

## Conference Paper

# Application of the ATC/DDD Method to Evaluate Captopril and Nifedipine Usage in Bluluk-Lamongan Regency Healthcare Service

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**Abstract.**

Hypertension occurs when the systolic blood pressure is more than 140 mmHg and the diastolic is more than 90 mmHg. Hypertension might cause damage to the body's organs directly or indirectly. This study aimed to analyze the use of the drugs Captopril and Nifedipin at the Bluluk Health Center, Bluluk District, Lamongan using the ATC/DDD method. This was an observational study with a retrospective descriptive design. Data collection was carried out using quantitative methods, more specifically the ATC/DDD method. The results of DDD/1000 inhabitants/day of the drug Nifedipine 10 mg in 2020 were highest in January, namely 0.98 mg, and the lowest was 0.17 mg in October with an average of 0.46 mg. For DDD/1000 inhabitants/day, the drug Captopril 12.5 mg in 2020, the highest in January was 3.6 mg and the lowest in May was 0.4 mg with an average of 1.6 mg. For DDD/1000 inhabitants/day, the drug Captopril 25 mg in 2020 was the highest in August at 7.6 mg and the lowest in April was 1.2 mg with an average of 3.7 mg. The DDD value of Nifedipine 10 mg was less than the World Health Organization value of DDD Nifedipine, which is 30 mg. The DDD value of Captopril (12.5 mg and 25 mg) was also less than the World Health Organization DDD of 50 mg, so it can be concluded that the use of Nifedipine 10 mg and Captopril (12.5 mg and 25 mg) is still controlled.

**Keywords:** Captopril, Nifedipine, ATC/DDD, hypertension, healthcare service

## 1. INTRODUCTION

Hypertension is one of the many diseases that are a challenge for Indonesia because the prevalence from year to year increases. Hypertension or commonly referred to as high blood pressure is a condition where there is an increase in systolic blood pressure of more than 120 mmHg and a diastolic pressure of more than 90 mmHg. Blood pressure measurements should be taken twice with a 5-minute interval in a calm or not panicked state. Blood pressure does not cause and is controlled, and it will cause some damage

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to body organs such as (coronary disease), brain (stroke in men), kidneys; therefore, hypertension must be detected early so as not to cause organ damage [1]. Usually, hypertension occurs in the age group 31-44 years (31.6%), age 45-54 years (45.3%), age 55-64 years (55.2%); this is because physiologically increasing a person's age is getting worse. The risk of suffering from hypertension is also high (Ministry of Health, 2019). There is a comparison of the proportion of people with hypertension between men and women. The percentage is 31.34% for men, while women have a higher ratio of 36.85% [2].

The 2018 Riskesdes show that South Kalimantan Province has the highest prevalence of hypertension in Indonesia at 44.13%. The second highest is West Java Province at 39.6%, then East Kalimantan Province at 39.3%. For East Java Province, the percentage of hypertension is 36.32%, ranking sixth. Overall, hypertension in Indonesia has increased since 2007. The proportion of people with hypertension is more common in urban areas than in rural areas. In 2013 research was conducted in an area, getting the percentage results in urban areas of 26.1% and for rural areas of 25.5% and continued to increase in 2018 to 34.4% and 33.7% [2].

Many ways are used to prevent hypertension, including starting a healthy life, such as diligently exercising, maintaining a nutritious diet, thinking positively to avoid being easily stressed, and using drugs. Antihypertensive drugs have become a necessity to control the blood pressure of people with hypertension. The choice of antihypertensive drugs also varies depending on hypertension suffered by the patient. There are several classes of drugs that are mostly consumed or used by the public, such as Calcium Antagonists (45.45%), the type of drug Amlodipine (44.27%), single therapy using only Amlodipine (63.08%), a combination of 2 antihypertensives namely Amlodipine and also Hidzrochlorothiazide (38.61%), next is a combination of 3 antihypertensive drugs, namely Amlodipine-Hidzrochlorothiazide-Captopril (69.57%) (Tandililing et al., 2017). The use of antihypertensive drugs can be in the form of a single dose or a combination dose. The most widely used single dose is the ACE Inhibitor drug class in the form of captopril with a percentage of 23.5%. In comparison, the most commonly used combination dose antihypertensive drug is the ACE Inhibitor drug class with a calcium antagonist in Captopril with Nifedipine which is 17.1% [3].

In prescribing Captopril and Nifedipine drugs at the Puskesmas, the ATC/DDD method was used to determine the use of Captopril and Nifedipine drugs, the ATC/DDD method was used. ATC, or the abbreviation of Anatomical Therapeutic Chemical and DDD, namely Defined Daily Dose, is a unit of measurement or a tool to measure and compare drug data at international, national, or local levels. ATC/DDD has become the standard

for international drug use research (WHO, 2021). This study chose antihypertensive drugs, namely Captopril and Nifedipine, because they were considered following one of the patterns of drug demand in the ATC/DDD method, which was used to analyze drug use for outpatients at the Bluluk Health Center, Bluluk District, Lamongan Regency.

## 2. METHODS

### 2.1. Study design and sample

In this study, data collection was done quantitatively using the ATC/DDD method for prescribing Antihypertensive drugs (Captopril and Nifedipine) in January - December 2020 at the Bluluk Health Center, Bluluk District, Lamongan Regency, in outpatients whose purpose was to determine the level of using the drug. Sampling was not random by taking all samples from antihypertensive drug prescriptions (Captopril and Nifedipine) in January – December 2020.

### 2.2. Inclusion and exclusion criteria

The inclusion criteria in this study were prescription drugs in January - December 2020, prescription antihypertensive drugs (Captopril 12.5 mg and 25 mg and nifedipine 10 mg) in outpatients, all prescriptions which contained single captopril, single nifedipine, and captopril and nifedipine in one prescription. The exclusion criteria in this study were prescriptions that could not be read.

### 2.3. Research instrument

The instrument has a function as a tool in collecting data to be studied. The form of this instrument is related to the data collection method, for example, the interview method, whose instrument is an interview guide. Questionnaire method, the instrument is a questionnaire or questionnaire. The instrument's test method is a test question, but the observation method is called a checklist [4]. The instrument in this study is prescription drugs for outpatients.

## 2.4. Data analysis

Analysis of the data obtained was processed to determine the indications of ATC/DDD by identifying the drugs Captopril and Nifedipine with the ATC method. The DDD calculation was obtained from the entire prescription in January - December 2020, then calculated the Captopril and Nifedipine drugs at the Bluluk Health Center, Bluluk District, Lamongan Regency.

## 2.5. How to Determine ATC Code

1. Open the site contained in WHO: ([https://www.whooc.no/atc\\_ddd\\_index/](https://www.whooc.no/atc_ddd_index/))
2. Point the cursor at the words ATC/DDD Index, then write the name of the drug to be studied (Searching for drug names uses a minimum of three letters that must be written in the name box), then hover over the search text.
3. After that, the drug code and class will appear, for example, C for the Cardiovascular system, C09 for Agents acting on the renin-angiotensin system, and C09A for Ace inhibitors plain, and so on.
4. For example, the ATC code C09AA01: is the ATC code for the Captopril drug, and you can see the DDD for the Captopril drug.

## 2.6. DDD calculation

1. Calculation of the number of prescriptions for Captopril and Nifedipine

A formula is used to calculate the number of prescriptions for Captopril and Nifedipine in each month to calculate the number of prescriptions for Captopril and Nifedipine. This formula will be used for prescribing calculations for Captopril and Nifedipine in January – December 2020.

Number of Prescriptions = Strength of Preparation (mg) X Number of Captopril and Nifedipine prescribed/month.

2. Calculation of Captopril and Nifedipine drugs in months

The second step after calculating the prescription of Captopril and Nifedipine is the calculation of the drugs Captopril and Nifedipine in units of months according to the WHO Index. The formula used for calculating Captopril and Nifedipine is as follows::

Captopril DDD according to WHO : 50 mg

Nifedipin DDD according to WHO : 30 mg

Daily dosage formula based on WHO Index:

Number of prescriptions for Captopril or Nifedipine in January - December 2020

Captopril or Nifedipine DDD on WHO Index

### 3. Calculation of Outpatient Visits (KPRJ)/1000 Population/Month January - December in 2020

The third step after obtaining the calculation in units of months according to the WHO Index is calculating Outpatient Visits (KPRJ) / 1000 Population/month January - December 2020. The formula for calculating Outpatient Patient Visits (KPRJ) is as follows:

KPRJ Number/month

1000 population

### 4. Calculation of DDD Captopril or Nifedipine/1000 Population/Month

The fourth step after obtaining the calculation of Outpatient Visits (KPRJ) / 1000 population / month is the calculation of DDD Captopril or Nifedipine / 1000 population / month. The formula for calculating DDD Captopril or Nifedipine / 1000 KPRJ / Month is as follows:

Total Captopril or Nifedipine DDD based on WHO Index/month

Total Outpatient Visits (KPRJ)

### 5. Calculation of DDD Captopril or Nifedipine/1000 Population/Day

The last step or the fifth step after calculating DDD Captopril or Nifedipine / 1000 Population / Month is the Calculation of DDD Captopril or Nifedipine / 1000 Population/day so that population results are obtained from Captopril or Nifedipine drugs for daily doses. The formula for calculating DDD Captopril or Nifedipine / 1000 Population/day is as follows.:

DDD Calculation Results Captopril or Nifedipine / 1000 KPRJ / Month

30 days

The value of the DDD/1000 Population/day calculation can be compared with the value of the WHO Index. This DDD calculation is used to determine the average dose of Captopril and Nifedipine drugs per day in adult patients.

### 3. RESULTS

#### 3.1. Sociodemographic characteristic

In Table 1, it can be seen that the percentage of prescribing Captopril 12.5 mg tablets during January to December 2020 based on gender was 63.6% with 73 patients in female patients and 36.4% with 42 patients in male patients. Patients who received the most prescriptions for Captopril 12.5 mg were at the age of 51-60 which had 47 patients (40.9%). As well as for Captopril 25 mg, the most patients was in female and patient with 51-60 years old.

In Table 2 it can be seen that the percentage of prescribing Nifedipine Tablets during January to December 2020 based on gender was found to be 73.5% in female patients and 26.5% in male patients. For factor age, an age range of 31-40 years there were 2 patients, 11 patients aged 41-50, 8 patients aged 51-60, 6 patients aged 61-70, 1 patient aged 71-80 and 81-90 as many as 2 patients.

#### 3.2. ATC/DDD code

The Anatomical Therapeutic Chemical (ATC) classification system is a system that distinguishes drug groups according to the therapeutic, pharmacological and chemical properties contained in the WHO Index and can be accessed on the Internet by typing [www.whocc.no](http://www.whocc.no), after the results of the ATC code for a drug are obtained on the website and the value of DDD can be known. In Table 3 it is known that the DDD value of Captopril according to WHO is 50 mg with the route of administration being orally. The ATC code of Captopril is C09AA01. While the DDD value of Nifedipine according to WHO is 30 mg with the route of administration being orally. The ATC code for the drug Nifedipine is C08CA05.

#### 3.3. Calculation of the use of Nifedipine and Captopril in Daily Dosages During January to December 2020

The daily dose of Nifedipine was obtained from the DDD value in one month divided by thirty days or the number of days in one month. In table 5 it can be seen that the value of DDD/1000 inhabitants/day has a total of 5.55 mg in 2020 with an average daily rate of 0.46 mg. in January, the result was 0.98, which was the highest DDD value and the lowest was in October, which was 0.17 mg. For the drug Captopril 12.5 mg, based on table 5 the total value of DDD/1000 KPRJ/Day of the drug Captopril 12.5 mg is 18.6

TABLE 1: Sociodemographic character of Captopril patients.

Characteristic	Using Captopril 25 mg	Using Captopril 12,5 mg
<b>Age</b>		
31-40	5 (3.7%)	1 (0.9%)
41-50	27 (20.1%)	19 (16.5%)
51-60	46 (34.3 %)	47 (40.9%)
61-70	30 (22.4%)	33 (28.7%)
71-80	20 (14.9%)	12 (10.4%)
81-90	6 (4.5%)	2 (1.7%)
91-100	0	1 (0.9%)
<b>Gender</b>		
Female	87 (64.8%)	73 (63.6%)
Male	47 (35.2%)	42 (36.4%)

TABLE 2: Sociodemographic character of Nifedipine patients.

Characteristic	Using Nifedipine
<b>Age</b>	
31-40	2 (6.7%)
41-50	1136.7%
51-60	8 (26.7%)
61-70	6 (20%)
71-80	1 (3.3%)
81-90	2 (6.7%)
<b>Gender</b>	
Female	22 (73.5%)
Male	8 (26.5%)

TABLE 3: ATC structure code for Nifedipine.

ATC Code	Name	DDD	U	Adm. R	Note
C08CA05	Nifedipin	30	mg	O	

TABLE 4: ATC structure code for Captopril.

ATC Code	Name	DDD	U	Adm. R	Note
C09AA01	Captopril	50	mg	O	

mg with an average of 1.6 mg per day. The highest DDD value was in January, which was 3.6 mg and the lowest value was in May, which was 0.4 mg. Furthermore, the total results of DDD/1000 KPRJ/day from the drug Captopril 25 mg were 44.7 mg with an average of 3.7 mg per day. The highest yield was in August at 7.6 mg and the lowest was in April at 1.2 mg.

TABLE 5: Daily dose of Nifedipine.

Months	Use of Nifedipine in daily dose
January	0.96 mg
February	0.3 mg
March	0.79 mg
April	0.39 mg
May	0.38 mg
June	0.35 mg
July	0.34 mg
August	0.73 mg
September	0.33 mg
October	0.17 mg
November	0.37 mg
December	0.42 mg
<b>Total</b>	<b>5.55 mg</b>
<b>Average</b>	<b>0.46 mg</b>

TABLE 6: Daily dose of Captopril.

Months	Daily use of Captopril 12.5 mg	Daily use of Captopril 25 mg
January	3.6 mg	6.0 mg
February	2.5 mg	2.9 mg
March	2.2 mg	4.3 mg
April	0.9 mg	1.2 mg
May	0.4 mg	1.4 mg
June	0.7 mg	1.8 mg
July	0.8 mg	2.6 mg
August	1.3 mg	7.6 mg
September	1.0 mg	4.7 mg
October	2.3 mg	2.0 mg
November	1.3 mg	4.3 mg
December	1.6 mg	5.9 mg
<b>Total</b>	<b>18.6 mg</b>	<b>44.7 mg</b>
<b>Average</b>	<b>1.6 mg</b>	<b>3.7 mg</b>

## 4. DISCUSSION

Table 1 shows that more female patients used Captopril at a dose of 12.5 mg and a dose of 25 mg for antihypertensive therapy. This is caused by hormonal factors [4]. As in the data [2] the percentage of people with hypertension in Indonesia is more suffered by women than men. In table 1 it can be interpreted that the use of the drug Captopril is most



widely used by patients aged 41-70. This is because the age of entering menopause, at this age humans experience physiological changes [5].

Table 2 shows the percentage of patient using Nifedipine 10 mg based on the gender of the patient from January to December 2020. For the percentage of use obtained, male patients had a total percentage of 26.5% with a total of 8 patients. Meanwhile, female patients have a total of 22 patients and have a percentage of 73.5%. The results showed that female patients used Nifedipine more for antihypertensive therapy. This is due to hormonal factors [4]. As in the data [2] the percentage of people with hypertension in Indonesia is more suffered by women than men.

Table 2 shows 41-50 years old patient mostly used Nifedipine for their therapy. From these data, it can be interpreted that the use of Nifedipine is most widely used by patients aged 41-50 and followed by patients aged 51-60 years. This is due to the age of entering menopause [6, 7]. In a survey conducted by Rosyada in 2016 it was found that 40% of menopausal ages are 45-50 years old and 60% are more than 51 years old because at this age humans experience physiological changes [5].

The daily dose of DDD Nifedipine is calculated by dividing the monthly DDD/1000KPRJ value by 30 (thirty) which is the number of days in each month. The results of this DDD calculation as shown in table 5 have a total of 5.55 mg in 2020 and have an average of 0.46 mg per day. The highest usage was in January, which was 0.96 mg/day, while the lowest was in October, which was 0.17 mg/day. From the results obtained, it can be interpreted that the use of the drug Nifedipine at the Bluluk Health Center does not exceed the DDD value of Nifedipine at WHO, which is 30 mg. The drug Nifedipine is little used in prescribing antihypertensive drugs because it prefers other antihypertensive drugs to be prescribed to outpatients.

Calculation of DDD Captopril 12.5 mg daily dose obtained by means of the results of the value of DDD/1000 inhabitants per month divided by 30 days which is the number of days in each month. The results of this DDD calculation as in table 6 have a total of 18.6 mg in 2020 and have an average of 1.6 mg per day. The highest usage was in January, which was 3.6 mg per day, while the lowest was in May, with 0.4 mg/day. For the results of the DDD calculation, Captopril 25 mg, as shown in table 6, has a total of 44.7 mg in 2020 and has an average of 3.7 mg per day. The highest usage was in August, which was 7.6 mg/day, while the lowest was in April, which was 1.2 mg/day. From the results obtained, it can be interpreted that the use of the drug Captopril either at a dose of 12.5 mg or a dose of 25 mg at the Bluluk Healthcare Center does not exceed the DDD value of Captopril at the WHO which is 50 mg. This is because Captopril is a drug for antihypertensive therapy only, it can be compared with Mefenamic Acid Drugs based

on the research of Prakasiwi et al., 2021 [8] at the Singosari Healthcare Center, it was found that the Mefenamic Acid drug had a DDD value four to six times higher than the WHO DDD value. This is because the drug Mefenamic Acid is an anti-inflammatory drug that is used to treat pain in most minor ailments [7]. The total prescription for Captopril 25 mg was 134 prescriptions during 2020. This prescription was carried out by doctors taking into account the appropriate drug therapy for the patient as well as the type of drug, dose strength, route, timing of drug administration and duration of drug use. Captopril is usually prescribed to patients because it is cheap and effective in lowering the patient's blood pressure [6].

## 5. CONCLUSION

This DDD study resulted in a DDD value of 10 mg Nifedipine not exceeding the value determined by WHO, which is 30 mg per day. And for the DDD value of Captopril (12.5 mg and 25 mg) it also does not exceed the DDD value limit that has been determined by WHO, which is 50 mg per day. It can be concluded that the use of the drugs Nifedipine and Captopril in outpatients at the Bluluk Healthcare Center in Lamongan is still appropriate.

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