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Factors related to rational antibiotic prescriptions in community health centers in Depok City, Indonesia

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Summary Irrational antibiotic prescription is common in developing countries, including in Indonesia. The aims of this study were to evaluate antibiotic prescription patterns and the factors related to the rationale for antibiotic prescriptions in community health centers in Depok City, Indonesia. The study employed a cross-sectional design in eleven primary health centers in Depok City, Indonesia. The sample consisted of 28 physicians and 788 oral antibiotic prescriptions, 392 of which were evaluated for rationality according to local guidelines issued by the Ministry of Health Republic of Indonesia from October to December 2012. Data were analyzed with chi-square tests and logistic regression analysis. The most widely prescribed antibiotics were amoxicillin (73.5%) and co-trimoxazole (17.4%). The most frequent diseases were acute pharyngitis (40.2%) and non-specific respiratory infection (25.4%). Approximately 220 of the 392 prescriptions did not meet the criteria for rational antibiotic prescriptions with regard to antibiotic selection (22.7%), duration of administration (72.3%), frequency of administration (3.2%), or duration and frequency of administration (1.8%). Physicians who had attended training for rational drug use were 2.01 times more rational than physicians who had never attended

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training. Physicians with a short working period (i.e., <7 years) were 3.95 times more rational in prescribing antibiotics than physicians who had been working for longer periods (i.e., >7 years). Most antibiotics were prescribed irrationally. Training for rational drug use and length of practice were factors related to the rationality of antibiotic prescriptions. Suitable interventions are urgently required to encourage the rational prescription of antibiotics in the PHCs.

Introduction

Antibiotics are the most frequently used drugs in health service facilities, and they must be used rationally to provide optimal benefits [1]. The irrational use of antibiotics has negative health consequences, including bacterial antibiotic resistance, treatment inefficiency, increased morbidity and mortality, and increased health care costs [2—4]. However, the rational use of antibiotics remains a significant problem in many countries, especially in developing countries [5—10]. Strategies are needed to effectively address this issue and to avoid the negative consequences of antibiotic misuse. Rational use of medicines requires that ''patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community'' [11].

The rational use of drugs is associated with several factors, including health care workers, patients, patient load and health care facilities [12,13]. Factors associated with increased drug prescription rationality by prescribing health workers include training for rational drugs, years of practice, and educational background [12,14]. The rational prescription of drugs is also associated with the characteristics of health care facilities, including the availability of treatment guidelines and the availability of drugs [12,13].

The prevalence of infectious diseases in Indonesia is high. The results of The National Basic Health Research in 2013 show that between 2007 and 2013 the prevalence of acute respiratory infection increased from 24.0% to 25.0%, pneumonia from 2.1% to 2.7%, and hepatitis from 0.6% to 1.2%. The prevalence of tuberculosis (TB) was unchanged at 0.4%, while diarrhea and malaria decreased from 9.0% to 3.5% and 2.95% to 1.9%, respectively [14]. The most effective approach for improving medicine use in primary care in developing countries involves a combination of health personnel education and supervision, consumer education, and ensuring that there is an adequate supply of appropriate medicines [15]. To prevent irrational prescribing, in 2007, the Indonesian Ministry of Health developed strategies and interventions including a rational drug use course, an essential medicine list, and Standard Treatment Guidelines. The guidelines contain systematically developed statements that include recommendations and information to assist physicians and other health care practitioners to make decisions about appropriate health care for 114 diseases, including 63 infectious diseases [16]. However, adherence to clinical guidelines can be low among low- and middle-income countries [9].

Depok is a city bordering Jakarta, the capital of the Republic of Indonesia, with an area of 200.3 km^2, a population of 1,898,567, and an average population density of 9479 people/km^2 in 2012. It has 11 sub-district primary health centers (PHCs), each of which supervises 1—3 village community health centers (CHC) [17]. Based on disease pattern data, infectious diseases were the most commonly treated outpatient illnesses in these 11 PHCs in 2008. In these health care centers, 46.22% of all prescriptions were for antibiotics, which is high. The rationality of the prescriptions in dose accuracy, choice of drug, and frequency and duration of administration is unknown [18].

However, research evaluating the factors that influence the use of antibiotics by health providers in low-income countries is rare [19]. In the absence of research on prescribing antibiotics in primary health care centers in Depok, it was necessary to conduct a study to evaluate whether antibiotics were prescribed rationally and whether the prescribing patterns varied depending on the characteristics of the prescriber. The present research aimed to analyze the rationality of antibiotic prescriptions and its relationship with prescriber characteristics across all sub-district PHCs in Depok

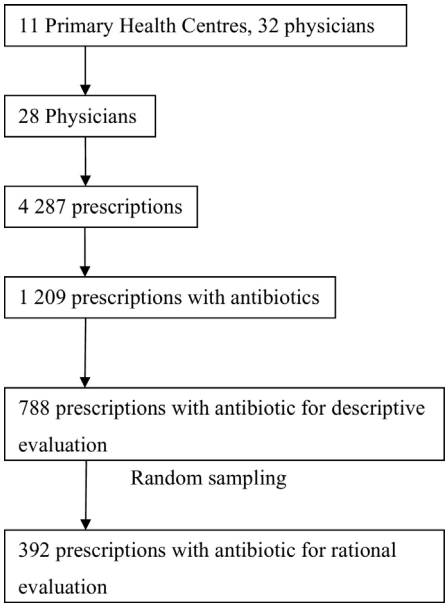

Figure 1 Study flowchart.

City to enable the development of targeted future interventions.

Table 1 Demographic of physicians and patients with antibiotic prescription.

Demographics	Frequency (%)
Physician (*n* = 28)	
Gender	
Male	6 (21.4)
Female	22 (78.6)
Education	
General medicine	27 (96.4)
Postgraduate in medicine	1 (3.6)
Experience	
Short (<7 years)	10 (35.7)
Long (≥7 years)	18 (64.3)
Training of rational drug use	
Had attended	22 (78.6)
Had never attended	6 (21.6)
Patient with antibiotic (*n* = 788)	
Gender	
Male	359 (45.6)
Female	429 (54.4)
Age of patient	
≤5 years	180 (22.8)
6—11 years	108 (13.7)
12—18 years	72 (9.1)
19—60 years	362 (46.0)
>60 years	66 (8.4)

Materials and methods

This cross-sectional study was conducted at all (11) sub-district PHCs' community health centers containing 32 physicians in Depok City, West Java, Indonesia. The sample consisted of those physicians who agreed to participate. Written approval to conduct this study was obtained from the Health Authority of Depok City, and all participants provided written, informed consent.

Total sampling was used to select the physicians. The total number of antibiotic prescriptions between October and December 2012 (a heavy rainy season) was estimated as a single population. A descriptive analysis covered 788 oral antibiotic prescriptions. A target sample size of 392 antibiotic prescriptions was required for rationality analysis. The quantity of prescriptions per physician was calculated based on the proportion of prescriptions and physicians [20]. Simple random sampling was used to obtain sample antibiotic prescriptions from each physician (Fig. 1).

The rationality of the antibiotic prescriptions was evaluated based on the suitability of the antibiotic selection, dose conformity, and duration and frequency of use, as recommended in the treatment guidelines issued by the Ministry of Health of the Republic of Indonesia [16]. For the treatment of diseases not included in these guidelines, other therapeutic guidelines were used [21—26].

Statistical analysis was performed using SPSS version 18 (SPSS Corp, Chicago, IL, USA). A descriptive analysis, including frequencies and percentages, was generated, and chi-squared tests were performed. Logistic regression analysis was used to determine the variables associated with the rationality of antibiotic prescriptions. The level of statistical significance was set at $p < 0.05$.

Results

Descriptive analysis

A total of 28 physicians agreed to participate out of the total population of 32 physicians practicing in the sub-district PHCs. Most of the physicians were women (78.6%), had a general medical education (96.4%), had practiced for >7 years (64.3%), and had attended training on rational drug use (78.6%) (Table 1).

Of the 4287 prescriptions written during the study period, 1209 prescriptions contained antibiotics, of which 788 prescriptions for antibiotics were evaluated. Antibiotics were prescribed for patients aged from <5 years to >60 years. The

Table 2 Antibiotic prescription patterns based on the therapy of diseases.

Type of diseases	Type of antibiotic									Total (%)
	Am	Ce	Ci	Ch	Co	Er	Me	Te	Th	
Abscess, furuncle, and carbuncle	2	0	0	0	1	0	0	0	0	3 (0.4)
Acute otitis media	8	0	0	0	1	0	0	0	0	9 (1.1)
Acute pharyngitis	270	0	12	0	34	1	0	0	0	317 (40.2)
Acute tonsillitis	35	0	0	0	6	1	0	0	0	42 (5.3)
Amebiasis	0	0	0	0	10	0	0	0	0	10 (1.3)
Bacterial conjunctivitis	12	0	0	0	0	0	0	0	0	12 (1.5)
Burn wound	1	0	0	0	0	0	0	0	0	1 (0.1)
Bronchitis	4	1	1	0	0	0	0	0	0	6 (0.8)
Bronchopneumonia	0	1	0	0	0	1	0	0	0	2 (0.3)
Chronic suppurative otitis	2	0	0	0	0	0	0	0	0	2 (0.3)
Common cold	24	0	1	0	4	0	0	0	0	29 (3.7)
Coughs	5	0	0	0	1	0	0	0	0	6 (0.8)
Cystitis	5	0	4	0	3	0	0	0	0	12 (1.5)
Dengue fever	3	1	0	0	0	0	0	0	3	7 (0.9)
Diarrhea	0	1	0	0	23	0	0	5	0	29 (3.7)
Dysentery	0	0	0	0	0	0	3	0	0	3 (0.4)
Dyspepsia	2	0	0	0	1	0	0	0	0	3 (0.4)
Eczema	10	0	0	0	0	0	0	1	0	11 (1.4)
Febris observation	5	0	1	0	6	0	0	0	0	12 (1.5)
Impetigo	11	0	0	0	1	0	0	0	0	12 (1.5)
Mumps	1	0	0	0	0	0	0	0	0	1 (0.1)
Non-specific gastro intestinal infection	1	0	0	0	0	0	0	0	0	1 (0.1)
Non-specific acute respiratory infection	156	0	2	0	42	0	0	0	0	200 (25.4)
Non-specific skin disorders	13	0	1	0	1	0	2	1	0	18 (2.3)
Other signs and symptoms	6	0	0	0	0	0	0	0	0	6 (0.8)
Pneumonia	0	0	1	0	3	0	0	0	0	4 (0.5)
Sinusitis	1	0	0	0	0	0	0	0	0	1 (0.1)
Stomatitis	2	0	0	0	0	0	0	0	0	2 (0.3)
Tuberculosis suspect	0	1	0	0	0	0	0	0	0	1 (0.1)
Typhoid	0	0	2	1	0	0	0	0	23	26 (3.3)
Total (%)	579 (73.5)	5 (0.6)	25 (3.2)	1 (0.1)	137 (17.4)	3 (0.4)	5 (0.6)	7 (0.9)	26 (3.3)	788 (100)

Am — amoxicillin, Ce — cephadroxil, Ci — ciprofloxacin, Ch — chloramphenicol, Co — cotrimoxazole, Er — erythromycin, Me — metronidazole, Te — tetracycline, Th — thiamphenicol.

Table 3 The distribution of the irrationality of antibiotic prescriptions based on the type of disease.

Type of disease	Type of irrationality				
	Antibiotic selection	Duration of administration	Frequency of administration	Duration and frequency	Total (%)
Abscess, furuncle, and carbuncle	2	0	0	0	2 (0.9)
Acute pharyngitis	11	72	0	0	83 (37.7)
Acute otitis media	0	5	0	0	5 (2.3)
Amebiasis	6	0	0	0	6 (2.7)
Bacterial conjunctivitis	9	0	0	0	9 (4.1)
Chronic suppurative otitis media	0	2	0	0	2 (0.9)
Common cold	0	16	0	0	16 (7.3)
Community acquired pneumonia	1	0	0	0	1 (0.5)
Cystitis	2	2	0	0	4 (1.8)
Diarrhea	0	8	0	0	8 (3.6)
Eczema	6	0	0	0	6 (2.7)
Impetigo	9	0	0	0	9 (4.1)
Non specific acute respiratory infection	1	43	0	0	44 (20.0)
Sinusitis	0	1	0	0	1 (0.5)
Stomatitis	0	2	0	0	2 (0.9)
Typhoid	0	1	7	4	12 (5.5)
Tonsillitis	3	7	0	0	10 (4.5)
Total (%)	50 (22.7)	159 (72.3)	7 (3.2)	4 (1.8)	220 (100.0)

largest group of patients was women (54.4%) aged between 19 and 60 years (46.0%) (Table 1).

Of the 70 infectious diseases diagnosed (Table 2), the most common were pharyngitis (40.2%), non-specific acute respiratory infection (25.4%), acute tonsillitis (5.3%), the common cold (3.7%), diarrhea (3.7%) and typhoid (3.3%). Nine antibiotics were prescribed according to availability. The most frequently prescribed were amoxicillin (73.5%), co-trimoxazole (17.4%), and thiamphenicol (3.3%). Amoxicillin and co-trimoxazole were mostly prescribed for acute pharyngitis, nonspecific acute respiratory infections and the common cold. Co-trimoxazole was also prescribed for diarrhea. Thiamphenicol was mostly prescribed for typhoid.

Rational analysis

Out of 788 prescriptions with antibiotics, 392 prescriptions were randomly chosen and evaluated. Approximately 220 of the 392 prescriptions did not meet the criteria for rational antibiotic prescriptions in antibiotic selection (22.7%), duration of administration (72.3%), frequency of administration (3.2%), or duration and frequency of administration (1.8%). Irrational administration and duration of antibiotic treatment occurred most often for pharyngitis, which was the most common infectious problem (Table 3).

Physicians who had attended training on rational drug use were 2.01 times more likely to be rational in the prescription of antibiotics than those who had not completed such training. Physicians with less experience (i.e., <7 years) were 3.95 times more likely to be rational when prescribing antibiotics than those who had worked for longer (i.e., ≥7 years) (Table 4).

Discussion

Because the most common infectious diseases in Indonesia are acute respiratory infections [14], it was not surprising that the most common infections in this study were pharyngitis, non-specific acute respiratory infection, and acute tonsillitis. The results of this study are similar to Munaf's findings in six PHCs in South Sumatra, Indonesia [27], although in the latter study, ampicillin was

Table 4 Multivariate association of characteristic of physicians and the rationality of antibiotic prescriptions in 11 primary health center.

Characteristic of physicians	Rationality of antibiotic prescribing ($n = 172$)	OR	95% CI	p value
Education				
Master of medicine	13 (92.4%)	6.264	0.020—1.273	0.083
General medicine	159 (42.1%)			
Years of service				
Short (<7 years)	91 (65.0%)	3.952	0.158—0.405	0.000
Long (≥7 years)	81 (32.1%)			
Training on rational drug use				
Had attended	142 (46.1%)	2.014	0.286—0.860	0.013
Had never attended	30 (35.7%)			

the most frequently prescribed antibiotic (31% of 1776 prescriptions). This difference may relate to the availability of antibiotics at the centers. In the present study, ampicillin was not available in the health centers, and amoxicillin was not available at the PHCs in Munaf's study. An inappropriate supply of medicine is one of several determinants of irrational antibiotic use [12], and the lack of availability of the indicated antibiotics may limit the ability of prescribers to provide appropriate antimicrobial therapy [19]. That chloramphenicol and thiamphenicol, which have similar indications, were available while ampicillin was not reflects the poor supply in the area of our study.

This study revealed evidence of irrational antibiotic prescribing for diarrhea and the common cold. For both conditions, it is clearly mandated that antibiotics should not be used because most episodes are caused by a virus [16]. In our study, the most frequently prescribed antibiotic for diarrhea was co-trimoxazole (Table 3). A study conducted in India showed that the main antibiotic class that was prescribed for diarrhea was fluoroquinolones [28]. Similar to our findings, a study in Hong Kong reported upper respiratory tract infections to be the most common diagnoses and amino-penicillin to be the most commonly prescribed antibiotic [29].

The findings of the present study highlight the irrational use of antibiotics in Depok City's health centers. As in previous studies, the principles of rational antibiotic prescription were not fully applied by physicians in daily medical practice [3,5—7]. These findings also support the claim that most antibiotic prescriptions in primary health care are irrational [2,4,12,18,28,29]. The determinants of antibiotic prescribing include a lack of knowledge, perceived patient demand, economic incentives, pressure from pharmaceutical promotions, fear of bad clinical outcomes, peer norms and local medical cultures, timely laboratory results and an unstable antibiotic supply [19]. A qualitative study in Spain [30] revealed that the identification of physician attitudes and knowledge related to inappropriate antibiotic prescribing enables the development of specific interventions. A recent systematic review concluded that inadequate knowledge of prescribing is prevalent among physicians, however many physicians were interested in improving their antibiotic prescribing [31].

A major finding of this study was that the duration of antibiotic administration was frequently too short. This observation is in agreement with the published data indicating that medical doctors are most likely to prescribe antibiotics for insufficient periods of time in developing and transitional countries [12]. In Depok City, this behavior may have been influenced by the pooled procurement system for all PHCs, which might have resulted in an insufficient supply of antibiotics. A study in Korea concluded that prescription patterns were more affected by supply factors than by demand factors [32] and that antibiotic choices were guided by the availability of drugs. Lack of prescriber knowledge could be a cause of an inappropriate antibiotic therapy duration [12]. Future studies should be conducted to further determine the possible causes for the irrationally short durations of antibiotic therapy.

Rational drug use training leads to an increased understanding of the considerations associated with prescribing antibiotics. By following these general principles, all physicians are expected to prescribe antimicrobial agents in a responsible manner that benefits both the individual patients and the community [9,12,15]. On average, educational interventions targeting health providers have the largest effect [12]. Moreover, many physicians are interested in improving their antibiotic prescribing [31].

In the present study, physicians with less experience (<7 years) were 3.9 times more likely to be rational when prescribing antibiotics in health centers than those with more experience (≥7 years) in the present study (Table 4). One plausible explanation is that most physicians with more experience were managers of the centers in Depok City and several had not yet received rational drug use training. Furthermore, older physicians may be more exposed to pressure from pharmaceutical companies and patients than younger physicians who have recently completed medical school training. The inappropriate use of antibiotics can be attributed to a number of factors, including physician non-adherence to treatment guidelines, lack of knowledge and training regarding antibiotics, lack of diagnostic facilities, uncertainty over the diagnosis, pressure from the pharmaceutical industry, fear of clinical failure, financial benefits for physicians, and pressure from patients to prescribe antibiotic treatment [29,31].

While we believe this work has important implications for physicians' attitudes toward the rational use of antibiotics, one limitation is that the assessment of rationality was not entirely based on the treatment guidelines issued by the Ministry of Health of the Republic of Indonesia. Moreover, a small number of physicians participated, which may reduce the generalizability of our findings. Our results should be explored in a larger study to better understand the factors that influence prescribing, which will help to determine the correct strategy for improving prescribing patterns.

Conclusion

Most antibiotics were prescribed irrationally in the sub-district PHCs in Depok City, Indonesia. Training for rational drug use and physician experience were factors associated with the rationality of antibiotic prescriptions, suggesting that training for physicians regarding the principles of rational antibiotic prescriptions is very important. Suitable interventions are urgently required to encourage the rational prescription of antibiotics in the PHCs.

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Competing interest

The authors declare that they have no competing interests.

Ethical approval

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References

[1] World Health Organization. Community based surveillance of antimicrobial use and resistance in resource constrained setting. Geneva: World Health Organization; 2009. Available from: http://www.who.int/entity/medicines/publications/community_based_may09.pdf [accessed 28.04.13].
[2] World Health Organization. The world medicine situation. World Health Organization; 2004. Available from: http://www.who.int/medicinedocs/pdf/s6160e/s6160e.pdf [accessed 28.04.13].
[3] Gaash B. Irrational use of antibiotics. Indian J Pract Doc 2008;5(1):25—9.
[4] Otoom S, Culligan K, Al-Assoomi B, Al-Ansari T. Analysis of drug prescriptions in primary health care centres in Bahrain. EMHJ 2010;16(5):511—6.
[5] Hadi M, Duerink DO, Lestari ES, Nagelkerke NJ, Werter S, Keuter M, et al. Survey of antibiotic use of individuals visiting public health care facilities in Indonesia. Int J Infect Dis 2008;12:622—9.
[6] Desalegn AA. Assessment of drug use pattern using WHO prescribing indicators at Hawassa University teaching and referral hospital, south Ethiopia: a cross-sectional study. BMC Health Serv Res 2013;13:170—6.
[7] Dong L, Hong Y, Wang D. Drug prescribing indicators in village health clinics. Fam Pract 2011;28:63—7. Available from: http://fampra.oxfordjournals.org [accessed 09.03.12].
[8] Bhatia R, Narain JP. The grow challenge of antimicrobial resistance in the South-East Asia region. Indian J Med Res 2010;132:482—6.
[9] Holloway K, van Dijk L. The world medicine situation 2011 rational use of medicine. 3rd ed. Geneva: World Health Organization; 2011. Available from: http://www.who.int/medicines/areas/policy/world_medicines_situation/WMS_ch14_wRational.pdf [accessed 28.04.13].
[10] Soulsby EJ. Resistance to antimicrobials in humans and animals. BMJ 2005;331:1219—20.
[11] World Health Organization. Medicines: rational use of medicines. Fact sheet N°338; 2010. Available from: http://www.who.int/mediacentre/factsheets/fs338/en/index.html [accessed 28.04.13].
[12] World Health Organization. Medicines use in primary care in developing and transitional countries: fact book summarizing results from studies between 1990 and 2006. World Health Organization; 2009. p. 2011. Available from: http://apps.who.int/medicinedocs/documents/s16073e/s16073s.pdf [accessed 31.05.11].
[13] Basaran NF, Akici F. Aspects of physicians' attitude towards the rational use of drugs at a training and research hospital: a survey study. Eur J Clin Pharmacol 2013;69:1581—7.
[14] National Institute of Health Research and Development, Ministry of Health Republic of Indonesia. 2013 Indonesia basic health research; 2013. p. 66—74.
[15] Holloway KA. Promoting the rational use of antibiotics. Reg Health Forum 2011;15(1):122—30.
[16] Departemen Kesehatan Republik Indonesia. Pedoman Pengobatan Dasar di Puskesmas. Departemen Kesehatan Republik Indonesia: Jakarta; 2007.

[17] Badan pusat statistik Depok. Kota Depok dalam angka 2012. Badan pusat statistik Depok; 2012.
[18] Sari KCDP. Evaluasi rasionalitas penggunaan obat di seluruh puskesmas kecamatan kota Depok pada tahun 2010 ditinjau dari indikator peresepan menurut World Health Organization (WHO). Depok: Program Studi Farmasi Universitas Indonesia; 2011. Available from: http://lontar.ui.ac.id/file?file=digital/20294954-S1514-Evaluasi%20rasionalitas.pdf [accessed 28.04.13].
[19] Radyowati A, Hilbrand H. Improving antibiotic use in low-income countries: an overview of evidence on determinants. Soc Sci Med 2003;57:733—44.
[20] Lwanga SK, Lameshow. Sample size determination in health studies. A practical manual. WHO; 1991. Available from: http://apps.who.int/iris/bitstream/10665/40062/1/9241544058_%28p1-p22%29.pdf [accessed 28.03.13].
[21] American Academy of Ophthalmology. Conjunctivitis. San Francisco: American Academy of Ophthalmology; 2011. p. 3—20.
[22] Arcalo VP, Peterson AM. Pharmacotherapeutics for advanced practice: a practical approach. 2nd ed. Philadelphia: Lippincott Williams & Wilkins; 2006. p. 164—72.
[23] Cole C, Gazewood J. Diagnosis and treatment of impetigo. Am Fam Phys 2007;75:859—64.
[24] Elston DM. In: Infectious disease of the skin. London: Manson Publishing; 2009. p. 11—2.
[25] Gouws A. Severe atopic dermatitis/eczema. Curr Allergy Clin Immunol 2012;25:140—4.
[26] Leekha S, Terrell CL, Edson RS. General principles of antimicrobial therapy. Mayo Clin Proc 2011;86:156—67.
[27] Munaf S. Antibiotic prescription habit in six primary health centres in South Sumatra. Med J Indones 2005;14:44—9.
[28] Kotwani A, Chaudhury RR, Holloway K. Antibiotic-prescribing practices of primary care prescribers for acute diarrhea in New Delhi, India. Value Health 2012;15:S116—9.
[29] Lam TP, Ho PL, Lam KF, Choi K, Yung R. Use of antibiotics by primary care doctors in Hong Kong; 2009.
[30] Vazquez-Lago JM, Lopez-Vazquez P, Lopez-Duran A, Taracido-Trunk M, Figueiras AS. Attitudes of primary care physicians to the prescribing of antibiotics and antimicrobial resistance: a qualitative study from Spain. Fam Pract 2012;29:352—60.
[31] Rezal RSM, Hassali MA, Alrasheedy AA, Saleem F, Aryani F, Yusof MD, et al. Physicians' knowledge, perceptions and behaviour towards antibiotic prescribing: a systematic review of the literature. Expert Rev Anti Infect Ther 2015:1—16. Downloaded from: informahealthcare on [26.03.15].
[32] Choi K-H, Park S-M, Lee J-H, Kwon S. Factors affecting the prescribing patterns of antibiotics and injections. J Korean Med Sci 2012;27:120—7.