Original Article

# ANTIBIOTIC USE AT PRIMARY HEALTHCARE CENTERS IN SURABAYA: A SURVEILLANCE STUDY

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## ABSTRACT

**Objective:** Antibiotics are considered to be overprescribed in primary health care centers. This study aimed to investigate the defined daily dose (DDD) of antibiotics per 1000 patients visit in a year in primary health care centers, the prevalence of upper respiratory infections (URI) and diarrhea, the percentage of antibiotic prescription for URI and diarrhea in Surabaya.

**Methods:** A surveillance study of antibiotic use was done from the reports and use of drug demand sheet, which called laporan pemakaian dan lembar permintaan obat (LPLPO), outpatient medication card, and health care information and management system of primary health care center, which called sistem informasi manajemen manajemen puskesmas (SIMPUS) in Surabaya. DDD/1000 patients were calculated for describing the antibiotics usage level in each primary health care centers. Three primary health care centers selected based on its antibiotic use or its population density to recognize its antibiotic prescribing percentage for non-pneumonia respiratory tract infection and nonspecific diarrhea.

**Results:** The DDD antibiotic systemic per 1000 patients visit primary health care centers in Surabaya is relatively low. The results found higher prevalence URI does not correlate to the frequent antibiotic prescribed. The prevalence of URI at one primary healthcare center (25% cases) was less than at the other (44%), but the percentage of antibiotic prescription and the total antibiotic usage were higher (73%; 1006 DDD/1000 patients vs. 21%; 675 DDD/1000 patients). The prevalence of diarrhea at primary health care center 2 (2,84%) was less than at primary health care center 1 (4,95%), but the percentage antibiotic prescription and the total antibiotic usage were higher (43%; 1006 DDD/1000 patients vs 18%; 675 DDD/1000 patients).

**Conclusion:** The antibiotic usage at primary healthcare centers in Surabaya was shown to vary widely. Eighty-seven percent (55/63) primary health care centers antibiotic usage was less than 4 DDD/1000 patients day, only two primary health care centers antibiotic usage 6 DDD/1000 patients day. Further research to investigate antibiotic usage and the differences in usage between primary health care centers in treating URI is required.

**Keywords:** Antibiotic, Primary health care, Defined daily dose (DDD)/1000 patients

## INTRODUCTION

Usage of antibiotic in a lot of countries has increased continuously in the last decade especially in primary cares. The antibiotic is overuse, inappropriate use of antibiotic in both quantity and drug choice, i.e. antibiotic prescribed rate in some countries are more than 80%, sometimes contained more than two antibiotics and the percentage of cephalosporin use more than the percentage of penicillins [1]. At primary health care, antibiotic usually indicated for upper respiratory and gastrointestinal infections [1-3] which are often overuse and injudicious. Upper respiratory infection (URI) and diarrhea are an infection which is mostly caused by viral infections and not recommended to be treated with antibiotics without a positive microbial test [4, 5]. The inappropriate use of antibiotics can lead to antimicrobial resistance. If antibiotics become ineffective, this disease will lead to increase morbidity, healthcare expenditure, and eventually premature mortality [6].

To evaluate the level of antibiotics usage in primary health care, World Health Organization has devised a measurement unit which named defined daily dose (DDD) [7, 8]. This standard unit can be used to compare drug exposure across health facilities; assigned by WHO and linked to ATC system, readily available, inexpensive, and easy to use [9]. We, therefore, conducted a surveillance study about DDD antibiotic per 1000 patients visit the primary health care centers; the prevalence and the percentage of antibiotics prescription of URI and diarrhea in three primary health care centers in surabaya.

## MATERIALS AND METHODS

The study was conducted in the year 2014. The research object were all 62 primary health care centers in surabaya, particularly three primary health care centers which named bulak banteng (Blk),

pegirian (Pg), and gading (Gd) primary health care center. The three primary health care center was chosen based on its antibiotic usage and population density at 2013. The rate of antibiotic use in the bulak banteng primary health care center is low and in Pegirian is high. Gading primary health care center was located at the most densely populated area. This research has permission from the health department of surabaya. To calculate the percentage of antibiotics prescription in the patient with URI and diarrhea at 2014, data were collected from outpatient medication card which includes patient's name, diagnosis, and treatment received. DDD antibiotic systemic per 1000 patients visit and percentage were calculated. The prevalence of URI and diarrhea cases were obtained from primary health care's information and management system, which called sistem informasi manajemen puskesmas (SIMPUS).

To calculate the DDD/1000 patient days, data were collected from the reports and use of drug demand sheet which include the list of health care's drugs used and the number of drugs used through 2014. DDD/1000 patient days were calculated with the formula below [7-9]:

$$\{(\text{Total antibiotics in a year [gram]}/\text{WHO's DDD [gram]})/\text{total patient visit in a year}\} \times 1000$$

A searchable version of the complete ATC index with DDDs is available online [8].

## RESULTS

The results found the usage of antibiotic in all 62 primary health care centers in Surabaya varied widely. In 2013 the DDD/1000 patients of 62 primary health care centers were ranged from 247.17 DDD/1000 patients (0.68 DDD/patients day) for Gading primary

health care until 2175.16 DDD/1000 (5.96 DDD/patients day) patients for Lontar primary health care. Between the five districts of Surabaya, Center Surabaya had the highest DDD/1000 patients with 969.59 DDD/1000 patients (2.7 DDD/1000 patients a day) and East Surabaya was the lowest with 681.09 DDD/1000 patients (1.9 DDD/1000 patients day). Eighty-seventh percent (55/63) primary health care centers antibiotic usage are less than 1500DDD/1000 patients (4 DDD/1000 patient visit per day. In 2014, URI was the

disease with the highest number of the case in the all three primary health care centers. URI cases in Blk primary health care were 8072 cases, while in Pegirian (Pg) were 5188 cases and in Gading (Gd) were 525 cases. primary health care with the highest URI prevalence was Bulak Banteng (Blk) with 44.35% and followed by Pegirian (Pg) with 25.57% and Gading (Gd) with 2.16%. The percentage of antibiotic prescription in URI patient was highest in Pg primary health care with 73%, followed by Blk with 21% and Gd with 12%.

**Table 1: The DDD/1000 patients in five districts of surabaya**

| No. | Primary healthcare | DDD/1000 patients | Total patient visit in a year |
|---|---|---|---|
| **South surabaya** | | | |
| | Total | 696.65 | 671744 |
| 1. | Pk | 1615.17 | 3231 |
| 2. | Sd | 1465.90 | 28528 |
| 3. | Kd | 1299.57 | 53354 |
| 4. | Sw | 1188.47 | 27162 |
| 5. | Pt | 1149.79 | 50368 |
| 6. | Jg | 1072.47 | 50039 |
| 7. | Dk | 925.24 | 34168 |
| 8. | Wy | 825.15 | 46142 |
| 9. | Wn | 799.06 | 33580 |
| 10. | Jm | 757.06 | 37438 |
| 11. | Gy | 751.78 | 44557 |
| 12. | Kb | 738.85 | 52498 |
| 13. | Swh | 544.52 | 48182 |
| 14. | Ng | 398.61 | 62236 |
| 15. | Bn | 390.33 | 38897 |
| 16. | Gn | 283.09 | 32281 |
| **North surabaya** | | | |
| | Total | 778.46 | 493211 |
| 1. | Tm | 1560.59 | 12803 |
| 2. | Pg | 1237.82 | 62279 |
| 3. | KrS | 1214.61 | 40585 |
| 4. | Kl | 1125.55 | 27079 |
| 5. | Wns | 1087.95 | 39977 |
| 6. | Pr | 1065.20 | 53971 |
| 7. | Kn | 1023.59 | 35687 |
| 8. | Sdt | 756.65 | 19392 |
| 9. | Tnh | 728.58 | 54628 |
| 10. | Mr | 697.47 | 25988 |
| 11. | SdW | 640.28 | 48036 |
| 12. | Bl | 623.15 | 19513 |
| 13. | Dp | 482.07 | 53273 |
| No. | Primary healthcare | DDD/1000 patients | Total Patient visit in a year |
| **East surabaya** | | | |
| | Total | 681.10 | 454285 |
| 1. | Tng | 1586.29 | 42367 |
| 2. | Mly | 1300.72 | 32929 |
| 3. | Kpt | 1211.74 | 20109 |
| 4. | Mnr | 1190.35 | 24667 |
| 5. | Mj | 981.52 | 42670 |
| 6. | Rn | 922.14 | 35259 |
| 7. | Pc | 877.80 | 40262 |
| 8. | KlN | 725.95 | 27401 |
| 9. | Pc | 607.17 | 32813 |
| 10. | Mdk | 517.32 | 31027 |
| 11. | Klr | 333.77 | 48477 |
| 12. | Gd | 247.17 | 76304 |
| **West surabaya** | | | |
| | Total | 753.13 | 412105 |
| 1. | Ln | 2175.16 | 20220 |
| 2. | Bn | 1523.11 | 11181 |
| 3. | Tnj | 1229.03 | 25299 |
| 4. | Sm | 1185.19 | 54203 |
| 5. | Smm | 1149.25 | 38733 |
| 6. | As | 1132.58 | 41913 |
| 7. | Blk | 1043.90 | 13024 |
| 8. | MnK | 988.75 | 63488 |
| 9. | Md | 912.34 | 19012 |
| 10. | Bnw | 875.94 | 28427 |
| 11. | LdK | 692.92 | 31790 |

| 12. | Jr | 615.11 | 25561 |
|---|---|---|---|
| 13. | Bls | 510.31 | 39254 |
| **Center surabaya** | | | |
| | Total | 969.60 | 276360 |
| 1. | Gn | 2155.90 | 19164 |
| 2. | DrS | 1491.09 | 15314 |
| 3. | Kdn | 1315.53 | 45533 |
| 4. | Tbd | 1173.68 | 36917 |
| 5. | Ktb | 1128.46 | 44837 |
| 6. | Pnl | 939.85 | 42677 |
| 7. | Smw | 914.32 | 30199 |
| 8. | Tbr | 768.91 | 41719 |
| **Total DDD/1000 patients surabaya 2013** | | **753.84** | **2307705** |

**Table 2: The comparison of DDD/1000 patients day**

| Variabel | South | North | East | West | Center | Total |
|---|---|---|---|---|---|---|
| n | 16 | 13 | 12 | 13 | 8 | 62 |
| Minimum | 0.8 | 1.3 | 0.7 | 1.4 | 2.1 | 0.7 |
| Maksimum | 4.4 | 4.3 | 4.3 | 6.0 | 5.9 | 6.0 |
| Average | 2.4 | 2.6 | 2.4 | 3.0 | 3.4 | 2.7 |
| Quartile 1 | 1.9 | 1.9 | 1.6 | 2.4 | 2.6 | 2.0 |
| Quartile 2 | 2.2 | 2.8 | 2.5 | 2.9 | 3.2 | 2.6 |
| Quartile 3 | 3.2 | 3.1 | 3.3 | 3.2 | 3.7 | 3.3 |

**Table 3: The comparation of the antibiotic use and URI prevalence**

| Primary healthcare | URI cases | URI prevalence | Percentage of antibiotic prescription | DDD antibiotics/1000 patients visit |
|---|---|---|---|---|
| 1 | 8072 | 44.35% | 21% | 675.73 |
| 2 | 5188 | 25.57% | 73% | 1006.02 |
| 3 | 525 | 2.16% | 12% | 191.50 |

**Table 4: The comparation of the antibiotic use and the diarrhea prevalence**

| Primary healthcare | Diarrhea cases | Diarrhea prevalence | Percentage of Antibiotic prescription | DDD antibiotics/1000 patients visit |
|---|---|---|---|---|
| 1 | 1217 | 4.95% | 18% | 675.73 |
| 2 | 70000 | 2.84% | 43% | 1006.02 |
| 3 | 108 | 1.13% | 27.78% | 191.50 |

## DISCUSSION

Antibiotic use in primary health care centers in Surabaya, which divided by five districts, is 2.07 DDD/1000 patients visit per day. The uses are relatively low compared with antibiotic consumption in ambulatory care patients in British Columbia 1997-2000 (18 DDD/1000 inhabitant-days) or Armenia 2011 (15.3 DDD/1000 inhabitants per day) [10, 11]. In the community, the prevalence of respiratory infection and the percentage of visits in which antibiotics were prescribed, are high [12]. In 2014, higher prevalence URI did not correlate to frequent antibiotic prescribed. Blk was the primary health care with the highest number of URI case and prevalence (8072 cases; 44.35%), but the percentage of antibiotics prescription (21%) and the DDD/1000 patients (675.73) was lower than Pg's (73%; 1006.02). URI is mostly caused by the virus such as adenoviruses, coronaviruses, adenoviruses, enteroviruses, and influenza viruses. The prevalence of URI which caused by bacteria is not more than 10% and need a throat culture before prescribing an antibiotic [13]. As well as URI, diarrhea should not be treated with an antibiotic but oral rehydration [14]. Therefore those percentage of antibiotic prescription in URI and diarrhea patients reflect an overuse of antibiotic in those all three primary health care centers.

## LIMITATION

The DDD antibiotics calculate based on the reports and use of drug demand sheet, which called Laporan Pemakaian dan Lembar Permintaan Obat (LPLPO) for patients visiting the primary health care center. In a district, patients can have antibiotics not only from the primary health care center but also from the pharmacy between or across the district. Therefore, it is difficult to know antibiotic use by inhabitant in the district.

## CONCLUSION

The antibiotic usage at primary healthcare centers in Surabaya varied widely. The average percentage use of antibiotics for respiratory tract infection non-pneumonia and diarrhea in some primary health care centers in Surabaya is higher than its national indicator, i.e. 20% and 8% respectively. Further research to investigate antibiotic indication and the level of URI and diarrhea severity between primary health care centers are required.

## CONFLICTS OF INTERESTS

We wish to confirm that there are no known conflicts of interest associated with the publication and there has been no significant financial support for this work that could have influenced its outcome.

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