

Clinical profile of patients with cerebrovascular disease at Stroke Unit, Sanglah General Hospital, Denpasar, Bali



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ABSTRACT

Introduction: Stroke is the leading cause of disability and has a high mortality rate with most death occur in developing countries. Unfortunately, only a few informations available about strokes in developing countries, including Indonesia. Thus, this research aimed to provide a general overview of stroke patients from stroke unit in Bali, Indonesia.

Methods: A cross-sectional study was carried out in Sanglah General Hospital, Denpasar Bali between August 2017 – January 2018 evaluating newly admitted stroke patients. There was no age limit, both male and female were enrolled. Data related to socio-demographic, risk factors, clinical features, and imaging result were extracted from medical records.

Results: A total of 82 subjects were enrolled. Strokes were more common in males (61%) with most affected age group was

50-59 years (29.3%) and young stroke (age ≤ 45 years) accounted for 19.5% of the cases. Ischemic stroke (53.7%) was more common type encountered, and hypertension (76.8.3%) was leading risk factor. First-time stroke accounts for 80.5% while recurrent stroke accounts for 19.5% with 3.6% admitted for the ≥ 3 episodes. Overall, territories of middle cerebral artery including basal ganglia (25%) and internal capsule (20.5%) were frequently affected in ischemic stroke while lenticular-capsular (44.7) and lobar structure (18.4%) in hemorrhagic stroke. Typical chief clinical presentation was hemiparesis (42.7%) and altered consciousness (26.8%).

Conclusions: Stroke tends to affect late adult with male predominance and hypertension as leading risk factor. Ischemic stroke was the most common type. There were differences in clinical presentations and anatomic site preferences between hemorrhagic and ischemic stroke.

Keywords: Cerebrovascular Disease, Stroke, Clinical Profile, Bali

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INTRODUCTION

Stroke is a common neurological disorder and the leading cause of disability worldwide. It is only second to ischemic heart disease in terms of the global mortality rate.^{1,2} Stroke estimated to affect one for every six people worldwide with a mortality rate as high as 1 per 20 deaths with most of the death occurred in developing countries.^{1,3} Stroke is becoming a significant cause of premature death, and long-term disability in low to middle-income countries as the prevalence of key modifiable risk factors increase and enhanced by the demographical changes.

The incidence of stroke is projected to increase throughout the world in the incoming decades, as more developing countries are shifting into a modern westernised lifestyle and diet. These changes will be the driving force for the rise of chronic diseases such as obesity, diabetes mellitus, dyslipidemia, and hypertension.⁴ Additionally, increased life expectancy and the number of elderly population will likely to increase the number of strokes even further. Patne et al. estimated that

stroke would step up from the sixth to the fourth place as the cause of disease burden in the coming decade.⁵

As most of the metabolic disease, stroke can be prevented. Knowledge of risk factors and clinical profile of stroke patients which may vary among populations is essential to design the strategies aimed to reduce the stroke incident, mortality and morbidity. It is expected that in the coming years, stroke incident will increase as lifestyle and diet patterns shift mimicking western countries. Therefore, the knowledge of local stroke pattern is increasingly essential both for curative effort and preventive strategy to reduce its burden.⁵

Indonesia is one of the fastest developing countries with ongoing improvement in living standards, education and health system. It is a vast country with diverse cultures and ethnic groups accompanied by wide varieties of lifestyle.^{6,7} Along with its development, westernised lifestyle shifting is inevitable. If this trend continued, it would induce the epidemic of non-communicable disease,

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including stroke which results in double burden of diseases, both communicable and non-communicable disease.^{4,5} National health survey data has already documented an increasing trend of stroke prevalence from 8.3% in 2007 to 12.1% in 2013.^{8,9}

Many authors had published studies that describe the profile of stroke in a large population, mainly from developed countries. Indonesian population, however, is quite different from developed countries regarding nutrition, lifestyle as well as genetic.¹⁰ Therefore, it is rational to suspect that these differences may influence the risk, type, and survival of stroke. Although there were some extensive studies had conducted in the previous decade, not much is known about the current profile of stroke in Indonesia.^{11,12} Therefore, this study aimed to provide an updated general view of stroke patients from one of the tertiary hospital in Indonesia.

METHODS

A cross-sectional study was carried out amongst patients admitted to Stroke Center, Sanglah General Hospital, Denpasar, Bali between August 2017 – January 2018. Data collected from medical records of patients who had a diagnosis of stroke established by neurologist based on World Health Organization (WHO) definition “rapidly developing clinical signs of focal or global disturbance of cerebral function, with symptoms lasting 24 h or longer or leading to death, with no apparent cause other than vascular origin”.⁶ Exclusion criteria were cerebrovascular disease related to trauma (head injury), patients with coagulation disorders and incomplete essential records. There was no age limit, and both male and female participants were enrolled. Data related to socio-demographic (age at stroke onset, sex, body mass index, marital status, education status), clinical features (chief complaint), type of stroke, risk factors and previous medical history (history of smoking and alcohol, hypertension, diabetes mellitus, atrial fibrillation, ischemic heart disease, previous stroke, dyslipidemia), and radiological data (or its interpretation from radiologist) related to areas of brain affected were extracted from medical record. All study protocol has been approved by the ethical committee of Universitas Udayana/Sanglah General Hospital. The data analysis was conducted in R version 3.6.0.¹³ Descriptive statistics were used to present the result. Continuous variables expressed as a mean \pm standard deviation while categorical variables were expressed as percentages. Chi-square and risk assessment was used as the inferential statistics to detect association among variables and expressed as *p-values* ($p < 0.05$

considered significant) and Odds ratio with 95% confidence interval.

RESULTS

A total of 82 cases of stroke which were admitted in stroke unit Sanglah Hospital, Bali, Indonesia had fulfilled the inclusion and exclusion criteria thus were included in this study. The socio-demographic data is presented in Table 1. Male (61%) was found to be more common than female (39%) with a male to female ratio of 1.6:1. Patient's age ranged from 16 to 79 years old with a mean age 55 ± 14 years old. The mean age for male patients was 56.5 ± 13.6 years, while the female was 52 ± 14.2 years (table 2). Most of the patients were in the 50-59 years age group which accounted for 29.3% of total patients.

Ischemic stroke was more common (53.7%) than hemorrhagic stroke (46.3%). Subarachnoid hemorrhage which accounts for 8.5% of all patients, mostly responsible for hemorrhagic stroke in young patients. Men were slightly more common to experience an ischemic stroke (56%) than hemorrhagic stroke (44%). In contrast, women had an equal percentage of ischemic and hemorrhagic stroke (50%). Young stroke, defined as stroke occur at age < 45 years old, accounts for 19.5% of all patients with predominantly affected by hemorrhagic stroke (81.3%). In patients ≥ 45 Years old, ischemic stroke was more common, which comprised about 62.1% of the case. In ischemic stroke, the patient's age was ranged from 40-79 with mean age 61 ± 10 years old. The age of patients with hemorrhagic stroke was ranged from 16-76 years old with mean age 48 ± 15 years old. If SAH were analysed separately from intra-cerebral bleeding (ICB), the mean age for ICB was 52.5 ± 11 , and the age range was 24 – 76 years old. SAH mostly affect young patients ranged from 16-44 years old, with mean age 27 ± 10 years old. Among all patients, 80.5% experienced the first-time stroke, while 15.9% experience the second stroke and 3.6% had experienced the third or more stroke episode.

The most common modified-risk factors for chronic diseases were hypertension (76.8%), followed by dyslipidemia (64.6%), obesity (42.7%), diabetes mellitus (30.5%), and other factors in lesser frequencies (Table 2). Information regarding hypertension was inferred from the patient's history, while dyslipidemia, diabetes mellitus, and obesity were inferred from history, physical examination and laboratory measurement. Chi-square analysis shows a significant association of age (≥ 45), diabetes mellitus and dyslipidemia with ischemic stroke (Table 2).

Some other comorbid were also documented in lesser frequency such as pneumonia (1.2%), post-partum period (1.2%), and malignancy (1.2%). Some other risk factors, such as the history of Rheumatic Heart disease with or without a valvular problem, intravenous drugs users, and sedentary lifestyles, were not documented.

As shown in Table 3, the most common main clinical presentation was unilateral body weakness or hemiparesis (42.7%) followed by an altered level of consciousness (26.8) and slurred/loss of speech

(14.6). Hemiparesis was the most chief complaint presented in ischemic stroke and accounting for 65.9% of the case while altered consciousness was more dominant in hemorrhagic stroke (47.4%).

Most of the patient in this study underwent a Computed Tomography (CT) scan, but some also underwent Magnetic Resonance Imaging. According to the imaging, the most common site of haemorrhage was the lenticular-capsular region which each account for 44.7% (table 4). The typical location of infarct was in basal ganglia (25%), as shown in Table 4.

DISCUSSION

The occurrence of stroke tends to rises in more advanced age. As shown in table 1, the incidence rises significantly starting from the 4th decade (40-49 years) and then peaked in the 5th decade (50-59) of life. In the present study, the mean age for stroke was 54.8±13.9 years. This mean age does not differ much from the study conducted by Misbach et al. in Indonesia (2001) and Asean country (2000) with mean age 58.8±13.3 and 59.0±13.8 years, respectively.^{11,12} However, this result quite

different from the study of Patne et al. in India which reported the mean age of 64 years.⁵ It is worth to mention that hemorrhagic stroke tended to affect a younger in individual with mean age 48±15 years. Whereas, ischemic stroke affected a slightly older individual with mean ages 61±10 with no ischemic stroke was observed in patients aged forty or younger this study. Whereas, age≥45 years old was found significantly associated with ischemic stroke (Table 2). The mean age for female patients

Table 1 Socio-demographic Features of The Stroke Patients in Stroke Centre of Sanglah General Hospital, Bali

Variables	Male	Female	Total
Age			
<20	2 (4%)	0 (0%)	2 (2.4%)
20-29	1 (2%)	2 (6.3%)	3 (3.7%)
30-39	0 (0%)	3 (9.4%)	3 (3.7%)
40-49	8 (16%)	9 (28.1%)	17 (20.7%)
50-59	16 (32%)	8 (25%)	24 (29.3%)
60-69	15 (30%)	4 (12.5%)	19 (23.2%)
≥70	8 (16%)	6 (18.8%)	14 (17.1%)
Marital Status			
Married	48 (96%)	30 (93.8%)	78 (95.1%)
Unmarried	2 (4%)	2 (6.2%)	4 (4.9%)
Education Status			
No-formal education	1 (2%)	0 (0%)	1 (1.2%)
Primary	5 (10%)	6 (18.8%)	11 (13.4%)
Secondary	1 (2%)	0 (0%)	1 (1.2%)
Higher	17 (34%)	15 (46.8%)	32 (39%)
University	6 (12%)	0 (0%)	6 (7.4%)
Unreported	20 (40%)	11 (34.4%)	31 (37.8%)
Occupational Status			
Employed	39 (78%)	20 (62.5%)	59 (72%)
Unemployed	0 (0%)	12 (37.5%)	12 (14.6%)
Student	2 (4%)	0 (0%)	2 (2.4%)
Retired	9 (18%)	0 (0%)	9 (11%)

Table 2 The Distribution of Risk Factor Stratified by Stroke Type

	Total (%*)	Stroke Type (%**)		p-value	Odds Ratio (95% CI)	Significant
		Ischemic	Hemorrhagic			
Non-modifiable risk factors						
Gender						
Male	50 (61)	28 (26.8)	22 (23.2)	0.65	1.27 (0.52-3.1)	NS
Female	32 (39)	16 (50)	16 (50)			
Age						
Age ≥ 45	66 (80.5)	41 (62.1)	25 (37.9)	0.002	7.11 (1.84-27.42)	S
Age < 45	16 (19.5)	3 (18.8)	13 (81.3)			
History of TIA						
Present	2 (2.4)	2 (100)	0 (0)	0.49	-	NS
Absent	80 (97.6)	42 (52.5)	38 (47.5)			
History of CVD						
Present	9 (11)	7 (77.8)	2 (22.2)	0.17	3.41 (0.66-17.5)	NS
Absent	73 (89)	37 (50.7)	36 (49.3)			
Previous Stroke						
Present	16 (19.5)	10 (62.5)	6 (37.5)	0.58	1.57 (0.51-4.81)	NS
Absent	66 (80.5)	34 (51.5)	32 (48.5)			
Modifiable risk factors						
Hypertension						
Present	63 (76.8)	35 (55.6)	28 (44.4)	0.61	1.39 (0.50-3.89)	NS
Absent	19 (23.2)	9 (47.4)	10 (52.6)			
Smoking habit						
Present	9 (11)	3 (33.3)	6 (66.7)	0.29	0.39 (0.09-1.68)	NS
Absent	73 (89)	41 (56.2)	32 (43.8)			
Alcohol consumption						
Present	2 (2.4)	0 (0)	2 (100)	0.21	-	NS
Absent	80 (97.6)	44 (55)	36 (45)			
Diabetes Mellitus						
Present	25 (30.5)	20 (80)	5 (20)	0.002	5.50 (1.81-16.7)	S
Absent	57 (69.5)	24 (42.1)	33 (57.9)			
Obesity						
Present	35 (42.7)	19 (54.3)	16 (45.7)	0.99	1.05 (0.43-2.51)	NS
Absent	47 (57.3)	25 (53.2)	22 (46.8)			
Dyslipidemia						
Present	53 (64.6)	34 (64.2)	19 (24.6)	0.012	3.40 (1.32-8.79)	S
Absent	29 (35.4)	10 (34.5)	19 (65.5)			

*Column Percentage; **Row Percentage

TIA: Transient Ischemic Attack; CVD: Cardiovascular Disease

was slightly younger than male. This is contrary to the most the result reported from the population or community-based studies. We have not found any sufficient explanation from the socio-demographic and risk factor documented in this study since the occurrence of the particular factors were equal

between male and female, some even favour male. However, other undocumented factors such as oral contraceptive use, history of a migraine, and stroke aetiology might hold the answer. Genetic factors might also play a role, as hinted by a systematic review that revealed women more likely than men

Table 3 Chief Complaint of Stroke Patients

Variables	Stroke-Type		Total (%)
	Hemorrhagic (%)	Ischemic (%)	
Unilateral body weakness/hemiparesis	6 (15.8)	29 (65.9)	35 (42.7)
Altered/decreased consciousness	18 (47.4)	4 (9.1)	22 (26.8)
Slurred/loss of speech	4 (10.5)	8 (18.2)	12 (14.6)
Headache	6 (15.8)	0 (0)	6 (7.3)
Convulsions	2 (5.3)	0 (0)	2 (2.4)
Unilateral Paresthesia	0 (0)	1 (2.3)	1 (1.2)
Orbital muscle palsy	1 (2.6)	0 (0)	1 (1.2)
Double/loss of vision	0 (0)	1 (2.3)	1 (1.2)
Vomiting/nausea/dizziness	0 (0)	1 (2.3)	1 (1.2)
Facial droop	1 (2.6)	0 (0)	1 (1.2)
Total	38 (100)	44 (100)	82 (100)

Table 4 Anatomical Location of Stroke

Site	Frequency (%)
Ischemic Stroke (n=44)	
Anterior Circulation	
Frontal Lobe	1 (2.3)
Parietal* Lobe	5 (11.4)
Centrum semiovale	1 (2.3)
Corona Radiata	3 (6.8)
Basal Ganglia	11 (25)
Paraventricular	3 (6.8)
Internal capsule	9 (20.5)
External Capsule	1 (2.3)
Posterior Circulation	
Thalamus	2 (4.5)
Cerebellar	1 (2.3)
Undetected on CT Scan	7 (15.9)
Hemorrhagic Stroke (n=38)	
Anterior Circulation	
Lenticular-capsular	17 (44.7)
Lobar	7 (18.4)
Posterior Circulation	
Cerebellar	1 (2.6)
Thalamic	3 (7.9)
Brainstem	2 (5.3)
Subarachnoid Hemorrhage	8 (21.1)

*Including areas (frontoparietal, temporoparietal & parietooccipital) in MCA distribution

to have a parental history of stroke.¹⁴ Therefore, further study needed to explore and confirm this finding.

This study also showed a male predominance pattern, which was also found in the most study of stroke.^{15,16} Overall male to female ratio in this study was 1,6:1, which close to previous study result.⁵ Sex differences were also documented in many previous studies.¹⁷⁻¹⁹ The reasons are still unclear. However, some possible hypotheses were raised, one of those was the positive effect of estrogen on the cerebral circulation.²⁰ It is shown that lifetime exposure of ovarian estrogen may protect against ischemic stroke.²¹ Male predominance also found on many ischemic heart disease studies.¹⁵ Thus, the key of observed sex difference might relate to cardiovascular components such as overall higher blood pressure in men compared to women of similar age.^{22,23} This is in accordance with the fact that most of the cardiovascular disease involving larger vessels, including ischemic heart disease and peripheral artery disease were more common in men.²⁴ The similarities between these two disease entities may result from many other shared risk factors as well.¹⁵

As most of the study so far, cerebral infarction was found more frequent than haemorrhage. Female stroke patient shows an equal fraction of ischemic and hemorrhagic stroke while it is a slightly higher proportion of ischemic stroke (56%) than hemorrhagic stroke in male. Women have a lower ratio of Ischemic/hemorrhagic stroke, partly due to a higher proportion of SAH. SAH is particularly affected young people (age <45) mostly due to rupture of a large cerebral aneurysm or arteriovenous malformation. The published systematic review also points toward a higher incidence rate of SAH in women compared to men.¹⁸ Although the interesting finding in this study was SAH in two male patients below twenty years old.

Stroke also poses a threat not only to the elderly but also to younger individuals.^{25,26} Frequency of young stroke, defined as stroke occurring at age ≤45 years, in this study was quite high at 19.3%. Most of the study reported a slightly lower proportion at 16.26% and 12.9% in Patne et al. and Misbach et al. respectively.^{5,12} Young age traditionally not considered to be at high risk of stroke.²⁷ However, the number of cases of stroke in young and middle-aged people are rising.^{28,29} Young patients in this study were more commonly found to have a hemorrhagic stroke which accounts for 81.3%, which likely to be more severe than ischemic stroke.³⁰ Young stroke also tends to be more deleterious in terms of the productive year lost and increase the burden of the

patient's family and could adversely affect patient's relationships with community.^{5,31} Furthermore, young stroke may significantly impair the future of student when it affects individuals in their school age as two patients observed in this study.

This study also provides insight into risk factors for stroke. Hypertension is probably the most important preventable risk factor for the cerebrovascular disease was found as the most common risk factor in this study.¹⁶ Its presence in both stroke types is consistent with most studies that have been conducted so far.^{5,32} After hypertension, other risk factors for chronic diseases such as dyslipidemia and obesity were also found in a significant number of patients. Other established risk factor for stroke such as diabetes mellitus, previous stroke, history of heart disease including atrial fibrillation, smoking & alcohol intake followed in a lower frequency. History of transient ischemic attack was found in 2,4% of all patients, which slightly lower than the previous study.¹² Age \geq 45, diabetes mellitus and dyslipidemia were statistically significant favouring ischemic stroke than hemorrhagic stroke (table 2). These condition known as risk factors for atherosclerotic cardiovascular disease appeared to favour ischemic stroke, while other risk factors did not prefer either of the stroke subtypes.^{30,33} Other risks factor such as the previous stroke in this study (19.5%) shows a relatively similar number with previous Indonesian study (19.9%).¹²

However, there were some notable differences from most literature. The smoking history was 11% which was much smaller than other population such as in western populations of India.^{5,32} Diabetes was also high while alcohol use (2.4%) was infrequent compared to most reported in the literature.^{5,32} Other notable difference was the high number of patients with dyslipidemia (64.6%) which was found second in proportion after hypertension. The finding might suggest a shifting pattern of risk factors in the community. An increasing proportion of hypercholesterolemia but a decreasing proportion of high blood pressure, smoking habit and diabetes mellitus in stroke patients were also observed in the Lausanne Stroke Registry.³⁴ It also might explain the unawareness of people toward dyslipidemia and if at all, it less likely to be treated under control compared to hypertension and diabetes as described by some study.^{35,36}

Although many risk factors were shared between stroke and ischemic heart disease, the contribution of dyslipidemia and obesity as a risk factor for stroke is still controversial and inconsistent across studies.³⁷ One reason was probably that stroke, in general, was much more heterogeneous disease than ischemic heart disease.¹⁵ Further analysis revealed

that the presence of dyslipidemia and obesity without hypertension or diabetes were only in 8.5% of patients in this study. This proportion was small, while most were present at least with hypertension or diabetes or both. The presence certain of risk factors or comorbid this study does not warrant or confirm a cause-effect relationship to the occurrence of stroke, as this study does not designed to determine risk factors for stroke and it is presented only for descriptive purpose. Therefore, in this study, we refer to dyslipidemia and other minor or controversial risk factors as risk factors for chronic disease.

The frequent coexistence of more than one and sometimes multiple potential risk factors for stroke is an important message. This study showed a lower rate of tobacco and alcohol use with a higher rate of hypertension, diabetes, and dyslipidemia. A large proportion of stroke patients having multiple risk factors suggest the presence of individuals with inadequate treatment. It may reflect the generally poor public awareness and knowledge of these metabolic diseases for their long-term consequence on the cardiovascular and neurovascular system. In fact, increased efforts to reduce blood pressure has been associated with the declining incidence of stroke in developed countries.¹⁶ Therefore, improvement in health education and promotion to the general population in developing countries should be emphasised. Additionally, all patients with evidence of risk factors for stroke deserve control and modification of these factors when possible.

The clinical presentation as the main reason for patients to be admitted by family or bystander were hemiparesis (42.7%) followed by altered consciousness (26.8%) and slurred speech/loss of speech (14.6%). These prominent clinical presentations align with most known symptoms of stroke in the general population, such as unilateral motor disabilities (extremity and facial drooping) and slurred speech.^{38,39} These symptoms commonly caused by the neurological deficit due to stroke in the anterior circulation. While hemiparesis more frequently presented as the chief complaint in ischemic stroke, altered level of consciousness was more common in hemorrhagic stroke. Unfortunately, it is less known in public as one symptom indicating a stroke.³⁹ Nevertheless, in the view of health care providers, differences in chief complaints may help to differentiate ischemic and hemorrhagic stroke in pre-hospital setting or facilities lack in CT/MRI imaging capability. After all, immediate recognition and identification will increase the accuracy of the treatments and reduce the latency of admission to treatment.⁴⁰

This study also presents brief data regarding the most common anatomic site of the stroke. In cerebral infarction, the most common sites were the basal ganglia which account for 25% followed by internal capsule (20.5%) and parietal lobe (11.4%). The tendency of infarct in the basal ganglia and internal capsule were also observed in the study by Patne et al. and Eapen et al.^{5,41} Those sites indicates the involvement of anterior circulation especially the middle cerebral artery territory. Likewise, the most common site for haemorrhage was in the lenticular-capsular structure in the distribution supplied by perforating artery (basal ganglia, internal and external capsule), it accounts for 44.7%. The next, followed by lobar distribution (frontal, parietal, occipital) in 18.4%. The frequent involvement of this structure was also documented in the study describing the common anatomic topography and lesion size of stroke by Sperber et al.⁴²

We acknowledge that our results might not reflect the population as the source of data was a tertiary-referral hospital. Relatively small study subject also might not show the less frequent variant of stroke and its risk factor. Nevertheless, this data may prove useful in advancing stroke care, designing national prevention program, treatment protocol and as the basis for future and more comprehensive study of stroke in our population.

CONCLUSION

The occurrence of stroke rises with age and peak in late adulthood. This study showed male predominance both in ischemic stroke and hemorrhagic stroke. Cerebral infarction was more common than haemorrhage with hypertension amongst the leading risk factors. Hemiparesis and altered level of consciousness were the typical clinical presentation with the structure in the lenticular-capsular area and basal ganglia as the most common pathologic site in hemorrhagic and ischemic strokes respectively.

CONFLICT OF INTEREST

All authors declare no conflict of interest.

AUTHOR CONTRIBUTION

KT and IDPGPS designed and supervised the study. KAW and IGPS collected the data and conducted the statistical analysis. KT, KAW and IGPS drafted the manuscript, IDPGPS revised and approved the final version.

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