Appropriate Use of Antibiotics in Ranong Province: A Stepwise Approach to Rational Drug Use

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Abstract

Irrational use of antibiotics is a global problem contributing to the development of resistance of microorganisms to standard treatments with increased morbidity and mortality rates. Rational drug use policy and guideline manual have been implemented by the Ministry of Public Health of Thailand since 2017. The objective of this study was to evaluate the impact of the implemented policy on antibiotic prescription, and in addition, the healthcare expenditure on antibiotic usage in the five main hospitals in Ranong Province. Four infectious diseases were focused in the study, *i.e.,* upper respiratory tract infection and acute bronchitis, acute diarrhea, fresh traumatic wound, and antibiotic prophylaxis in vaginal delivery of normal term labor. Relevant information on antibiotics use in the four focused diseases were collected by healthcare personnel from the electronic databases of the five focused hospitals. Multifaceted interventions were implemented to promote appropriate use of antibiotics in all relevant partners. After policy implementation, the average rates of antibiotics prescribed in all of the four target diseases have been continuously decreased from 2016 to 2018. The prescription rates in acute diarrhea and prophylaxis use in vaginal delivery of normal term labor were found to be significantly decreased below the target levels (≤20%). The daily doses (DDDs) of oral antibiotics prescribed in out-patients *per* 1,000 visit *per* day and the daily doses (DDDs) of injectable antibiotics use in in-patients *per* 100 patients-bed day as well as average cost of antibiotics use (per month) were generally decreased continuously. The key factors contributing to successful implementation of appropriate antibiotic use were promotion of awareness and provision of education and training of physicians, healthcare personnel, patients and communities as well as close monitoring and evaluation of the implemented program.

Keyword: Rational Drug Use, Antibiotic

**Office of the Permanent Secretary, Ministry of Public Health*

การสั่งใช้ยาปฏิชีวนะอย่างเหมาะสมในจังหวัดระนอง: ขั้นตอนสู่การสั่งใช้ยาอย่างสมเหตุผล

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บทคัดย่อ

การสั่งใช้ยาปฏิชีวนะที่ไม่เหมาะสมจัดเป็นปัญหาสาธารณสุขที่สำคัญของทุกประเทศ นอกจากจะนำไปสู่การดื้อยาของเชื้อแบคทีเรียแล้วยังทำให้การรักษาทำได้ยากขึ้น ส่งผลให้ผู้ป่วยต้องนอนโรงพยาบาลนานขึ้นหรือเสียชีวิต ปี 2560 กระทรวงสาธารณสุขได้จัดทำคู่มือแนวทางการส่งเสริมการใช้ยาอย่างสมเหตุผลและประกาศใช้ในทุกเขตสุขภาพ การศึกษานี้มีวัตถุประสงค์เพื่อดูผลการดำเนินการส่งเสริมการใช้ยาอย่างสมเหตุผลต่ออัตราการสั่งใช้ยาปฏิชีวนะใน 4 โรค ได้แก่ โรคติดเชื้อที่ระบบการหายใจส่วนบนและหลอดลมอักเสบเฉียบพลัน โรคอุจจาระร่วงเฉียบพลัน บาดแผลสดจากอุบัติเหตุ และการใช้ในหญิงคลอดปกติครบกำหนดทางช่องคลอด ตลอดจนมูลค่าของการสั่งใช้ยาปฏิชีวนะ ของโรงพยาบาล 5 แห่งในจังหวัดระนอง จากการดำเนินการส่งเสริมการสั่งใช้ยาอย่างสมเหตุผลโดยการใช้หลายวิธีร่วมกัน พบว่าอัตราการสั่งใช้ยาปฏิชีวนะใน 4 โรคมีแนวโน้มลดลงในปี 2016 ถึง 2018 โดยอัตราการสั่งใช้ยาปฏิชีวนะในโรคอุจจาระร่วงเฉียบพลันและการใช้ในหญิงคลอดปกติครบกำหนดทางช่องคลอด ลดลงต่ำกว่าเกณฑ์เป้าหมายที่กำหนดที่น้อยกว่าร้อยละ 20 จำนวน DDDs ยาปฏิชีวนะชนิดรับประทานที่สั่งใช้ต่อผู้ป่วยนอก 1000 ครั้งที่ผู้ป่วยมารับบริการต่อวัน และจำนวน DDDs ยาปฏิชีวนะชนิดฉีดต่อ 100 วันที่ผู้ป่วยอยู่ในโรงพยาบาล รวมทั้งมูลค่าการสั่งใช้ยาปฏิชีวนะเฉลี่ยต่อเดือน ลดลงอย่างต่อเนื่อง ปัจจัยแห่งความสำเร็จที่สำคัญในการสั่งใช้ยาปฏิชีวนะอย่างสมเหตุผล ได้แก่ การส่งเสริมสร้างความตระหนัก ร่วมกับการอบรมให้ความรู้แก่แพทย์ บุคลากรทางการแพทย์ ผู้ป่วย ญาติ และชุมชน ตลอดจนการกำกับติดตามและประเมินผลอย่างใกล้ชิด

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INTRODUCTION

Inappropriate use of antibiotics is a global health problem contributing to the development of resistance of bacteria to standard treatments with increased morbidity and mortality rates. The incidence of adverse drug reactions related to antibiotic use is also high, resulting in prolongation of hospitalization and increased cost of treatment. Medicines are used rationally when each individual patient receives treatment with an appropriate drug in an optimal dose for an adequate period of time, and at the lowest affordable cost.[1] The problem of inappropriate use of antibiotics may get worsen in situation where self-medication is common for some infections without prescription or recommendation from physicians, pharmacists, or qualified healthcare workers. In addition, non-therapeutic use of antibiotics as growth promoters in

agriculture may aggravate the situation[2]. Rational use of antibiotics should be based principally on the following key information: correct diagnosis of causative bacteria, site of infection, sensitivity of the bacteria to the antibiotic prescribed, patient's condition and concurrent diseases or medications, adverse drug reactions, and cost of the antibiotic. One of the effective approaches to promote the proper use of antibiotics is through educational intervention programs for all partners involved including patients, physicians, and healthcare workers.[3] In Thailand, inappropriate use of antibiotics has been a national problem for decades. The health authorities have put great efforts to solve or alleviate this problem by implementing "Rational Drug Use (RDU)" policy as the 15th National Health Service Plan since 2017. This rational drug use policy has been implemented under the National Strategic Plan of Development Drug System 2017-2021. The "Manual of Rational Drug Use" has been published by the Ministry of Public Health and used as an operational guideline for rational drug use in all hospitals throughout the country.

Ranong is one of the provinces located in the southern region of Thailand which is under the governance of the 11th Health Region. Rational drug use policy and the antimicrobial resistance management plan have been prioritized as the main policy in all of the five principal hospitals in Ranong Province to provide high quality services, and to reduce risk of drug resistance and adverse drug reactions as well as the cost of medical treatment. The objective of this study was to evaluate the impact of the implemented policy on antibiotic prescription, and in addition, the healthcare expenditure on antibiotic usage. The information obtained could be applied to develop the management system of rational drug use which would minimize the risk of development and spread of antibiotic resistance.

MATERIALS AND METHODS

This study was a retrospective descriptive study conducted in Ranong Province in 2016 (before policy implementation), 2017, and 2018 (until June). Ethical approval of the study protocol was obtained from the Ethical Review Committee, Ranong Provincial Public Health Office. Based on the Manual of Rational Drug Use, rational use of antibiotics focuses on four diseases, i.e., upper respiratory tract infection and acute bronchitis, acute diarrhea, fresh traumatic wound, and antibiotic prophylaxis in vaginal delivery of normal term labor. Since the implementation of the rational drug use policy, the Ranong Provincial Public Health Office has implemented various interventions to promote appropriate use of antibiotics to all relevant partners. These included provision of education and training for the physicians, health personnel, patients and communities, establishment of information system to support rational drug prescription, and implementation of effective monitoring

and follow-up system. The information system was developed to alert ("pop-up" warning") the physicians for careful consideration of only necessary prescription and with optimal doses of antibiotics for the focused diseases. The labels of antibiotics were revised to improve patient's perception about rational antibiotic uses for the four focused diseases. Health literacy through educational brochures or posters involving the appropriate use of antibiotics were produced and distributed to all healthcare personnel and patients. Awareness campaigns were regularly held both in the hospitals and the communities to provide the clear understanding about the four focused diseases and proper treatment with antibiotics when necessary. The campaigns for using evidenced based herbal medicines instead of antibiotics were promoted. Examples included the use of *Andrographis paniculata* for upper respiratory tract infection and "ya-luang-pid-samut" for acute diarrhea.

Relevant information on antibiotics use in the four focused diseases were collected by healthcare personnel from the electronic databases of all the five main hospitals of Ranong Province, *i.e.,* Muang Ranong Provincial Hospital (300 beds), Kapoe District Hospital (30 beds), Kra Buri District Hospital (30 beds), La-un District Hospital (30 beds), and Suk Samran District Hospitals (10 beds). Feedback responses or comments from patients and relevant partners of irrational prescription were also analyzed. The prescription rate of antibiotic use in each focused disease (defined as percentage of patients who received antibiotics in each focused disease) was determined. The target levels of the rates of antibiotics prescribed in upper respiratory tract infection and acute bronchitis, acute diarrhea, fresh traumatic wound, and antibiotic prophylaxis in vaginal delivery of normal term labor are not greater than 20%, 20%, 40% and 10%, respectively. Total amount of antibiotics use (expressed as daily dose of the prescribed antibiotics). The daily dose (DDD) is defined by the World Health Organization as the average maintenance dose per day of a drug used for its main indication in adults[4]. Information on the amount and cost of antibiotics use were also collected. Descriptive statistics (number of cases and percentage) was used for data summarization.

RESULTS

The average percentages of antibiotics prescribed in all of the four target diseases have been continuously decreased from 2016 to 2018 (Figure 1). The prescription rates were however, significantly declined below the target levels only in acute diarrhea and prophylaxis use in vaginal delivery of normal term labor. For upper respiratory tract infection and acute bronchitis, the average prescription rates of antibiotics prescribed in 2016, 2017, and 2018 were 38.37%, 32.23%, and 22.80%, respectively. The corresponding rates for acute diarrhea were 35.38%, 26.59%,

and 16.98%, respectively. For fresh traumatic wound, the average prescription rates of antibiotics prescribed in 2016, 2017, and 2018 were 54.62%, 54.03%, and 46.01%, respectively. The corresponding rates for antibiotics prescribed for prophylaxis in vaginal delivery of normal term labor were 12.85%, 5.73%, and 3.19%, respectively. The oral antibiotics prescribed in out-patients per 1,000 visit per day was decreased from 2.20 DDDs in 2016 to 1.78 DDDs in 2017, but was slightly increased to 1.83 DDDs in 2018 (Figure 2A). Likewise, the DDD of injectable antibiotics in in-patients per 100 patients-bed day was decreased from 60.00 DDDs in 2016 to 57.92 DDDs in 2017, but was slightly increased to 61.38 DDDs in 2018 (Figure 2B). The cost of antibiotics per month in 2016, 2017, and 2018 were 264,947.80, 280,074.80, 189,512.09 Baht, respectively. (Figure 2C).

DISCUSSION

Inappropriate use of antibiotics can lead to the development and spread of resistance of microorganisms to drugs. The situation remains the major public health problem with respect to the increase in number and incidence of disease morbidity and mortality, and limitation of effective and selective antibiotics for particular infections. Awareness of unnecessary or improper use of antibiotics as well as self-medications and non-therapeutic uses of antibiotics should be promoted. Several risk factors have been reported to be associated with irrational use of antibiotics and drug resistance development. These include unnecessary consumption of antibiotics for common cold and fever, lack of knowledge on accurate dose and frequency, and poor patients' compliance to antibiotic therapy.[5] Based on the World Health Organization's report, multifaceted interventions through educational and managerial interventions have been shown to be effective in improving rational antibiotic use in Southeast Asia by 20%-30%[6].

In Thailand, antibiotics are available in community and retail drug stores without prescription. Self-medication without proper knowledge and unregulated access to drugs are the two main reasons for inappropriate use of antibiotics. The policy on rational antibiotic use needs to be translated into practice with simple communication approach among different target groups including physicians, health personnel, patients, and communities. Attempt to support patients' demand, lack of proper knowledge and training on rational antibiotic use constitute the key factors for inappropriate use of antibiotics in physicians and healthcare personnel. Therefore, multifaceted interventions, *e.g.,* establishment and capacity strengthening of Pharmaceutical and Therapeutic Committee (PTC), supporting of effective coordination of program implementation, and monitoring of antibiotic use, are required to improve prescription behaviors of the healthcare personnel[7]. Results of a systematic analysis

showed that combination of effective persuasion approach and provision of information and education of patients and communities are the key strategies to achieve sustainable rational use of antibiotics[8].

In the present study, various interventions were implemented to promote rational antibiotic use in the four focused diseases in Ranong province. Physicians were the focus group training with attempts to convince them to avoid unnecessary uses of antibiotics particularly for the treatment of four infectious diseases of concern. With the implementation of these strategic interventions, the prescription of unnecessary antibiotics by the physicians was minimized. All the interventions applied were closely monitored and evaluated by the 11th Health Region Inspector General, Ministry of Public Health. After the two-year policy operation, the antibiotic prescription rates (average percentages of antibiotics prescribed) in acute diarrhea and for prophylaxis in vaginal delivery of normal term labor were below the target values. Although, the prescription rates in fresh traumatic wound and upper respiratory tract infection and acute bronchitis remained higher than the target levels, a trend of continuous decline was observed. The results of the current study confirm that the effectiveness of an intervention on rational antibiotic use depends on the prescribing behavior of the physicians and the awareness and strong intention of health personnel and community in implementing the policy strategies to improve rational antibiotic uses[9]. Information on previous performance on antibiotic prescription assisted healthcare personnel in realizing the necessity of practice change on the antibiotic use. The patients and their relatives received educational materials prior to physicians' visit and therefore their demands of antibiotic prescription was decreased. Results of a study which integrated multifaceted interventions show that antibiotic prescription rates were markedly decreased from 74% to 13% in upper respiratory tract infection and 78% to 19.1% in acute diarrhea without harmful consequences in patients who did not receive treatment with antibiotics[10]. The adherence to clinical practice guideline recommendations for antibiotic prophylaxis in adults with fresh traumatic wounds would also be expected to reduce unnecessary antibiotic prescription without increasing the rate of wound infection[11]. The Cochrane review on routine antibiotic prophylaxis after normal vaginal birth for reducing maternal infectious morbidity revealed that antibiotics are not a substitute for infection prevention and control measures around the time of childbirth and the postpartum period. The decision to routinely administer prophylactic antibiotics after normal vaginal births needs to be balanced by patient features, childbirth setting, and provider experience[12]. Moreover, the amount and cost of antibiotic uses should be considered. In the present study, a trend of decreasing of the amount of oral antibiotics use (DDD/1,000

OPD visit/day) was found after implementation of the policy. On the other hand, the amount of injectable antibiotics use (DDD/100 patients-bed day) remained unchanged. The cost of total antibiotics spent *per* month was reduced by 28% from 2016 to 2018.

In conclusion, based on the results of the study, the key factors which contribute to successful implementation of appropriate antibiotic use in all of the five district hospitals of Ranong Province are promotion of awareness and provision of education and training of physicians, healthcare personnel, patients and communities as well as close monitoring and evaluation of the implemented program. Similar strategic program can be applied to establish the management system of appropriate antibiotic use in other provinces in the 11th Health Region or other health regions. These multifaceted interventions could also be integrated into the program to promote the appropriate antibiotic use in other private settings including clinics and local drugstores in order to offer continuous improvement in rational antibiotic use in Thailand.

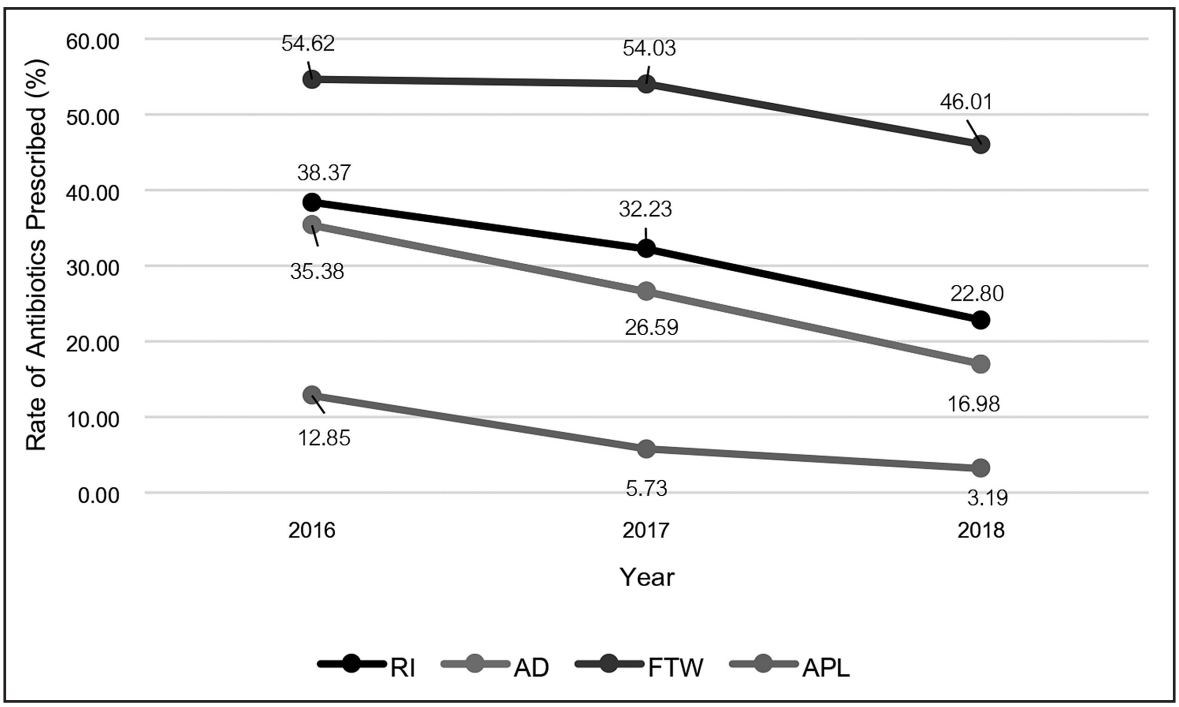

Figure 1 Rates (%) of antibiotic prescription in the four focused diseases, *i.e.,* upper respiratory tract infection and acute bronchitis (RI), acute diarrhea (AD), fresh traumatic wound (FTW), and antibiotic prophylaxis in vaginal delivery of normal term labor (APL). The target level of the percentages of antibiotics prescribed in URT, AD, FTW, and APL are ≤20%, ≤20%, ≤40% and ≤10%, respectively.

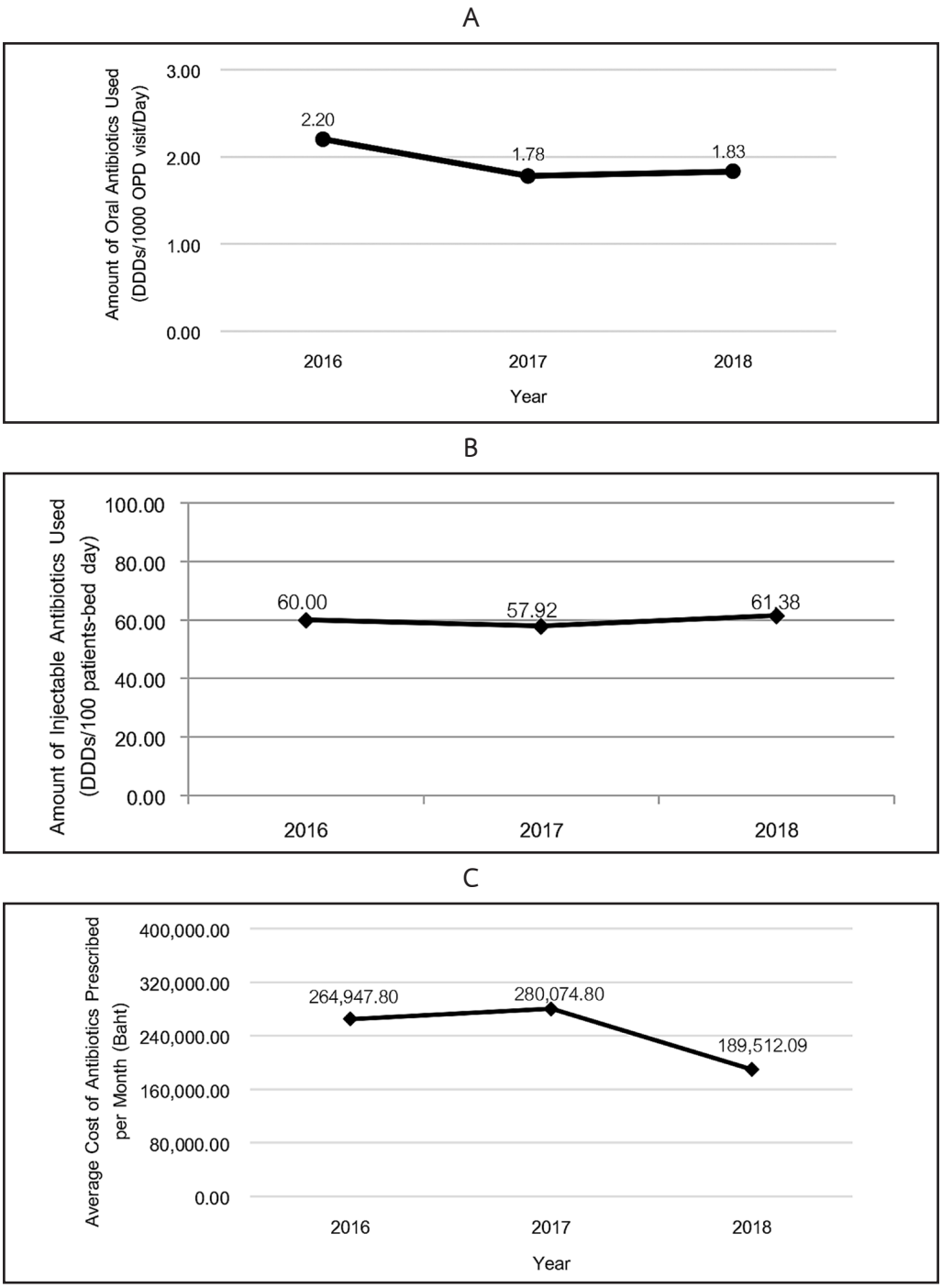

Figure 2 Amounts of (A) oral and (B) injectable antibiotics used and (C) total cost of antibiotic spent in 2016, 2017, and 2018 for the four focused diseases, *i.e.,* upper respiratory tract infection and acute bronchitis, acute diarrhea, fresh traumatic wound, and antibiotic prophylaxis in vaginal delivery of normal term labor.

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