



# The Incidence and Prevalence of Stroke by Cause in Indonesia Based on Global Burden of Disease Study 2019

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**Abstract.** Stroke is the world's second largest cause of mortality and the leading cause of disability. The report of incidence and prevalence of stroke by cause in Indonesia based on national population was limited. The objective of this study was to explore the incidence and prevalence of stroke and cause of stroke by province, sex, and age categories in Indonesia. The causes of stroke in Indonesia, including each province, were collected from the Global Burden of Disease study (GBD) 2019. The age-standardized incidence rates and age-standardized prevalence rates per 100,000 individuals with 95% Uncertainty Intervals (UIs) were used to estimate the incidence and prevalence characteristics. The cause of stroke was classified into three types: intracerebral hemorrhage, ischemic stroke, and subarachnoid hemorrhage. In 2019, the national incidence and prevalence of stroke in Indonesia were 293.33 (262.2 – 331.6 95% UIs) and 2,097.22 (1878.2 – 2351.8 95% UIs) per 100,000 individuals, respectively. East Kalimantan province holds the highest rank in the incidence rate of stroke and ischemic stroke as well as the prevalence rate for almost all types of stroke, except for subarachnoid hemorrhage, which Yogyakarta holds. Meanwhile, the highest incidence rates for intracerebral hemorrhage and subarachnoid hemorrhage were in the provinces of South Kalimantan and North Maluku, respectively. Females and over 70 years of age had a higher incidence and prevalence of stroke than other groups.

**Keywords:** Incidence rates · Prevalence rates · Stroke

## 1 Introduction

Stroke cases worldwide experienced a sharp increase between 1990 and 2019. The incidence of stroke increased by 70%, while the prevalence increased by 85%. The increase in death from stroke also increased by 43% and disability-adjusted life-years (DALYs) due to this cause increased by 32%. In 2019, stroke was the second-leading

cause of death [1, 2] and the third-leading cause of combination death and disability worldwide. The prevalence and incidence rates of stroke are at 101 million and 12.2 million, respectively [1].

Stroke incidence is reported to be higher in middle-income countries than in high-income countries [2, 3]. It is critical to map cases in each region in order to gain an overview of the cases in that region. Around half of all stroke-related deaths are caused by inadequate intervention of modifiable risk factors, and thus could be avoided [3]. One of the factors that can help reduce stroke rates is lifestyle modification [4, 5]. Hopefully, by knowing that a particular area has a high stroke rate, more preventive measures can be implemented.

In Indonesia, the incidence and prevalence of stroke, especially by cause, were reported in a limited number of studies based on the national population. The aim of this study was to explore the incidence and prevalence rate of stroke, as well as the causes of stroke, in Indonesia by province, gender, and age group.

## 2 Method

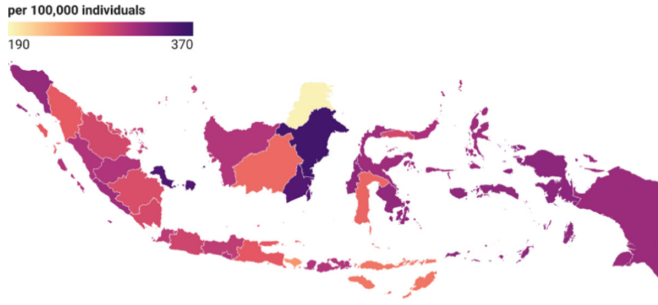
This study is part of GBD 2019. The GBD team performed a systematic effort to estimate the levels and trends of burden caused by 369 diseases and injuries by gender, age, year (from 1990 to 2019), and location, which included 204 countries and territories. The eligibility criteria for GBD 2019, the literature search approach, and data extraction are all detailed elsewhere [6, 7]. We gathered information on the age-standardized incidence and prevalence rates of stroke in the Indonesian population. We describe the data collected based on the cause of stroke and present it by province. In addition, we conducted analyses based on gender and age group. All estimates were expressed in terms of rates per 100,000 individuals, with 95% Uncertainty Intervals (UIs). This study's data are available on the Global Health website (<http://ghdx.healthdata.org>). Map visualization created using the datawrapper application (<https://www.datawrapper.de/>).

The causes of stroke are categorized into intracerebral hemorrhage, ischemic stroke, and subarachnoid hemorrhage. The GBD team's operational definition for Stroke and its classification is based on WHO guidelines. Stroke was defined as the quick onset of clinical indications of (typically localized) disruption of brain function that lasted more than 24 h or resulted in mortality. Ischaemic stroke is a type of stroke that causes neurological damage due to a localized cerebral, spinal, or retinal infarction. Intracerebral haemorrhage is a type of stroke that occurs when there is a focused collection of blood in the brain that is not caused by trauma. Non-traumatic stroke caused by bleeding into the brain's subarachnoid area is known as subarachnoid haemorrhage [1, 8].

## 3 Result and Discussion

### 3.1 Incidence Rate Stroke by Province

In 2019, Indonesia's national stroke incidence rate was 293.3 (262.2–331.6 95% UIs) per 100,000 individuals. Ischemic stroke, intracerebral haemorrhage, and subarachnoid haemorrhage were sequentially the highest to lowest leading causes of stroke, in terms



**Fig. 1.** Age-standardized incidence rate Stroke 2019

of prevalence. With 361.6 (319.9–410.0 95% UIs) and 195.0 (172.6–222.5 95% UIs) per 100,000 individuals, respectively, East Kalimantan had the highest and North Kalimantan had the lowest stroke incidence rates (Fig. 1). The highest and lowest incidences of intracerebral haemorrhage were 151.5 (129.1–176.8 95% UIs) per 100,000 individuals in South Kalimantan and 69.9 (59.4–82.2 95% UIs) per 100,000 individuals in North Kalimantan, respectively. Ischemic stroke incidence rate ranges from 112.4 (93.7–135.6 95% UIs) in North Kalimantan to 199.8 (166.0–243.9 95% UIs) per 100,000 individuals in East Kalimantan. The province of North Kalimantan had the lowest incidence of subarachnoid haemorrhage, with 12.7 (10.5–15.4 95% UIs), and North Maluku had the highest, with 17.2 (14.5–20.3 95% UIs) per 100,000 individuals (Table 1).

### 3.2 Prevalence Rate Stroke by Province

The national stroke prevalence rate in Indonesia was 2,097.2 (1878.1.2 – 2,351.8 95% UIs) per 100,000 individuals in Indonesia. East Kalimantan had the highest stroke prevalence rate (926.6 (769.5–1,090.1 95% UIs)) and North Kalimantan had the lowest (456.3 (380.0–535.0 95% UIs)) per 100,000 individuals, respectively (Fig. 2). East Kalimantan had the highest and North Kalimantan had the lowest prevalence of intracerebral haemorrhage, with 926.6 (769.5–1,090.1 95% UIs) per 100,000 individuals and 456.3 (380.0–535.0 95% UIs) per 100,000 individuals, respectively. The prevalence of ischemic stroke ranges from 1,032.7 (879.9–1,205.6 95% UIs) in North Kalimantan to 1,944.6 (1,640.4–2,307.1 95% UIs) in East Kalimantan per 100,000 individuals. East Nusa Tenggara had the lowest prevalence of subarachnoid hemorrhage, with 109.9 (91.4–132.4 95% UIs), while Yogyakarta had the highest, with 122.4 (102.6–147.1 95% UIs) per 100,000 individuals (Table 2).

### 3.3 Incidence and Prevalence Rate Stroke by Sex and Age

Stroke has a high incidence and prevalence rate, with women and people over the age of 70 bearing the brunt of the disease (Table 3). However, if the cause of the stroke is specified, the dominance shifts slightly. The majority of intracerebral hemorrhage, ischemic stroke, and subarachnoid hemorrhage cases were male, female, and nearly equal, respectively. The age group 70 years and older is the most common for all types of stroke, followed by the age group 50–69 years.

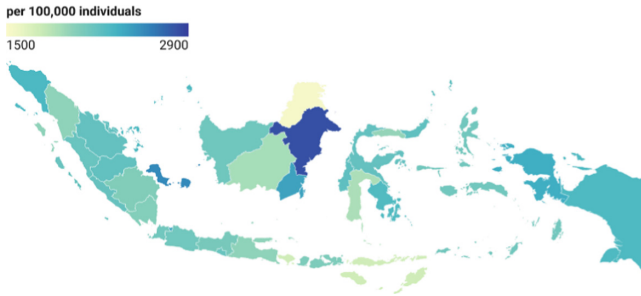
**Table 1.** Age-Standardized Incidence Rate Stroke By Cause In Each Province

Province	Stroke Rate per 100,000 (95% UI)	Intracerebral hemorrhage Rate per 100,000 (95% UI)	Ischemic stroke Rate per 100,000 (95% UI)	Subarachnoid hemorrhage Rate per 100,000 (95% UI)
<b>Aceh</b>	321.2 (287.3–363.8)	135.2 (115.0–157.0)	169.8 (141.2–204.9)	16.2 (13.6–19.2)
<b>Bali</b>	245.9 (219.1–277.5)	104.7 (88.8–122.9)	126.3 (104.9–152.7)	14.9 (12.5–17.8)
<b>Bangka-Belitung Islands</b>	352.8 (314.2–398.4)	148.4 (125.6–173.9)	188.7 (156.3–226.5)	15.8 (13.3–18.8)
<b>Banten</b>	301.7 (269.6–341.3)	126.3 (107.5–148.2)	159.3 (132.8–193.1)	16.1 (13.6–19.0)
<b>Bengkulu</b>	315.4 (282.2–354.5)	136.0 (115.7–158.9)	163.3 (136.7–196.5)	16.1 (13.6–19.1)
<b>Central Java</b>	300.2 (267.4–339.8)	122.3 (103.9–143.9)	162.0 (135.2–197.5)	15.8 (13.3–18.8)
<b>Central Kalimantan</b>	269.1 (238.8–303.6)	112.1 (95.2–131.5)	142.8 (119.5–172.3)	14.3 (12.0–16.9)
<b>Central Sulawesi</b>	317.2 (282.8–360.4)	138.9 (118.4–163.0)	162.4 (135.5–196.9)	15.9 (13.4–18.9)
<b>East Java</b>	278.7 (246.9–316.2)	113.4 (96.2–132.9)	150.6 (124.7–182.6)	14.8 (12.4–17.7)
<b>East Kalimantan</b>	361.6 (319.9–410.0)	145.9 (123.3–172.5)	199.8 (166.0–243.9)	15.9 (13.4–18.9)
<b>East Nusa Tenggara</b>	263.0 (235.5–298.2)	116.5 (98.3–137.2)	131.7 (110.4–159.3)	14.8 (12.5–17.7)
<b>Gorontalo</b>	290.5 (260.5–325.9)	127.8 (108.8–149.7)	146.8 (123.1–176.1)	15.9 (13.4–18.9)
<b>Indonesia</b>	293.3 (262.3–331.6)	119.4 (101.2–139.9)	158.7 (132.6–191.8)	15.3 (12.9–18.1)
<b>Jakarta</b>	297.5 (265.4–338.2)	104.2 (87.7–122.0)	179.0 (149.6–214.6)	14.3 (12.1–17.1)
<b>Jambi</b>	308.2 (273.8–349.2)	128.6 (108.9–150.4)	164.2 (137.1–195.9)	15.4 (13.0–18.3)
<b>Lampung</b>	288.7 (258.8–326.0)	118.5 (101.2–138.9)	154.4 (129.0–188.6)	15.8 (13.4–18.8)
<b>Maluku</b>	323.5 (289.6–362.5)	143.3 (121.7–168.2)	163.5 (137.2–196.5)	16.7 (14.1–19.8)

*(continued)*

**Table 1.** (continued)

<b>Province</b>	<b>Stroke Rate per 100,000 (95% UI)</b>	<b>Intracerebral hemorrhage Rate per 100,000 (95% UI)</b>	<b>Ischemic stroke Rate per 100,000 (95% UI)</b>	<b>Subarachnoid hemorrhage Rate per 100,000 (95% UI)</b>
<b>North Kalimantan</b>	195.0 (172.6–222.5)	69.9 (59.4–82.2)	112.4 (93.7–135.6)	12.7 (10.5–15.4)
<b>North Maluku</b>	317.1 (284.6–357.6)	140.9 (120.7–164.4)	159.0 (132.7–192.5)	17.2 (14.5–20.3)
<b>North Sulawesi</b>	311.4 (278.1–350.4)	132.3 (112.4–154.5)	163.5 (136.2–195.9)	15.7 (13.2–18.7)
<b>North Sumatra</b>	277.6 (247.4–313.8)	113.9 (96.9–133.5)	149.2 (124.7–180.4)	14.5 (12.3–17.2)
<b>Papua</b>	318.8 (285.2–359.2)	146.9 (124.8–171.7)	155.5 (129.5–188.4)	16.3 (13.8–19.6)
<b>Riau</b>	289.6 (258.6–327.4)	117.3 (99.6–137.8)	156.8 (130.6–190.4)	15.5 (13.1–18.4)
<b>Riau Islands</b>	300.5 (268.6–339.9)	120.0 (101.7–140.9)	164.6 (137.4–200.5)	15.9 (13.4–18.9)
<b>South Kalimantan</b>	351.5 (313.6–398.9)	151.5 (129.1–176.8)	184.0 (153.7–222.5)	15.9 (13.5–18.9)
<b>South Sulawesi</b>	271.7 (242.1–307.3)	112.7 (96.1–132.8)	144.7 (120.8–174.6)	14.3 (12.1–16.9)
<b>South Sumatra</b>	286.4 (255.6–325.6)	155.7 (98.2–135.9)	155.6 (130.2–188.4)	15.2 (12.8–18.1)
<b>Southeast Sulawesi</b>	322.4 (289.1–365.2)	139.9 (118.9–164.3)	165.7 (138.9–199.6)	16.8 (14.2–19.8)
<b>West Java</b>	293.0 (259.9–332.1)	111.6 (94.9–131.1)	166.4 (137.9–201.7)	14.9 (12.6–17.7)
<b>West Kalimantan</b>	307.5 (275.2–349.0)	131.7 (111.9–154.1)	159.9 (133.7–193.9)	15.9 (13.3–18.7)
<b>West Nusa Tenggara</b>	307.5 (274.5–343.9)	134.1 (114.0–156.6)	157.7 (131.4–188.3)	15.6 (13.1–18.6)
<b>West Papua</b>	325.3 (289.6–369.1)	139.3 (118.9–164.1)	169.4 (141.1–204.7)	16.5 (14.1–19.6)
<b>West Sulawesi</b>	324.3 (290.7–364.6)	146.2 (124.9–172.0)	161.8 (134.7–195.0)	16.3 (13.8–19.4)
<b>West Sumatra</b>	308.1 (275.1–346.1)	127.8 (108.8–149.9)	165.1 (138.3–198.4)	15.3 (12.9–18.2)
<b>Yogyakarta</b>	307.5 (274.9–346.5)	129.8 (110.5–152.0)	161.6 (134.9–194.4)	(13.6–19.2)



**Fig. 2.** Age-standardized prevalence rate Stroke 2019

**Table 2.** Age-Standardized Prevalence Rate Stroke By Cause In Each Province

Province	Stroke Rate per 100,000 (95% UI)	Intracerebral hemorrhage Rate per 100,000 (95% UI)	Ischemic stroke Rate per 100,000 (95% UI)	Subarachnoid hemorrhage Rate per 100,000 (95% UI)
<b>Aceh</b>	2,300.1 (2,045.5–2,582.2)	754.2 (628.7–886.1)	1,542.5 (1,319.2–1,817.7)	119.8 (100.3–143.7)
<b>Bali</b>	1,739.9 (1,553.5–1,951.2)	575.8 (480.4–674.1)	1,126.0 (950.1–1,340.2)	117.9 (98.9–141.6)
<b>Bangka-Belitung Islands</b>	2,564.0 (2,281.5–2,890.3)	837.7 (695.0–986.8)	1,748.7 (1,483.6–2,067.6)	114.6 (95.8–137.9)
<b>Banten</b>	2,130.6 (1,903.9–2,397.2)	687.6 (574.2–809.7)	1,426.6 (1,204.1–1,687.1)	119.9 (100.4–144.1)
<b>Bengkulu</b>	2,187.7 (1,946.8–2,479.3)	726.1 (604.4–860.0)	1,451.8 (1,231.3–1,713.1)	117.3 (98.0–140.4)
<b>Central Java</b>	2,097.2 (1,873.9–2,353.6)	671.9 (567.9–786.3)	1,406.0 (1,191.3–1,653.3)	120.9 (100.8–144.0)
<b>Central Kalimantan</b>	1,921.3 (1,713.7–2,165.2)	626.9 (527.5–734.2)	1,271.3 (1,083.8–1,506.7)	110.7 (92.3–132.9)
<b>Central Sulawesi</b>	2,202.2 (1,954.8–2,487.5)	754.1 (627.3–890.4)	1,442.5 (1,219.2–1,720.6)	113.7 (94.7–135.9)
<b>East Java</b>	2,001.9 (1,788.9–2,249.9)	638.5 (532.0–749.9)	1,341.2 (1,139.2–1,575.2)	116.1 (97.2–139.1)
<b>East Kalimantan</b>	2,821.2 (2,521.1–3,191.8)	926.6 (769.5–1,090.1)	1,944.6 (1,640.4–2,307.1)	115.8 (96.6–138.6)
<b>East Nusa Tenggara</b>	1,739.2 (1,551.3–1,958.3)	589.3 (493.3–697.2)	1,116.1 (944.1–1,313.5)	109.9 (91.4–132.4)

(continued)

**Table 2.** (continued)

<b>Province</b>	<b>Stroke Rate per 100,000 (95% UI)</b>	<b>Intracerebral hemorrhage Rate per 100,000 (95% UI)</b>	<b>Ischemic stroke Rate per 100,000 (95% UI)</b>	<b>Subarachnoid hemorrhage Rate per 100,000 (95% UI)</b>
<b>Gorontalo</b>	1,985.0 (1,775.5–2,229.5)	670.5 (558.3–787.2)	1,289.4 (1,093.4–1,514.3)	116.3 (96.8–141.3)
<b>Indonesia</b>	2,097.2 (1,878.1–2,351.8)	663.9 (557.1–777.1)	1,417.8 (1,210.3–1,667.9)	117.1 (98.3–140.4)
<b>Jakarta</b>	2,425.8 (2,185.8–2,732.5)	647.4 (547.1–756.3)	1,794.7 (1,524.2–2,108.9)	117.0 (98.5–140.3)
<b>Jambi</b>	2,207.2 (1,979.2–2,493.6)	710.2 (592.3–837.6)	1,492.5 (1,274.3–1,764.3)	115.0 (96.4–138.1)
<b>Lampung</b>	2,043.8 (1,828.3–2,292.7)	659.0 (552.3–777.2)	1,361.9 (1,151.6–1,604.3)	120.9 (101.3–144.9)
<b>Maluku</b>	2,131.3 (1,908.3–2,400.9)	715.6 (602.2–838.4)	1,402.6 (1,188.5–1,653.8)	115.6 (96.3–139.1)
<b>North Kalimantan</b>	1,536.2 (1,372.7–1,727.1)	456.3 (380.0–535.0)	1,032.7 (879.9–1,205.6)	113.9 (94.9–137.1)
<b>North Maluku</b>	2,130.7 (1,909.4–2,382.1)	734.4 (614.6–861.7)	1,375.4 (1,164.2–1,625.9)	119.8 (99.9–143.7)
<b>North Sulawesi</b>	2,212.0 (1,974.4–2,497.8)	721.5 (607.2–852.2)	1,485.2 (1,254.9–1,757.6)	116.3 (96.8–139.2)
<b>North Sumatra</b>	2,001.9 (1,788.9–2,244.4)	640.7 (536.6–752.2)	1,339.7 (1,138.8–1,570.7)	114.4 (95.7–138.1)
<b>Papua</b>	2,288.7 (2,054.6–2,564.3)	861.0 (719.7–1,009.2)	1,425.4 (1,205.4–1,681.2)	115.1 (95.9–137.9)
<b>Riau</b>	2,199.6 (1,962.8–2,481.3)	711.3 (601.8–834.4)	1,481.0 (1,253.5–1,748.2)	119.0 (99.5–142.9)
<b>Riau Islands</b>	2,290.6 (2,057.2–2,581.7)	718.7 (603.6–841.1)	1,571.2 (1,343.7–1,862.0)	121.2 (101.3–145.1)
<b>South Kalimantan</b>	2,434.6 (2,168.9–2,747.9)	805.1 (675.4–955.2)	1,643.7 (1,397.2–1,942.2)	112.9 (94.6–135.4)
<b>South Sulawesi</b>	1,895.5 (1,697.2–2,150.1)	600.3 (499.4–703.3)	1,271.6 (1,074.5–1,516.4)	110.6 (92.9–133.3)
<b>South Sumatra</b>	2,052.8 (1,832.0–2,308.7)	652.1 (542.1–764.6)	1,381.1 (1,166.6–1,624.5)	116.9 (97.4–141.1)

(continued)

**Table 2.** (continued)

Province	Stroke Rate per 100,000 (95% UI)	Intracerebral hemorrhage Rate per 100,000 (95% UI)	Ischemic stroke Rate per 100,000 (95% UI)	Subarachnoid hemorrhage Rate per 100,000 (95% UI)
<b>Southeast Sulawesi</b>	2,281.8 (2,048.9–2,564.8)	773.5 (646.3–912.9)	1,501.3 (1,275.2–1,762.4)	120.6 (100.5–145.3)
<b>West Java</b>	2,132.5 (1,903.8–2,401.5)	624.7 (524.0–735.7)	1,496.5 (1,270.6–1,771.8)	116.6 (97.6–140.6)
<b>West Kalimantan</b>	2,147.5 (1,927.7–2,419.9)	713.6 (601.1–837.8)	1,423.0 (1,207.2–1,694.6)	116.7 (96.9–140.3)
<b>West Nusa Tenggara</b>	2,068.6 (1,846.2–2,326.4)	686.2 (571.8–811.3)	1,369.5 (1,160.7–1,617.0)	111.5 (93.3–134.5)
<b>West Papua</b>	2,374.6 (2,114.9–2,665.6)	818.2 (680.7–973.8)	1,560.6 (1,325.9–1,838.3)	118.3 (98.9–141.9)
<b>West Sulawesi</b>	2,217.5 (1,982.0–2,510.2)	764.1 (645.8–895.7)	1,446.8 (1,221.3–1,723.1)	115.5 (96.5–139.3)
<b>West Sumatra</b>	2,175.1 (1,950.1–2,454.2)	698.5 (585.5–827.8)	1,468.1 (1,251.0–1,729.0)	115.3 (96.6–138.4)
<b>Yogyakarta</b>	2,174.7 (1,954.9–2,445.7)	707.1 (594.3–828.6)	1,454.1 (1,239.7–1,724.5)	(102.6–147.1)

**Table 3.** Age-Standardized Incidence and Prevalence Rate Stroke By Gender and Age Group

		Stroke Rate (95% UI)	Intracerebral hemorrhage	Ischemic stroke	Subarachnoid hemorrhage
<i>Incidence</i>					
<b>Sex</b>	Male	285.6 (255.7–323.2)	120.7 (102.9–141.9)	149.6 (124.1–180.1)	15.3 (13.0–18.2)
	Female	297.9 (265.3–337.1)	116.8 (99.1–135.1)	166.0 (139.4–201.3)	15.1 (12.7–18.0)
<b>Age</b>	Under 5 years	23.1 (14.7–34.0)	4.3 (2.3–7.1)	17.8 (10.5–29.0)	1.1 (0.5–2.0)
	5–14 years	20.4 (13.7–29.9)	7.4 (4.2–11.9)	11.3 (6.0–20.3)	1.7 (0.9–2.7)
	15–49 years	104.7 (87.2–123.3)	57.7 (43.5–73.4)	36.3 (26.7–48.8)	10.8 (8.5–13.5)
	50–69 years	741.2 (615.4–892.8)	309.1 (236.7–399.5)	394.4 (295.8–505.8)	37.7 (28.2–48.7)
	70+ years	1,825.7 (1,512.4–2,193.2)	623.9 (490.5–807.9)	1,144.5 (874.1–1,482.9)	57.3 (42.9–74.6)

(continued)



**Table 3.** (continued)

		Stroke Rate (95% UI)	Intracerebral hemorrhage	Ischemic stroke	Subarachnoid hemorrhage
<i>Prevalence</i>					
<b>Sex</b>	Male	1,960.6 (1,760.4–2,209.1)	700.7 (584.9–821.0)	1,239.1 (1,053.8–1,465.1)	112.4 (94.0–135.5)
	Female	2,208.9 (1,976.8–2,481.2)	629.7 (532.5–738.3)	1,567.9 (1,335.4–1,843.2)	120.3 (101.1–143.4)
<b>Age</b>	Under 5 years	4.5 (2.5–7.4)	7.6 (5.2–10.6)	31.1 (21.1–47.0)	1.9 (1.1–2.8)
	5–14 years	121.9 (88.3–165.1)	41.2 (28.8–56.2)	111.4 (76.9–156.6)	9.3 (6.1–13.7)
	15–49 years	965.8 (841.1–1,102.6)	421.9 (339.3–514.6)	485.2 (395.3–596.9)	89.5 (71.9–110.9)
	50–69 years	5,821.5 (5,068.4–6,720.2)	2,258.6 (1,811.2–2,807.2)	3,449.8 (2,788.9–4,244.9)	335.1 (266.2–424.5)
	70+ years	11,180.9 (9,117.7–13,623.5)	1,630.6 (1,217.1–2,158.7)	9,874.8 (7,654.5–12,603.7)	323.9 (235.4–427.0)

## 4 Discussion

This study demonstrated that the stroke prevalence and incidence in Indonesia were 293.33 and 2,097.22 per 100,000 individuals, respectively. The stroke prevalence from this study was higher compared to the global prevalence of 270 per 100,000 and USA prevalence of 260 per 100,000 in those over 20 years in 2017 [9]. Among countries in Asia, the number was also higher than the findings from Korea (159 per 100,000) and Thailand (185 per 100,000). However, the result was lower compared with China (719 per 100,000) and India (545 per 100,000) [10]–[13].

The WHO estimates are based on mortality data in which cerebrovascular disease is indicated as the cause of death [14]. Frequently, routine mortality statistics are the only data gathered on a national scale. While such data can offer a perspective of stroke trends and occurrence, numerous stroke studies were conducted in Indonesia, had determined that the validity of regular mortality stroke data was varying variable [15]. Data from the Ministry of Health showed that stroke prevalence in 2007 was 83 per 100,000 and risen to 121 per 100,000 in 2013, the prevalence of stroke in Indonesia has tended to rise [15, 16]. Stroke rates increased similarly in the majority of Asian countries, due to population aging and unhealthy lifestyles. Another plausible reason for the growing incidence is Indonesia's declining stroke death rate. This is unlikely to be the case with the Indonesian population, previous research has shown an increase in age-sex standardized mortality from 99 per 100,000 in 2002 to 193.3 per 100,000 in 2010 [17].

Stroke has considered being influenced by non-modifiable risk factors such as gender and age. This study discovered that females had a slightly greater stroke prevalence than males. This finding confirmed data from the American Heart Association, which indicated that generally, between 2011 and 2014, females had a stroke prevalence of 2.6 percent, which was greater than males 2.4 percent [9]. Indonesian data revealed a similar trend, with females and males experiencing a stroke prevalence was 12.1% and 12%,

respectively [15]. Moreover, it contradicted previous research findings indicating stroke was more frequent in males than females [18, 19]. In this study found that heritability of ischemic stroke and subarachnoid hemorrhage are higher in females than in males. Additionally, women face a greater lifetime risk than men due to the use of birth control tablets and pregnancy [20].

Age was a factor in causing chronic diseases including cardiovascular disease, cerebrovascular disease, and type 2 diabetes [21]. Age was a continuous risk factor for stroke, with the incidence and prevalence rates increased by a factor of two every five years beyond age 65 [22]. In this study found that incidence of stroke increased double after 50 years of age.

## 5 Conclusion

In Indonesia, the incidence and prevalence of stroke are quite high. Each province has a different number of cases, but the province of East Kalimantan requires special attention in stroke cases. Ischemic stroke is the most common type of stroke. Furthermore, women and people over the age of 70 are at a higher risk than other groups.

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