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Stroke Risk Factor Profile in an Urban Population: A Community-Based Descriptive Study in Mojo Sub-District, Surabaya, Indonesia

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ABSTRACT

Introduction: Stroke is still a major cardiovascular disease in Indonesia. Locally published data regarding stroke risk factors is still rarely reported. This condition complicates the regulation, policy-making, and community empowerment efforts to reduce modifiable stroke risk factors. Thus, a study is necessary to provide an overview of stroke risk factors and risks in cities in Indonesia, such as Surabaya. **Objective:** This study aimed to describe stroke risk factors in an urban Indonesian community, such as the Mojo sub-district in Surabaya. **Methods:** This was a descriptive study to describe stroke risk factors like age, gender, history of comorbidities, and history of cardiovascular disease, as well as patient clinical data like neurological symptoms, cardiovascular symptoms, anthropometry, vital signs, simple laboratory values, and cardiovascular risk categorization in the next ten years based on the Cardiovascular Disease Risk Index chart, Indonesian version. **Results:** In this study, 33 participants were included. Risk factors showed that many participants had histories of active smoking (18.2%), hypertension (45.5%), and diabetes (24.2%). One-third of the participants had a history of dyslipidemia. Based on the risk chart for cardiovascular disease, 36.3% of participants were at >10% risk of developing cardiovascular disease in the next ten years. **Conclusion:** The risk index of cardiovascular disease in the Mojo sub-district, Surabaya, was still high. A combination of government policies, public awareness improvement, and community empowerment are urgently required to manage these risk factors epidemiologically.

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INTRODUCTION

Stroke is still the main cardiovascular disease in Indonesia.[1] Cohort study data from 1990–2019 indicates that the global mortality rate from stroke is not as high as heart disease but can cause disability in patients.[2,3,4] The prevalence rate has also been reported to be increasing, both nominally and in percentage.5 This makes stroke one of the diseases with the highest burden. Stroke prevention efforts are divided into two categories: primary efforts before illness and secondary efforts after illness.[6,7,8] Primary efforts are carried out by manipulating modifiable stroke risk factors, such as smoking, diabetes, dyslipidemia, other metabolic diseases, gout, heart disease, kidney disease, and coagulation disorders. Primary efforts also include the detection of other minor causes of stroke, such as vascular malformations and anomalies.

Stroke can be detected early in first-level health facilities. Early detection data can aid in policy-making to reduce stroke risk factors.[9,10] However, locally published data on stroke risk factors is still rarely reported. This complicates regulation and policy-making as well as community empowerment efforts to reduce modifiable stroke risk factors. As a result, a study that can provide an overview of stroke risk factors and risks in Indonesian cities is required.

OBJECTIVE

This study aimed to describe stroke risk factors in an urban Indonesian population, starting at the sub-district level, and categorize them based on the Cardiovascular Disease Risk Index chart, Indonesian version.

METHODS

This was a descriptive study targeting the adult community in urban areas. The accessible population was sampled around the Mojo primary public health center, Mojo sub-district, Surabaya, Indonesia. The study was done in October 2022. Consecutive sampling methods were used for sampling.

The inclusion criteria for this study were adult patients over the age of 18. All participants agreed to undergo a complete examination, and patients filled out the consent form for study participation. The exclusion criteria for this study were invalid or incomplete data. This study was conducted under a legal permit issued from the Surabaya City Government with recommendation No. 070/2760/S/RPM/436.7.15/2022.

This study used examination variables based on the criteria of the Cardiovascular Disease Risk Index chart, Indonesian version, from the Health Ministry of the Republic of Indonesia and relevantly related factors. The risk factor variables studied were age, gender, history of comorbidities (hypertension, diabetes, dyslipidemia, and other comorbidities), history of cardiovascular disease (stroke and heart disease), and patient clinical data in the form of neurological symptoms, cardiovascular symptoms, anthropometry (height, weight, and body mass index), vital signs (systolic blood pressure, diastolic blood pressure, pulse rate, and respiratory rate), simple laboratory values (fasting blood sugar and cholesterol), and the Mini-Mental State Examination (MMSE) score.

Study data were collected by senior neurology residents of Universitas Airlangga. Regular-history taking procedures were used to assess patient history and comorbidities. Blood pressure and pulse rate were recorded using a digital sphygmomanometer (*Omron*® HEM 8172, Kyoto, Japan). Standard-issue medical weight and height scales were used to collect anthropometric data. Fasting blood sugar and total cholesterol data were collected using a point-of-care device (*EasyTouch*®, Bioptik, Inc., Taiwan). All the data were tabulated into a risk scale based on categorizing cardiovascular risk in the next ten years according to the Cardiovascular Disease Risk Index chart, Indonesian version.

The data results were presented as descriptive statistics based on the data types and distribution. The normal distribution was analyzed using the Saphiro-Wilk test. The mean was used for normal distribution, while the median was used for abnormal distribution if applicable.

RESULTS

A total of 38 participants took part in the screening examination, but only 33 participants completed the data. A total of 5 participants were excluded from the analysis because the MMSE could not be fully examined due to aphasia, they refused to participate in the MMSE, and one patient withdrew from the study. The results of the Saphiro-Wilk normality test showed a normal distribution for age, smoking history, systolic blood pressure, total cholesterol, pulse rate, height, and weight ($p > 0.05$). The average value (mean) was used as a concentration measure for these variables.

Demographically, the gender distribution of participants was almost equal. The mean age of the participants was 55.67 ± 12.74 years, with the majority being high school graduates. Most of the participants worked in the private sector (24.2%), followed by government employees (21.2%), retirees (21.2%), and those who took care of the household (18.2%). Most of the participants were married (93.9%).

The risk factor data showed that quite a few participants had a history of active smoking (18.2%). Hypertension was present in almost half of the participants (45.5%). A history of diabetes was current in nearly a quarter of the participants (24.2%). Major vascular diseases were presented in varying percentages: stroke (6.1%) and heart disease (21.4%). One-third of the participants (33.3%) had a history of dyslipidemia. Gout was another comorbidity present in one participant. Demographic data and risk factors are summarized in Table 1.

Clinical characteristics of the participants showed that neurological symptoms were quite prevalent. For example, the most common were paraesthesia and sensory symptoms (33.3%) and headache (9.1%). Compared to neurological-related symptoms, cardiovascular-related symptoms were relatively rare (6.1%). Anthropometry revealed that the average participant was overweight, weighing 65.55 ± 15.57 kg. Vital signs showed that most of the participant's systolic blood pressure was in the upper limit for prehypertension (140 mmHg). The results of the MMSE examination showed that the mental status of most of the patients was within normal limits. The participant's average fasting blood sugar was within normal limits (normal < 126 g/dL), while the average total cholesterol was high (214.42 ± 53.90 mg/dL). Based on the risk chart for cardiovascular disease, 36.3% of participants were at >10% risk of developing cardiovascular disease in the next ten years. The clinical characteristics of the patients are summarized in Table 2.

DISCUSSION

The main stroke risk factors are divided into two types: modifiable risk factors and non-modifiable risk factors.[11,12] Non-modifiable risk factors for stroke include age over 65, gender, genetic susceptibility, and relative geo-social-cultural conditions.[13–16] Modifiable risk factors for stroke include the presence of co-morbidities such as hypertension, diabetes, dyslipidemias, coagulation disorders, and lifestyle-related factors such as smoking and obesity.[11–13,17] The assessment of stroke risk factors is an essential part of community epidemiology because it can describe the level of cardiovascular health and predict the risk of disease at the community level.[17,18]

Stroke is a type of cardiovascular disease that affects the brain. Thus, the use of the Cardiovascular Risk Index chart can be an alternative for the assessment of stroke risk factors. There are several cardiovascular risk assessment systems, one of which is the pioneering Framingham Score. The Framingham score is a modality of the results of the Framingham surveillance study for coronary heart disease that was then modified into a cardiovascular risk scoring system.[19] The Framingham score states that the risk of cardiovascular disease in the next ten years can be assessed based on gender, age, blood pressure, total cholesterol, diabetes mellitus, and smoking history.[19] The modified Framingham Score results are divided into 25-point categories, each of which has a different interpretation depending on gender.[20] The interpretation of the Framingham Score has been further modified, for example, to assess cardiac age and target therapy for dyslipidemia. It is now plotted in the form of the *Riesgo Coronario Navarra* chart (RICORNA) and SCORE.[21,22] These plots are considered the early development of the Cardiovascular Risk Index chart. The specific use of a similar chart specifically for stroke is still limited. One of the earliest examples of a stroke-specific chart is the JMS Cohort Study from Japan, which published a stroke-specific index chart earlier than SCORE.[23] The Framingham Score served as the database, allowing for separately predicting hemorrhagic and ischemic stroke. However, validation and localization are still required to adapt this study to the Indonesian urban community.

According to the findings of this study, even among Surabaya residents with secondary or higher education, the risk of cardiovascular disease was still quite high, at 36.3%, with a probability of more than 10% experiencing any cardiovascular disease. This demonstrated that stroke risk factors are still not being adequately managed at the community level. It was found that at an average age of 55–56 years, which was younger than the risk factor age of 65 years, participants had excess body weight, systolic blood pressure at the lower threshold of stage I hypertension, and a total cholesterol value that exceeded the threshold of 200 mg/dL. In this study, there were signs of abnormal fasting blood sugar distribution, which showed a risk of diabetes and impaired glucose tolerance.

Studies show that the lack of control over risk factors for the disease at the community level should not only be assessed by host factors. According to research, abnormal findings of community-level risk factors must be evaluated based on the agent and environmental components.[24,25] Access to diets that do not support risk factor reduction has been shown to be a significant agent of high-risk factors for uncommunicated disease in a community.[26,27,28] Studies also show that the lack of social engineering efforts in the health sector can be an important environmental factor hindering risk factor reduction goals.[24,25,28–30] According to the evidence, regulating government policy is a crucial first step in reducing risk factors, followed by community empowerment and increased public awareness.[29,31]

The presence of neurological symptoms does not always indicate a stroke. However, the findings in this

study proved that more than half (57.6%) of the population had neurological symptoms. No studies have shown whether cardiac manifestations are more likely to occur later than neurologic symptoms, but the results of this study indicate a possibility.

This research is a pilot study, which has limitations. First, the descriptive study design cannot represent the longitudinal and temporal condition of the population to validate the cardiovascular risk index. Second, the existing and used cardiovascular risk indices are general cardiovascular risk indices that still need to be adjusted specifically for stroke assessment. Third, for the risk factor variable in the form of blood sugar, the number of research samples still needs to be larger to draw any conclusions. Fourth, while the initial data show a significant result, the study design limits this study's representativeness for a wider spectrum of the population. Hence, caution is needed when applying this study's results to a wider population.

CONCLUSION

The risk index for cardiovascular disease in the Mojo sub-district of Surabaya remained high. The dominant risk factors for stroke in the population of Mojo sub-district, Surabaya, were excess body weight, high systolic blood pressure, and high total cholesterol. A combination of government policies, public awareness improvement, and community empowerment are urgently required to manage these risk factors epidemiologically. More research is needed specifically designed to assess stroke-related risk in a wider spectrum of urban populations, as well as the development of a validated Indonesian-translated stroke-specific risk index scoring system.

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Author contributions

II and MAA provided the main manuscript writings. MWR helped collect raw data and recapitulation. DSB coordinated the data collection process. DK and SS provided independent consultation for manuscript review and revisions.

Conflict of Interest

The authors have no conflicts of interest regarding special relationships during the data collection, analysis, and writing of this research manuscript.

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TABLES AND FIGURES

Table 1. Participant Demographic Characteristics

Parameters	N	%	Mean	Median	Standard Deviation
Sex					
Male	15	45.5			
Female	18	54.5			
Age (Year)			55.67		12.74
Education					
Elementary school	9	27.3			
Junior high school	4	12.1			
Senior high school	10	30.3			
Diploma	2	6.1			
Bachelor Degree	7	21.2			
Masters	1	3.0			
Employment sector					
Unemployed	3	9.1			
Housewife	6	18.2			
Civil servant	7	21.2			
Private business	8	24.2			
Health	1	3.0			
Military	1	3.0			
Retired	7	21.2			
Marital status					
Unmarried	2	6.1			
Married	31	93.9			
Smoking					
No	27	81.8			
Yes	6	18.2			
Hypertension					
No	18	54.5			
Yes	5	45.5			

cont...

Table 1. Participant Demographic Characteristics

Parameters	N	%	Mean	Median	Standard Deviation
Diabetes mellitus					
No	25	75.8			
Yes	8	24.2			
Stroke					
No	31	93.9			
Yes	2	6.1			
Cardiovascular disease					
No	26	78.8			
Yes	7	21.2			
Dyslipidemia					
No	31	93.9			
Yes	2	6.1			
Another comorbidity history[a]					
No	32	97.0			
Yes	1	6.1			

[a] Comorbidity noted: hyperuricemia

Table 2. Clinical Characteristics and Cardiovascular Risk Index Participants

Paramerics	N	%	Mean	Median	Standard Deviation
Neurologic Symptoms (As reported)					
No symptoms	14	42,4			
Paresthesia and other sensory symptoms	11	33,3			
Headache	3	9,1			
Radicular pain	2	6,1			
Vertigo	2	6,1			
Hemiparesis and other motoric symptoms	1	3,0			
Cardiovascular Symptoms (As reported)					
No symptoms	31	93,9			
Dyspnea	2	6,1			
Anthropometry					
Height (cm)			155,58		8,23
Weight (kg)			65,55		15,57
Body mass index (kg/m^2)			26,99		5,65
Vital Signs					
Systolic blood pressure (mmHg)			140,18		21,79
Diastolic blood pressure (mmHg)				78	16,41
Heart rate (times/minute)			79,91		11,07
Respiratory rate (times/minute)				20	1,03
MMSE Score				28	2,16
Basic Point-Of-Care Risk Factor Assessment					
Total cholesterol (mg/dL)			214,42		53,90
Fasting blood glucose (mg/dL)				93	64,70
Cardiovascular Risk Index					
<10%	21	63,6			
10-20%	8	24,2			
20-30%	3	9,1			
30-40%	0	0			
>40%	1	3,0			