

# Correlation between geriatric ischemic stroke patient characteristic and drug related problems

*by* Setiadi Antonius Adji Prayitno

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## Correlation between geriatric ischemic stroke patient characteristic and drug related problems

Dhanang Prawira Nugraha<sup>\*1,3</sup>, Antonius Adji Prayitno Setiadi<sup>1,2</sup>, Yosi Irawati Wibowo<sup>1,2</sup>

<sup>1</sup>Department of Clinical and Community Pharmacy, Faculty of Pharmacy, Universitas Surabaya, Surabaya, Indonesia

<sup>2</sup>Center for Drug Information and Pharmaceutical Services, Faculty of Pharmacy, Universitas Surabaya, Surabaya, Indonesia

<sup>3</sup>Pharmacy Study Program, Stikes Karya Putra Bangsa Tulungagung, Tulungagung, Indonesia

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### ABSTRACT

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##### \*Corresponding author:

[dhanang.prawiranugraha.apt@gmail.com](mailto:dhanang.prawiranugraha.apt@gmail.com)

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**Background:** Drug related problems (DRP) can cause problems in treatments of patients with ischemic stroke.

**Objective:** This study was to determine the correlation between the characteristics of patients with ischemic stroke and the DRP.

**Methods:** A population in this study was 53 patients at dr Iskak Public Hospital in Tulungagung. Inclusion criteria were patients who were  $\geq 60$  years old and were diagnosed as acute ischemic stroke patients. The DRP was classified based on Pharmaceutical Care Network Europe version 6.2, especially problem and cause domain. Correlation between age, duration of treatment, number of comorbidities and number of drugs and the DRP was analysed by Spearman Rho or by Pearson analysis. The relationship between gender, guaranteed care and the DRP was analysed by using Eta analysis.

**Results:** This study revealed that patients with 60-69 years were 24 patients (45.28%), men were 30 patients (57%), 1 comorbidity was 26 patients (49.06%), duration of 5 days was 14 patients (26.42%), BPJS patients were 23 patients (35.94%), using 6 types of drug was 11 patients (20.75%). Age, sex and care guarantee did not correlate with the DRP (p-values  $> 0.05$ ). Duration of treatment, number of comorbidities and number of drugs correlated with the DRP (p-value  $< 0.05$ ) with consecutive correlation strength: weak (R = 0.32), moderate (R = 0.45), strong (R = 0.56).

**Conclusion:** Duration of treatment, number of comorbidities and number of drugs correlated with increasing incidences of the DRP in geriatric ischemic stroke patients.

**Latar Belakang:** Drug related problems (DRP) dapat menimbulkan masalah pada terapi pasien.

**Tujuan:** Untuk menentukan korelasi antara karakteristik pasien dengan DRP.

**Metode:** Populasi 53 pasien RSUD dr Iskak Tulungagung. Kriteria inklusi pasien Pasien  $\geq 60$  tahun, Diagnosa pasien stroke iskemik akut. DRP dikategorikan berdasarkan Pharmaceutical Care Network Europe versi 6.2 khususnya domain masalah dan penyebab. Korelasi usia, lama perawatan, jumlah komorbiditas dan jumlah obat dengan DRP dianalisis dengan analisis Spearman Rho jika tidak terdistribusi normal atau analisis pearson jika data terdistribusi normal. Hubungan antara jenis kelamin dan jaminan perawatan dengan DRP dianalisis dengan menggunakan analisis Eta.

**Hasil:** Pasien berusia 60-69 tahun sebanyak 24 pasien (25.28%), laki-laki 30 pasien (57%), 1 komorbiditas 26

*pasien (49.06%), lama perawatan 5 hari 14 pasien (26.42%), menggunakan BPJS 23 pasien (35.94%) dan mendapatkan 6 obat 11 pasien (20.75%). Usia, jenis kelamin dan jaminan perawatan tidak berkorelasi dengan DRP, p-value > 0.05 lama perawatan, jumlah komorbiditas dan jumlah obat berkorelasi dengan DRP, p-value < 0.05 dengan kekuatan korelasi berturut-turut lemah (R = 0.32), sedang (R = 0.45), Kuat (R = 0.60).*

**Kesimpulan:** Lama perawatan, jumlah komorbiditas dan jumlah obat berkorelasi dengan peningkatan angkakejadian DRP pada pasien stroke iskemik geriatri.

## INTRODUCTION

Ischemic stroke is one of diseases caused by atherosclerosis that ultimately causes blockage in blood vessels in a human brain. In 2016 stroke was the 4th leading cause of death in the United States.<sup>1</sup> In 2018, RISKESDAS (baseline health research) revealed that prevalence of stroke in Indonesia was 10.9" (permil) and prevalence in age group of > 65 years was 95.5" (permil). Regions that become the most stroke patients are in East Kalimantan, the special region of Yogyakarta and North Sulawesi.<sup>2</sup>

One of the age groups having risk of the stroke is the elderly (geriatric) population. According to a research by SUSENAS (national socio-economic survey) in 2014, a total population of geriatrics was 8.03% of the population, and East Java was in the third rank with a 10.96% population; meanwhile, Tulungagung district had a geriatric population of 124 thousand people in 2013.<sup>3,4</sup> Geriatrics is a risk factor of a stroke that cannot be modified similarly to gender, race and family history.<sup>5</sup> Many diseases suffered by geriatric patients usually are hypertension and diabetes; this disease is also a risk factor of stroke, but the risk is a modifiable risk factor.<sup>6</sup>

In a process of stroke treatment, there is a condition known as drug-related problems (DRP). Based on pharmaceutical care network Europe (PCNE), DRP is an incidence or condition involving a drug treatment that potentially affects desired health outcomes.<sup>7</sup> Cipolle et al. defined the DRP as an incidence

that is undesirable and experienced by patients suspected in involving drug treatment, interfered with achieving goals of the treatment and required to have professional judgment.<sup>8</sup>

A study on DRP in Taiwan showed that 87% of patients treated at a hospital had at least 1 DRP. The most common form of DRP was that some drugs were not prescribed (35%), while categories of drugs that caused DRP were cardiovascular drugs (33%).<sup>9</sup> Another study conducted in India also found similar results as geriatric patients discharged from the hospital received drugs without indications, unnecessary drugs in a long duration, sub-optimal dosing and inappropriate selection of drugs.<sup>10</sup> A systematic review revealed that elderly patients, polypharmacies and comorbidities were major risk factors causing adverse drug reactions (ADRs) considered as one of DRP forms.<sup>11</sup> An ADR incidence is a predictor that significantly increases length of treatment and death in a hospital as an incidence of 1 ADR can increase the length of treatment for 4 days and death 7 times for treated geriatric patients.<sup>12</sup> A study in Yogyakarta and Malang found that some drugs were one of factors causing DRP in geriatric patients.<sup>13,14</sup>

Studies above are mostly located in big cities that have demographics and facilities that are different from the city where this study was conducted. In addition, previous studies have not focused on geriatric patients and on correlations of some variables. Based on the data presented above, studying the correlation between patient characteristics and the incidence of DRP is necessary. Furthermore, this study can be used to optimize patient treatments and to develop clinical treatments for stroke, especially for geriatric ischemic stroke patients.

## METHODS

### Study design

This study used a cross-sectional method. Data collection was conducted consecutively in October - December 2018 in one of the

hospitals in Tulungagung regency. Its data were collected by noting medical records and interviewing with patients and/or patients' families to explore information not obtained from the medical records.

### **Population and sample**

This study focused on a population experiencing ischemic stroke treated at dr. Iskak Public Hospital of Tulungagung. Samples of this study were patients included in inclusion and exclusion criteria and were willing to participate in this study. 53 patients participated in this study. The inclusion criteria of this study were patients with age by  $\geq 60$  years old experiencing acute ischemic stroke. Meanwhile, the exclusion criteria were incomplete data including age, sex, drug, comorbidity, duration, and guarantee of care, dead patients before data collection and the patients who were not willing to participate in this study.

### **Ethical Consideration**

This research has received a permission from the ethics commission of dr. Iskak Public Hospital of Tulungagung with a letter number 070/4008/407.206/2018.

### **Measurement**

Drug-related problems (DRP) that occurred were grouped based on PCNE version 6.2, especially in the problems and cause domains. The DRP data were collected and determined based on authors' clinical judgment in theory and existing evidences based on medical science.

### **Data analysis**

Data analysis was conducted by using SPSS 24, which included sex, age, length of treatment, comorbidity, amount of drug and DRP. Data normality was analysed by using Kolmogorov Smirnov analysis. Correlations between age, duration of treatment, number of comorbidities and amount of drugs and the DRP were analysed by Spearman Rho analysis if the data were not

normally distributed or by Pearson analysis if the data were normally distributed with a 95% confidence level. If the p-value was  $< 0.05$ , it meant there was a significant correlation between patient characteristics and the DRP. Relationships between sex, guaranteed care and the DRP were analysed by using Eta analysis with a 95% confidence level.

## **RESULTS**

### **Patient characteristics**

Based on this study, characteristics of the patients could be seen in Table 1. Men were the most treated patients (57%) with age range of 60-69 years old (45.28%). Duration of the treatment was 3-5 days (49.06%). Patients with collateral BPJS treatment were 35.94%. 1 Comorbidity was 49.06%. Population who received 6-10 types of drugs was 58.49%.

Based on table 2, it was found that 30 male patients (57%) were the most treated patients. Then based on the comorbidity, the patients with hypertension were 28 patients (50.91%), and the 1 comorbidity was 26 patients (40.96%). Majority of patients treated for 5 days was 14 patients (26.42%). Based on the guarantee of care, the patients using BPJS were 23 patients (35.94%). According to the age groups, patients with age of 60-69 years old were 22 patients (41.51%). The patients receiving about 6 types of drugs were 11 patients (20.75%), and the number of DRP was 2 DRP per patient of 12 patients (22.64%).

Based on the results, all the data were not normally distributed with p-value  $< 0.05$ . Based on the analysis of Spearman Rho on duration of the treatment, the number of comorbidities and the number of drugs had correlation with the DRP p-value  $< 0.05$  with consecutive strengths from weak, moderate to strong ( $r = 0.32; 0.45; 0.60$ ) with a positive relationship. Therefore, the longer the treatment, the more the number of comorbidities and the number of drugs, the more DRP occurred. Meanwhile, age did not have a correlation with the DRP. Based on Eta's analysis, it found that the gender and collateral

Table 1. Patient characteristics

Category		Number (n=53)	Percentage (%)
Sex	Male	30	57.00
	Female	23	43.00
Age	60-69	24	45.28
	70-79	22	41.51
	80-89	5	9.43
	90-99	2	3.77
Duration of therapy	3-5	26	49.06
	6-8	18	33.96
	9-11	6	11.32
	12-14	3	5.66
Health financing source	ASKES (health assurance)	1	1.56
	BPJS (Indonesian national health insurance)	23	35.94
	JAMKESDA (local health insurance)	5	7.81
	KIS (Indonesian health card)	10	15.63
	Private	14	21.88
Comorbidity	0	11	20.75
	1	26	49.06
	2	11	20.75
	3	5	9.43
	1-5	4	7.55
	6-10	31	58.49
	11-15	12	22.64
	16-20	4	7.55
	21-25	0	0.00
	26-30	0	0.00
	31-35	2	3.77

used by the patients did not affect the amount of DRP that occurred with a p-value > 0.05.

#### DISCUSSION

The results of this study revealed that the treated patients had an average of 2.45 DRP. It is higher than a study conducted by Hohman and Abunalah indicating that average patient was 1.8 DRP and 1.6 DRP per patient.<sup>16,17</sup> This might be due to different populations and number of samples in this study that were relatively small. Moreover, this study was conducted on general

wards rather than on stroke-specific wards. Besides, the authors in this study used different classification that could affect the average results because PCNE had a more detailed domain so that more DRP were identified and counted.<sup>18</sup>

No indications of drugs or unclear drug indications were the most DRP experienced by patients with 32 incidences (24.62%), while DRP in forms of drugs that were not needed was 31 incidences (23.85%). The results of this study are similar to studies by Semcharoen

Table 2. Types of the most common DRP in patients

Code	Sub-domain	Number	Percentage
P1.1	No effect of drug treatment/ therapy failure	4	3.08%
P1.2	Sub-optimal drugs	1	0.77%
P1.4	Untreated indication	8	6.15%
P2.1	ROTD other than allergy	1	0.77%
P3.2	Unnecessary drugs	31	23.85%
C1.1	Inappropriate drug selection (not for the most precise indication) including the use of contra-indicated drugs	4	3.08%
C1.2	No indications of drug used or unclear drug indications	32	24.62%
C1.3	Combination of drugs or inappropriate drugs including incidences of drug interactions	10	7.69%
C1.4	Incorrect duplication of therapeutic groups or active ingredients	5	3.85%
C1.5	Showing indications without prescribed drugs	4	3.08%
C1.6	Many drugs (different therapeutic groups or active ingredients) prescribed for same indication	7	5.38%
C1.8	Synergistic / preventive drugs that are not prescribed	1	0.77%
C3.1	Too low drug dose	8	6.15%
C3.2	Too high drug dose	1	0.77%
C3.6	Problems related to pharmacokinetics of drugs that require dosage adjustments	5	3.85%
C4.1	Too short duration treatment	1	0.77%
C5.1	Inappropriate time of drug uses	6	4.62%
C5.2	Using drugs less than their guidelines for treatment (underused) or administering drugs less frequently than rules of their usage (under-administered)	1	0.77%
TOTAL		130	100.00%
Average of DRP in patients		2.45	
Standard of deviation		± 9.27	

et al. and Celin et al. reporting that the most prevalent DRP showed no clear indications meaning that uses of a drug were sanctioned or had no scientific evidences.<sup>19,20</sup> The results of this study showing unnecessary drugs were similar to a Silva's study.<sup>21</sup> In fact, reducing unnecessary drugs could save cost of patients' treatments to 60 million per year.<sup>21</sup>

The results of this study also noted that increasing age did not correlate to the incidence of DRP with p-value > 0.05 (p = 0.23). These results are in line with studies by Handayani (2018) and Da Costa (2016) presenting that incidences of DRP in geriatric and non-geriatric

patients were similar.<sup>22</sup>

The duration of treatment correlated with the incidence of DRP with p-value < 0.05 (p = 0.02) and had a weak correlation (r = 0.320). Some studies argued that relationships between duration of treatment, incidences of DRP and length of treatment were one of the risk factors for DRP.<sup>17,23-25</sup> The longer a patient was treated, the more drugs were prescribed, and the risks of DRP would increase.<sup>17,24</sup> Therefore, it is necessary to optimize roles of clinical pharmacists to prevent incidences of DRP.

The number of comorbidities correlated significantly with the incidence of DRP with

p-value < 0.05 and had a moderate correlation ( $r = 0.45$ ). This variable was closely related to the number of DRP incidences of patients who had multi-pathological conditions with more than 11 times of DRP incidences compared to single pathology condition.<sup>17,28</sup> It is not surprising that there is a relationship between the number of comorbidities and the amount of drugs.<sup>29,30</sup> In a randomized controlled trial study, presence of clinical pharmacists had been functioned to reduce unnecessary uses of drugs and to reduce length of patients' treatments.<sup>31</sup> In addition, roles of clinical pharmacists had proven useful to identify DRP in geriatric patients by increasing collaboration with health professionals to solve problems proportionally.<sup>30</sup>

The number of drugs correlated significantly with the incidence of DRP with p-value < 0.05 and had a moderate correlation ( $r = 0.598$ ). Many studies stated that there was a relationship between number of drugs with the incidence of DRP; the more the amount of drug that is prescribed, the greater the possibility of DRP that will arise.<sup>17,24,25</sup> Polypharmacy incidence could increase the incidence of DRP to 8 times.<sup>28</sup> In a study of patients who received hyperpolypharmacy (getting  $\geq 10$  drugs), rates of re-hospitalized patients could be 2.5 times greater than patients who did not get polypharmacy.<sup>32</sup> The use of polypharmacy drugs could increase ADR to 8-12 times. By reducing the amount of unnecessary drugs, it can minimize 400 thousand of drugs per month.<sup>33</sup>

Gender did not correlate to the incidence of DRP with p-value > 0.05. Some studies had not found a correlation between sex and DRP.<sup>17,24,25,28,34,35</sup> This could occur because of differences of number of population, socio-demography and classification methods.<sup>18</sup> Health financing source did not correlate with the incidence of DRP with p-value > 0.05. Based on this study, the type of health-care guarantee did not correlate with the incidence of DRP. One of possible reasons was that the formulary used in each treatment guarantee was different; therefore, this might effect on the incidence of DRP. There were studies reporting

that limiting the drugs used in the formulary would reduce the incidence of polypharmacy, but the correlation with the incidence of DRP has not supported yet by existing scientific evidences.<sup>36</sup>

The limitation of this study was the relatively small numbers of samples and short research time; therefore, it could not adequately represent a wider population. Besides, the DRP that occurred in this study was the result of the clinical judgment of the authors.

### CONCLUSION

It could be concluded that 53 geriatric ischemic stroke patients experienced 150 DRP, and its average was  $2.45 \pm 9.27$  DRP per patient. Then duration of treatment, number of comorbidities and number of drugs correlated with the incidence of DRP in geriatric ischemic stroke patients.

### CONFLICT OF INTEREST

There was no conflict of interest.

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