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Research Article

EVALUATION OF DRUG USE FOR RESPIRATORY PROBLEMS IN DEPOK, INDONESIA, BEFORE AND AFTER IMPLEMENTATION OF THE NATIONAL FORMULARY

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ABSTRACT

Objective: The aim of this study was to compare the quantity and quality of drug utilization (DU) in patients with respiratory problems at a hospital in Indonesia before and after the implementation of the national formulary.

Methods: A cross-sectional retrospective study was conducted in 2013 and 2015 at the Depok Hospital in Indonesia. Prescriptions and data from patients were recapitulated, reviewed, and evaluated using the anatomical therapeutical chemical classification/defined daily doses (DDDs) and DU90% methodologies. The results were statistically analyzed and compared before and after implementation of the national formulary.

Results: The quantity of drug use in DDD/1000 inhabitant per day was increased from 0.17 to 0.26 between 2013 and 2015. The quality of drug use was also increased following a decrease in the number of drugs in the DU90% segment. The percentage of drugs that adhered to the national formulary was 88.67%; however, no significant difference was noted before and after the implementation of the national formulary.

Conclusion: The quantity, quality, and adherence of drug use to the national formulary was increased at the Depok city hospital after the implementation of the national formulary.

Keywords: Anatomical therapeutic chemical/defined daily doses, Depok hospital, Drug utilization, National formulary.

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INTRODUCTION

National formulary was first applied as prescribing guidance for national health insurance in 2014 [1]. The national formulary comprises lists of essential drugs specific for health care and is widely used to promote rational pharmacotherapy [1]. Formularies are developed and implemented as management tools in primary health care and hospitals [2].

Respiratory disease is common in Indonesia. On the basis of basic health research report in 2013, the prevalence of respiratory disease in Indonesia is approximately 25%, and infants are the most affected (>35%). The high prevalence, as well as variations of this disease, can affect the pattern of drug use in health facilities. Respiratory diseases can be categorized as rhinitis, sinusitis, pharyngitis, laryngitis, epiglottis, and tonsillitis, based on the region affected; bronchitis, bronchiolitis, and pneumonia occur when the lower parts of the body are affected by the disease [3].

In 1981, the World Health Organization (WHO) recommended the anatomical therapeutic chemical/defined daily doses (ATC/DDDs) method as an international standard for drug utilization (DU) studies. The method was employed to evaluate the use of medicines and to detect any early signals of their irrational use. This method can be combined with the DU 90% method to identify the high use segment of medicine [4].

DU 90% prescribing profiles have been proven valuable in general practice for assessing the overall prescribing quality. DU 90% identifies drugs constituting 90% of the prescribed volume in DDDs and the adherence to the guidelines within this segment. It includes all the different drugs prescribed, and may, therefore, be useful for assessing the quality of drug prescription in hospitals [4,5]. The quality of prescribing drug and adherence to guidelines have been evaluated at different levels (hospital and primary care); a large diversity in the manner in which drugs are selected in the formulary and the methods used to develop and implement the formulary have been reported [2,5-7].

In the current study, we aimed to compare the quantity and quality of DU in patients with respiratory problems at a hospital in Indonesia before and after the implementation of the national formulary.

METHODS

This cross-sectional study was conducted in 2013 and 2015 at the Depok city hospital, in Indonesia. Data of drugs used at the hospital during the years 2013 and 2015 were obtained retrospectively from the pharmacy database. The survey included 11 types of respiratory diseases diagnosed at the hospital. Prescriptions for patients diagnosed with common cold, pharyngitis, tonsillitis, acute respiratory infection, bronchopneumonia, bronchitis, bronchiolitis, rhinitis, sinusitis, asthma, and bronchiectasis were included in this study. Prescriptions, treatment books, and patient data regarding respiratory diseases during the years 2013 and 2015 were reviewed and evaluated. The drugs included in the study were antihistamines, antimycobacterial, corticosteroids, nonsteroidal anti-inflammatory drugs, antipyretics, analgesics, respiratory drugs, medicines for cold and cough, and vitamins.

Data were collected and calculated as DDD/1000 inhabitants/day based on the ATC/DDD guidelines [3]. The total amount for each drug was converted to grams and calculated by multiplying the total number of drugs with the total amount in DDD units. The total amount of each drug in DDD units was calculated by dividing the total amount of drugs in grams by the DDD values of the drugs, as described on the WHO website. DDD is a technical unit based on the assumed average maintenance dose per day for a drug used for its main indication in adults. >1 DDD given to an adult patient per day could be viewed as an indication of overuse, and the data can be used as a signal for irrational use.

Table 1: Prescriptions in 2013 and 2015 at Depok city hospital

Diagnosis	2013	2015
Rhinitis	1269	1761
Bronchitis	1185	1585
Asthma	1054	993
ARTI	775	999
Bronchopneumonia	463	798
Pharyngitis	516	166
Bronchiectasis	296	347
Tonsillitis	49	34
Common cold	21	16
Bronchiolitis	4	0
Sinusitis	3	0
Total prescription	5635	6699

Table 2: Population and drug consumption at Depok city hospital

Information	2013	2015
Population (inhabitant)	716, 188, 400	742, 230, 420
Drug consumption (DDD)	206, 651.30	231, 056.6
Drug consumption (DDD/1000 inhabitant/day)	0.16	0.25

DDD: Defined daily dose

Table 3: Pattern of drug use in 2013 and 2015 at Depok city hospital

No.	ATC/DDD code	Drug	DDD/1000 inhabitants per day	
			2013	2015
1	R03AC02	Salbutamol	0.0707884	0.0917138
2	A11GA01	Vitamin C	0.0160150	0.0010532
3	R06AB02	Chlorpheniramine maleate	0.0135113	0.0023973
4	A11EA	Vitamin B complex	0.0115919	0.0392870
5	B03BA01	Cyanocobalamin	0.0063092	0.0001867
6	H02AB02	Dexamethasone	0.0046626	0.0030404
7	J04AC01	Isoniazid	0.0046417	0.0071698
8	A11DA01	Thiamine	0.0040855	0.0002398
9	R05CB06	Ambroxol	0.0037790	0.0109552
10	R03BA02	Budesonide	0.0033214	0.0024639
11	J01MA02	Ciprofloxacin	0.0032212	0.0021105
12	N02BE01	Paracetamol	0.0029292	0.0026081
13	H02AB04	Methylprednisolone	0.0028320	0.0038155
14	J04AB02	Rifampicin	0.0027357	0.0044885
15	R05CA03	Glyceryl guaiacolate	0.0026734	0.0012063
16	J01DB05	Cefadroxil	0.0020560	0.0014672
17	R06AX13	Loratadine	0.0017118	0.0001751
18	J01DD08	Cefixime	0.0015415	0.0037556
19	J01CR02	Amoxicillin clavulanic	0.0014199	0.0029817
20	J01CA04	Amoxicillin	0.0013778	0.0005841
21	R06AE07	Cetirizine	0.0013711	0.0326516
22	J04AK01	Pyrazinamide	0.0011073	0.0015260
23	A11HA02	Pyridoxine	0.0007112	0.0007270
24	R03DA04	Theophylline	0.0006964	0.0008053
25	M01AG01	Mefenamic acid	0.0006814	0.0006386
26	H02AB07	Prednisone	0.0005383	0.0004945
27	R05DA09	Dextromethorphan	0.0004301	0.0000009
28	M01AB55	Kalium diclofenac	0.0002883	0.0003025
29	M01AB55	Natrium diclofenac	0.0001892	0.0003065
30	H02AB08	Triamcinolone	0.0001676	0.0155183
31	J04AK02	Ethambutol	0.0001414	0.0006967
32	J01FA01	Erythromycin	0.0001292	0.0000384
33	M01AE01	Ibuprofen	0.0001266	0.0000853
34	J01EE01	Cotrimoxazole	0.0001234	0.0000261
35	R05DA04	Codeine	0.0001003	0.0000857
36	J01BA02	Thiamphenicol	0.0000759	0.0000135
37	R01BA52	Pseudoephedrine combination	0.0000742	0.0017585
38	J01FA10	Azithromycin	0.0000698	0.0001055
39	J01MA12	Levofloxacin	0.0000698	0.0000000
40	N02AX02	Tramadol	0.0000163	0.0000106
41	R05CB02	Bromhexine	0.0000056	0.0000539
42	J01BA01	Chloramphenicol	0.0000023	0.0000022
43	R01AD12	Fluticasone furoate	0	0.0158846
44	R03AC04	Fenoterol HBr	0	0.0000898
45	R03AK06	Fluticasone propionate	0	0.0015763
46	R03BA07	Mometasone furoate	0	0.0003772
		Total	0.1683201	0.255475

p=0.865 DDD: Defined daily dose, ATC: Anatomical therapeutic chemical

The DDD/1000 inhabitants/year was calculated by dividing the total consumption in 1 year (DDD units) by the total number of visiting patients during the 1-year period divided by 1000; this can be divided by 365 to calculate the DDD/1000 patients/day. For example, the figure of 10 DDDs/1000 patients/day for amoxicillin (J01CAO4) indicates that 10 out of 1000 patients (or 1%) may have theoretically received a standard dose of amoxicillin (1 g every day).

Data regarding the number of patients and patterns of diseases were obtained from the total number of patients who visited the hospital and the disease report published by the district health office, respectively. Population data were obtained from the census data in 2013 and 2015.

Data on drug use were analyzed using descriptive statistics, and the most used drug segment was identified by the DU 90% method. The drugs were ranked by the volume of DDDs and those drugs accounted for 90% of the total volume, that is, the DU 90%.

SPSS software was used for statistical analyses, with $p<0.05$ considered significant. Non-parametric and parametric tests were performed to compare the quantity and quality of the drugs used. Adherence to prescription in 2015 was used for descriptive analyses.

RESULTS

Prescriptions were collected from patients who were diagnosed with 11 types of respiratory diseases using the International Statistical Classification of Disease and Related Health Problems, 42 and 46 types of drugs were used for the patients in 2013 and 2015, respectively (Tables 1-3). However, the ratios of drug consumption among the respiratory patients in 2013 and 2015 were 0.16 DDD/1000 inhabitants/day and 0.25 DDD/1000 inhabitants/day, respectively ($p>0.05$).

As shown in Table 4, the DU 90% of 14 out of 42 types of drugs and 11 out of 46 drugs were obtained in 2013 and 2015, respectively. Drugs with the highest DU 90% in 2013 were salbutamol (42.06%), Vitamin C (9.51%), and chlorpheniramine maleate (8.03%) and in 2015 were salbutamol (35.90%), Vitamin B complex (15.38%), and cetirizine (12.78%). No significant difference in DU 90% between the 2 years was noted ($p>0.05$).

It was found that the drug adherence of 47 types of drugs (88.67%) and six types of drug in Depok city hospital were not included in national formulary. The drugs that were not included were thiamphenicol, kalium diclofenac, pseudoephedrine, glyceryl guaiacolate, ambroxol, and dextromethorphan.

DISCUSSION

The findings of the present study indicated the presence of variations in prescriptions for different respiratory problems. The formulary is

Table 4: DU 90% segment in Depok city hospital for the years 2013 and 2015

Rank	2013		2015	
	Drug name	%	Drug name	%
1	Salbutamol	42.06	Salbutamol	35.90
2	Vitamin C	9.51	Vitamin B complex	15.38
3	Chlorpheniramine maleate	8.03	Cetirizine	12.78
4	Vitamin B complex	6.89	Fluticasone furoate	6.22
5	Cyanocobalamin	3.75	Triamcinolone	6.07
6	Dexamethasone	2.77	Ambroxol	4.29
7	Isoniazid	2.76	Isoniazid	2.81
8	Thiamine	2.43	Rifampicin	1.76
9	Ambroxol	2.25	Methylprednisolone	1.49
10	Budesonide	1.97	Cefixime	1.47
11	Ciprofloxacin	1.91	Dexamethasone	1.19
12	Paracetamol	1.74		
13	Methylprednisolone	1.68		
14	Rifampicin	1.63		
Total %		89.37		89.36
Total of drugs within DU 90% segment	14		11	
Total number of drugs	42		46	

DU 90%: Drug utilization 90%

used to manage drug use and influence their applications in primary care and hospitals [1]. Depok city hospital is the intermediary health facility with the highest number of visiting patients in Depok city. This study showed that the population, rug consumption, and total number of prescriptions had increased over the years in Depok city (Tables 1 and 2).

Prescriptions for rhinitis were the highest at the hospital. Rhinitis is one of the most common atopic diseases and chronic disorders in childhood [8]. The International Study of Asthma and Allergies in Childhood Phase 3 reported that the prevalence rates of allergic rhinitis in Indonesia in children aged 6–7 years and 13–14 years were 3.6% and 6.4%, respectively [9]. Several studies have evaluated the inflammatory properties of cetirizine in children and adults with allergic rhinitis [10]. In a previous study, children treated with cetirizine (5 mg/day for 4 weeks) demonstrated a significant reduction in inflammatory cell infiltrate [11].

The most highly prescribed drug at the Depok city hospital was salbutamol. Salbutamol is indicated for asthma and other conditions associated with reversible airway obstruction. Patients with severe acute asthma should be given high-flow oxygen (if available) and a short-acting beta 2 agonist through a large-volume spacer or salbutamol nebulizer [12]. Thus, salbutamol is the first line of treatment for asthma and was the most commonly used drug at the hospital in this study.

Fourteen drugs were included in the DU 90% segment in the year 2013 and 11 in 2015, with Vitamin C being the most commonly prescribed drug. The prophylactic use of Vitamin C does not reduce the incidence of common cold but decreases the duration of the illness by 8% [13]. Vitamin B12 was prescribed for respiratory problems and included in the DU 90% segment in the year 2013, in the current study. Vitamin B12 has been shown to maintain respiratory tract infections and decrease morbidity [14]. The corticosteroid dexamethasone was included among the DU 90% drugs used in 2013 and 2015. Corticosteroids have revolutionized the management of certain conditions, such as asthma and croup. In some conditions, such as bronchiolitis or cystic fibrosis, their use is controversial and not routinely recommended [15]. Fluticasone furoate, indicated as a prophylactic drug for allergic rhinitis and asthma, was not included in the DU90% segment in 2013 but was included in 2015 [12].

CONCLUSION

In the present study, DU for respiratory problems was measured by calculating the DDD/1000 inhabitants/days and DU 90% at the Depok city hospital in Indonesia. DDD/1000 inhabitants were found to be increased in 2015, and the quality of drug use was increased after implementation of the national formulary. The number of drugs in the DU 90% segment was decreased from 11 to 14 types of drugs from 2013 to 2015, respectively. The adherence percentage of drugs in 2015 to the national formulary at the Depok city hospital was 88.67%.

CONFLICTS OF INTEREST

All authors have none to declare.

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