PKU Muhammadiyah Hospital of Yogyakarta.

METHODS

This is a non-experimental research with descriptive evaluative analysis and retrospective data

collection. Subjects of this study is kidney failure hospitalized patients at PKU Muhammadiyah Hospital of Yogyakarta which is meet inclusion and exclusion criteria. Peroid of inpatient hospitalized is between January until December 2010. After recording the data from medical records it is need to calculate GFR (glomerular filtration rate) to determine the stage of renal disorders (acute, chronic or terminal). Once the GFR was counted and the stage of patients has known, the data are grouped based on the stage of the level of kidney function.

An evaluation of the accuracy of antibiotics use in patients with renal impairment then conducted. After that evaluation of clinical outcomes of patients appropriate indications based on criteria appropriate indication, appropriate medication, right dose and right patient is performed. It also conducted an evaluation of the accuracy of a given dose of antibiotics based on the existing literature for each stage of renal disorders (acute, chronic or terminal).

RESULT

This is a retrospective study, data taken from medical records of patients with renal impairment who use antibiotics treated in PKU Muhammadiyah Hospital of Yogyakarta in 2010 that has been meet the study inclusion and exclusion criteria. Number of patients acquired during 2010 is 76 patients in accordance with inclusion and exclusion criteria. Summary of patient demographic data are presented in Table 1. Male patient (53,95%) with aged range beetween 51 year old until 60 year old (40,78%) has the largest percentage on the gender and age groups. Hypertensive (73,68%) was the mostly comorbid disease in thus patient.

Tabel 1. Demographic data of patient with renal impairment who taking antibiotics based on PKU Muhammadiyah Hospital medical record on 2010

Criteria	Number of cases	Percentage (%)
Gender		
1. Male	41	53,95
2. Female	35	46,05
Age		
1. 18 – 30 y.o	8	10,53
2. 31 – 40 y.o	10	13,16
3. 41 – 50 y.o	27	35,53
4. 51 – 60 y.o	31	40,79
History of Previous Illness		
1. Hypertension	56	73,68
2. Diabetes Mellitus	1	1,32
3. Hypertension + Diabetes Mellitus	8	10,53
4. Hypertension + Pneumonia	8	10,53
5. Hypertension + Urinary Tract Infection	3	3,95

Data of body temperature and leukocyte count is collected to determine the sign of infection in patient. The result of body temperature and leukocyte count in renal impairment patient hospitalized at PKU Muhammadiyah hospital can be seen at table 2.

Table 2. Patient characteristics data based on temperature and leukocytes in patient with renal impairment who taking antibiotics based on PKU Muhammadiyah Hospital medical record on 2010

Infection Marker	Number of Cases	Percentage (%)
1. Normal temperature + Normal LC	25	32,89
2. Normal temperature + High LC	12	15,79
3. Normal temperature + No examinations of LC	13	17,11
4. High temperature + Normal LC	4	5,26
5. High temperature + High LC	19	25,00
6. High temperature + No examinations of LC	3	3,95
Normal temperature < 37,5^{0}C High temperature > 37,5^{0}C LC : leukocytes count Normal LC < 10.000/µL High LC > 10.000/µL		

Figure 1 shows stage of renal disease on patients who received antibiotics in PKU Muhammadiyah Hospital of Yogyakarta. From the research it is known that 80.3% (61 patients) of patients have stage 5 renal impairment or end stage renal disease conditions
(ESRD). Staging in patients used to determine the dose provided in accordance with the patient's creatinine klirens.

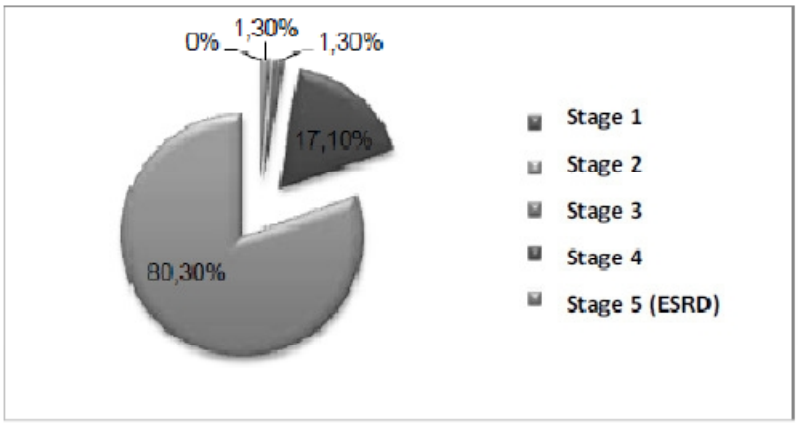

Figure 1. Renal failure stage in patient with renal failure who who received antibiotics in PKU Muhammadiyah Hospital of Yogyakarta

DISCUSSION AND CONCLUSSION

This study aims is to determine the appropriate usage of antibiotics and clinical outcomes in patients renal impairment who experienced infection in PKU Muhammadiyah Hospital of Yogyakarta. In addition this study also to evaluate the accuracy of the dose of antibiotic use in patients with renal impairment in PKU Muhammadiyah Hospital at Yogyakarta who have an infectious disease. Indication of an infection is can be determine with an increase of temperatures above 37.5°C, the numbers of leukocytes more than 10,000 rb / mL and respiration rate more than 20x/minute [6]. Based on table 2 are known markers of patients with fever infection and increased numbers of leukocytes by 25.00% (19 patients) and amounted to 32.89% (25 patients) there was clearly have no indication of the use of antibiotics because there is no increase in body temperature neither increase of leukocytes count. Based on clinical data of patient, medical diagnosed and antibiotics regimen of each patient, the use of antibiotics in renal failure patient can be assessed as follow.

a. The accuracy of Antibiotic Use In Patients Renal Impairment With Infection

The accuracy was evaluated based on the appropriate use of antibiotics indication, the right drug, right patient and appropriate dosage. From this research note only 25.00% (19 patients) who had to give an indication of infection

antibiotic. From Table III it can be seen on the accuracy of drug delivery in patients with renal impairment who have infectious disease.

Table 3. Antibiotics use accuracy in renal impairment patient who have infectious disease on PKU Muhammadiyah Hospital Yogyakarta

Accuracy Parameters	Number of Cases	Percentage (%)
Indication		
1. Appropriate Indication	19	25,00
2. Inappropriate Indication	57	75,00
Medication		
1. Appropriate Medication	16	21,05
2. Inappropriate Medication	3	3,95
Patient		
1. Right Patient	18	23,68
2. Improper Patient	1	1,32
Doses		
1. Appropriate Doses	17	22,37
2. Inappropriate Doses	2	2,63

b. Clinical Outcome of Antibiotics Use in Kidney Disorders Patients With Infection Disease

Table 4 shows the clinical outcome of the use of antibiotics therapy in renal impairment patients with infection during hospitalization at the hospital PKU Muhammadiyah Yogyakarta who have an appropriate indication of antibiotics use. Clinical outcomes are a parameter to determine the effectiveness of antibiotics therapy. Rational therapy parameters should be conclude appropriate indication, appropriate medication, right patient and the appropriate doses (4T). Appropriate antibiotics use is accordance with the criteria appropriate indication, appropriate medication, right patient and the appropriate doses. In appropriate antibiotics use is if the use of antibiotics does not meet one of or all of the criteria appropriate indication, appropriate medication, right patient and the appropriate doses.

Table 4. Clinical outcome of antibiotics use in renal impairment patients with infectious disease on PKU Muhammadiyah Hospital Yogyakarta

Accuracy Evaluation	Account	%	Good	%	Poor	%	Duration	Account	%
1. Appropriate	14	18,42	14	18,42	-	-	<7 days >7 days	12 2	15,79 2,63
2. Inappropriate	5	6,58	4	5,26	1	1,32	<7 days >7 days	2 3	2,63 3,95

Appropriate : accordance with the criteria appropriate indication, appropriate medication, right patient and the appropriate doses

Unappropriate : does not meet one or all of the criteria appropriate indication, appropriate medication, right patient and the appropriate doses

c. Profile and Precision Antibiotic Doses in Patients Kidney Disorders with Infection Disease

Based on the data from medical records of total 76 patients who received antibiotics in patients with renal disorders on PKU RS Muhammadiyah Yogyakarta, the most widely used antibiotics is the class of cephalosporins. The cephalosporins are bactericidal and they act by inhibiting synthesis of the bacterial cell wall. The most widely used system of classification of cephalosporins is by generations and is based on the general features of their antibacterial activity, but may depend to some extent on when they were introduced. Succeeding generations generally have increasing activity against Gram-negative bacteria[7]. The complete profiles of antibiotic use and doses accuracy of antibiotic use in patients with renal impairment can be seen in Table 5. Based on the table, there is 16 patient who have inappropriate doses of antibiotics. In patient with renal disorders, some drug is should be adjusted in doses according to the renal creatinine clearance of each patient because of altered pharmacokinetics of the drug expecially those drug where majority excreted via renal[8]. Inappropriate doses in this research mean the antibiotics doses is not adjusted based on patient creatinine clearance. Uses of antibiotics without adjusted the doses can increasing the toxicity of antibiotics because of it

accumulating doses in body which can give an adverse effect to the patient.

Table 5. Profile and doses accuracy of antibiotics use in patient with renal disorder at PKU Muhammadiyah hospital Yogyakarta

No.	Antibiotics	Dose	Total Patient	Percentage (%)
SINGLE USE OF ANTIBIOTICS				
1.	Cefotaxime	• Appropriate • Inappropriate	23 2	32,89
2.	Ceftriaxone	• Appropriate	13	17,11
3.	Ceftazidime	• Inappropriate	3	3,95
4.	Cefoperazone	• Appropriate	1	1,32
5.	Cefepime	• Inappropriate	1	1,32
6.	Ceftizoxime	• Inappropriate	1	1,32
7.	Amoxicilin	• Appropriate	3	3,95
8.	Meropenem	• Appropriate	2	2,64
9.	Ciprofloxacin	• Appropriate	1	1,32
COMBINATION USE OF ANTIBIOTICS				
1.	Levofloxacin + Amoxicilin	• Appropriate	1	1,32
2.	Cefotaxime + Amoxicilin	• Appropriate	1	1,32
3.	Cefotaxime + Cefixim	• Appropriate • Inappropriate	1 1	1,32 1,32
4.	Ciprofloxacin + Ceftriaxone + Metronodazole	• Appropriate	1	1,32
5.	Ceftriaxone + Metronodazole	• Appropriate	1	1,32
SWITCH THERAPY OF ANTIBIOTICS				
1.	Cefixime (po) → Cefotaxime (iv)	• Inappropriate	2	2,64
2.	Cefixime (po) → Amoxicilin (po)	• Appropriate	1	1,32
3.	Cefotaxime (iv) → Cefadroxil (po)	• Inappropriate	1	1,32
4.	Cefoperazone (iv) → Meropenem (iv)	• Appropriate	2	2,64
5.	Ceftriaxone (iv) → Cefadroxil (po)	• Appropriate	1	1,32
6.	Cefotaxime (iv) → Amoxicilin (po)	• Appropriate	2	2,64
7.	Cefotaxime (iv) → Amoxicilin (po) + Azitromicine (po)	• Inappropriate	2	2,64
8.	Cefotaxime (iv) → Cefixime (po)	• Inappropriate	2	2,64
9.	Ceftriaxone (iv) → Meropenem (iv)	• Appropriate	1	1,32
10.	Amoxicilin (po) → Ceftriaxone (iv)	• Appropriate	1	1,32
11.	Amoxicilin (po) + Cefotaxime (iv) → Meropenem (iv)	• Appropriate	1	1,32
12.	Amoxicilin (po) → Cefotaxome (iv)	• Appropriate	1	1,32
13.	Amoxicilin + Clavulanat → Meropenem	• Appropriate	1	1,32
14.	Cefotaxime (iv) → Ampicilin + Gentamicin	• Inappropriate	1	1,32
TOTAL OF APPROPRIATE DOSES			**60**	**78,95**
TOTAL OF INAPPROPRIATE DOSES			**16**	**21,05**

Antibiotics use in patient with renal disorders is need to concider the effectiveness and safety of each agent. Uses of antibiotics without proper indication can increasing bacterial resistency and patient cost. Antibiotics

use without an adjusment dose can increasing drug toxicity to the patient. From total 76 patient who received antibiotics, only 19 patient who have appropriate indication. Nineteen patient who have appropriate indication, 21,05% (16 patient) have an appropriate medication, 23,68% (18 patient) is right patient and 22,37% (17 patient) have an appropriate doses. Only 14 patient from total 19 patient with appropriate indication have good clinical outcome. It is need to do reassesment to the use of antibiotics in patient with renal disorder. A case control or cohort study can be done to see the effectiveness of antibiotics use in renal impairment hospitalized patient. Clinical outcome of appropriate indication group and inappropriate indication group can be asses with this study so it can be determine which group is really need an antibiotics use.

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