

Systematic Review: NCP for Mortality on Ischemic Stroke Patient

Fidiana Kurniawati^{a,1,*}

^a Lecture at STIKES RS. Baptis Kediri, Jl. Mayjend Panjaitan No. 3B Pesantren Kediri 64102

¹ fidianakurniawati@gmail.com

* Corresponding author

Keywords:

Predictor mortality
Stroke ischemia
Blood Pressure

ABSTRACT

Background: Stroke can cause an increase in mortality and the number one causing of long-term disability in the world. Stroke is an emergency condition that must be overcome within ≤ 4.5 hours. If it exceeds that time stroke patients will suffer disability and even death. The role of nurses in emergency situations is necessary to save patients and anticipate patients falling on critical conditions even death. The Nursing Care Plan in determining the predictors of ischemic stroke mortality is an early intervention in dealing with emergency diseases that nurses can perform. This study aimed to determine the pulse pressure, systolic blood pressure and diastolic blood pressure as a predictor of mortality that could be done by nurses independently.

Method: This study used Systematic review. Literature derived from using Pubmed, Medline, Science Direct, Proquest, Google Scholar databases. The researcher measured the measurement of effect expressed by hazard ratios (HR) and 95% confidence intervals (95% CI). Five publications were included in the analysis.

Result: The results collected showed that a 10 mmHg increase in pulse pressure was associated with an increased risk of stroke (HR 1.046, 95% CI 1.025-1.068, $P < 0.001$). In addition, blood pressure systolic (collected HR 1.053, 95% CI 1.033-1.073, $P < 0.001$) and diastolic blood pressure (collecting HR 1.056, 95% CI 1.038-1.074, $P < 0.001$) were found became a significant predictor of ischemic stroke. The insignificant relationship between pulse pressure and mortality predictors (HR 1.022, 95% CI 0.983-1.063, $P = 0.270$). Significant Systolic blood pressure with mortality (HR 1.008, 95% CI 1.002-1.014, $P = 0.012$), and no significant diastolic blood pressure (HR 1.023, 95% CI 0.964-1.085, $P = 0.451$). Significantly all related to all causes of death.

Conclusion: Pulmonary pressure and diastolic blood pressure were risk factors but not predictors of ischemic stroke mortality, systolic blood pressure was a predictor of mortality in ischemic stroke patients.

Copyright © 2018 Joint International Conference

All rights reserved

I. BACKGROUND

Stroke is one of the major causes of death in upper middle countries (WHO, 2013). Stroke is an attack that occurs in the brain due to blood vessel disorders, abrupt and cause symptoms in accordance with the part of the brain that has blood vessel disorders (Ntaios, Bath, & Michel, 2010). Stroke is included in cerebrovascular disease (CVD) which is an emergency disease that requires immediate relief. Stroke can cause an increase in mortality and is the number one cause of long-term disability in the world (Yint et al., 2016).

Mortality data is one of the important public health indicators and useful for determining health priorities, evaluating the program and planning the research to be done. Stroke is a major health problem in the world representing the third most common cause of death in the UK. The Oxford Vascular Study reported a 1.2-fold higher incidence of cerebrovascular disease than the incidence of coronary disease (Alonso, et al., 2015). World Health Organization says Indonesia has ranked 97th in

the world for the highest number of stroke patients with death total reached 138.268 people or 9.7% of total deaths occurred in 2011 (Geeganage et al., 2011). Based on SEAMIC (South East Asian Medical Information Center) data, the largest stroke mortality rate in Southeast Asia occurred in Indonesia (Yuziani et al., 2017). Based on the report on the pattern of causes of death in Indonesia from the 2010 death data analysis, the highest underlying cause of 15 districts was stroke disease of 17.7%, followed by ischemic heart disease (10.0%). Based on data from RI Health Department, (2010) stroke prevalence in Indonesia reached 8.3 per 1000 population. Provinces with the highest prevalence of stroke were Aceh Province (16.6 per 1000 population) and the lowest was Papua (3.8 per 1000 population).

Stroke is an emergency condition that must be overcome within ≤ 4.5 hours. If it exceeds that time stroke patients will suffer disability and even death. Management of stroke aims to smooth the flow of blood clogging in the brain (Song et al., 2015). Table 1 is a recommendation of stroke emergency evaluation by Advanced Cardiac Life Support (ACLS) and National Institute of Neurological Disorders and Stroke (NINDS).

Table 1. Stroke Evaluation Recommendation based on ACLS and NINDS

<i>Time Interval</i>	<i>Time target</i>
<i>Door to doctor</i>	<i>10 min</i>
<i>Access to neurologic expertise</i>	<i>15 min</i>
<i>Door to CT scan completion</i>	<i>25 min</i>
<i>Door to CT scan interpretation</i>	<i>45 min</i>
<i>Door to treatment</i>	<i>60 min</i>

II. METHOD

The National Stroke Association (NSA) outlines strokes into two classifications: ischemic stroke and hemorrhagic stroke (NSA, 2014) (Gorica & Jovanovic, 2017). The dominant stroke is ischemic stroke with a prevalence of 83% of the overall stroke and the remaining 17% is a hemorrhagic stroke (Adams et al., 2013). The prognosis or outcome of ischemic stroke depends on the type and duration of a stroke. Each type of stroke has different outcomes depending on the neurological deficits that arise based on the location of regional vascular lesions in the brain (Mardjono & Sidharta, 2009). Ischemic stroke can cause residual symptoms and disability in the form of physical restriction, social dysfunction and psychological chronic so that the number of dependence with others is very high (Rahmi, 2011). Mortality and morbidity Stroke is influenced by various factors, so it is necessary to identify the factors that influence it. Proper and comprehensive management in the prevention and treatment of signs and symptoms of Stroke is expected to prevent death in patients. The role of nurses in emergency situations is necessary to save patients and anticipate patients falling on critical conditions even death. The results of this study nurses are expected to understand, prevent, and reduce risk factors for stroke, so that it has the benefits that can determine control, prevent and cope with stroke. Identification of risk factors needs to be done to provide an effective basis for prevention efforts.

In this study used the method of Systematic Review design analysis and in accordance with specific inclusion indicators in the selection of documents through a comprehensive search system (Comprehensive literature search).

Eligibility Criteria in this study was conducted based on inclusion criteria to eliminate and select data. Types of study using Retrospective on predictor mortality factors in ischemic stroke patients, restriction of language using English with international journal publication, year of publication of document that were in 2004-2018. Respondents were patients with ischemic strokes of various age groups who came to the Emergency Department and experienced the first stroke.

This study identified the search for electronic databases, and searches for reference articles, there was no language restriction on the arithmetic. This study was taken from the electronic database PubMed, Science Direct and Google Scholar, through database scanning, and screening articles done

independently by researchers. The researcher follows the requirement in fulfilling the inclusion criteria.

Researchers used the electronic search strategy for each electronic database, with the limitation of inclusion criteria. Researchers used Search String: Predictor, Mortality, Ischemic Stroke. The researcher identified and collection the data using the extraction sheet through the PICO approach (Population, Intervention, compare, and outcome). The researcher extracted and checked data from the document being recorded. The data was also identified by the facilitator, to review the extraction results by the researcher, after which the discussion was done related to the data extraction that had been done by the researcher. Researchers conducted Critical Appraisal using the Critical Appraisal Skill Program (CASP) instrument.

Summary Measures was performed by caram identifying blood pressure and pulse in ischemic stroke patients to be a predictor of mortality in patients with ischemic stroke. The researchers reviewed 5 articles with Critical Appraisal Skill Program (CASP) to determine the predictor factor analysis of mortality in ischemic stroke patients, after that the data extraction with PICO approach was done to identify each indicator in the article. Systematic Review on ischemic stroke predictors to analyze blood pressure and pulse factors as a predictor of mortality in cases of ischemic stroke. The main purpose of this research was to know the blood pressure and pulse as predictors of mortality in ischemic stroke patients and could be done by nurses as NCP or independent action.

The data analysis of this research was done by identifying SD data, mean, and significance value (p) and analyzed data using management review with $I^2 > 75\%$, $P < 0.0001$. The data identified are citation, intervention type, compare, respondent type, output type, and follow up.

A total of 5 studies were selected to match the inclusion criteria after the review. Researchers used electronic search strategy for each electronic database, with inclusion criteria. Search using literature search strategy using PubMed, ProQuest, EBSCO, and Google Scholar search strategies. The search results were duplicated and an abstract review was conducted according to the study criteria. After data identification and then got 54 data accordingly, after done eligibility got 8 literatures accordingly. Researchers conducted in-depth identification of articles used (include) amounted to 5 articles.

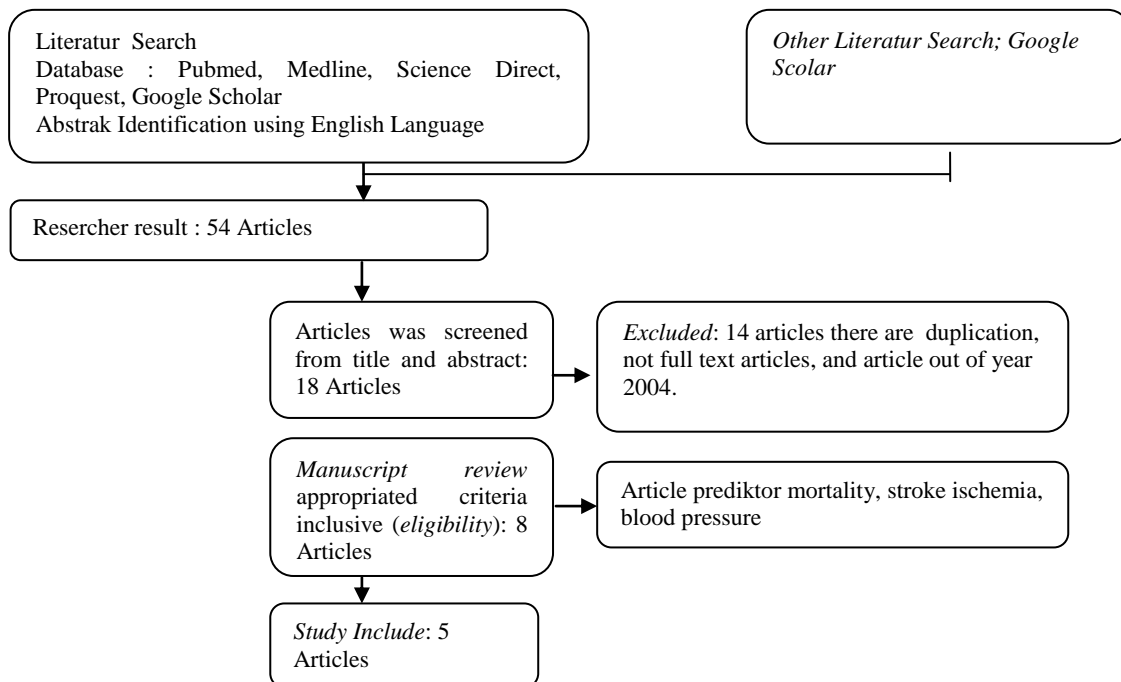


Figure 1. Picture of PRISMA Flow Chart for literature identification

III. RESULT

Table 2. Characteristic Responden of Systematic Review: NCP Predictor Mortality Stroke Ischemia

Researcher	Design	Responden	Charasteristic Responden
Glasser, 2015	Retrospective	25	Participants age \geq 45 years without history of stroke
Kao, 2011	Prospective	59	Participants with fluctuated blood pressure
Geegenage, 2011	RCT	1479	Participants with ischemic strokes
Inoue, 2009	Prospective	2369	Participants were 35 years or older without history of stroke
Grabska, 2009	Retrospective	1677	Participants were hospitalized for acute ischemic stroke
Vemmos, 2004	Prospective	198	Participants in ED for suspected acute ischemic stroke

Abbreviation: RCT = *randomized controlled trials*, ED = Emergency Departement

Based on Table 2 the characteristics of respondents in this systematic review include \geq 45-year-old patients coming to hospitals with a history of acute stroke, not recurrent stroke, patients with elevated blood pressure, patients came to ED with ischemic stroke, \geq 35 years of age or older with no stroke history with high blood pressure, as well as patients coming to the ED with suspected ischemic stroke. The designs in this study included RCT, Prospective and Retrospective, with a total of 5.807 respondents.

Table 3. Characteristic Pulse Pressure, Systolic Blood Pressure and Diastolic Blood Pressure in Patient with Stroke Ischemia

Researcher	Patients	Mortality prosentase	Pulse Pressure (mmHg)	Systolic Blood Pressure (mmHg)	Diastolic Blood Pressure (mmHg)
Glasser, 2015	25	NR	NR	NR	NR
Kao, 2011	59	10.9%	60.4 (17.9)	148.5 (21.6)	88.1 (13.9)
Geegenage, 2011	1479	4.1%	NR	156.4	84.6
Inoue, 2009	2369	NR	40.6 (9.9)	124.2 (15.1)	74.5 (9.9)
Grabska, 2009	1677	30.6%	NR	151.6	88.2
Vemmos, 2004	198	17.7%	70.4 (16.4)	161.3 (21.2)	90.9 (14.8)

Abbreviation: NR= *Not Reported*

Table 4. Characteristic of Stroke *Hazard Ratio* Stroke and Mortality Hazard Ratio

Researcher	<i>Hazard Ratio Stroke</i>			<i>Hazard Ratio Mortalitas</i>		
Glasser, 2015	1.11 (1.06-1.16)	1.11 (1.07-1.16)	1.13 (1.05-1.22)	NR	NR	NR
Kao, 2011	0.99 (0.64-1.55)	0.85 (0.55-1.31)	0.71 (0.43-1.18)	1.31 (0.95-1.80)	1.05 (0.77-1.43)	0.69 (0.47-1.02)
Geegenage, 2011	1.026 (1.008-1.044)	1.031(1.031-1.094)	1.025(0.995-1.057)	1.003 (0.986-1.021)	1.010 (0.995-1.025)	1.027 (0.999-1.055)
Inoue, 2009	1.29 (1.13-1.46)	1.48 (1.28-1.70)	1.34 (1.17-1.54)			
Grabska, 2009				1.013 (1.000-1.026)		
Vemmos, 2004				1.39 (1.04-1.86)		

Abbreviation: NR= *Not Reported*

Based on table 3 showed mortality in 5 research journal ranging from 4.1% to 30.6%, in stroke incidence. The value of pulse pressure is the difference of systolic and diastolic blood pressure in 5 research journals that is 40.6 to 70.4 mmHg. The normal value of pulse pressure was 40 - 60 mmHg. Based on these results indicated the pulse pressure above normal, while systolic blood pressure from 5 journals were 124.2 to 161.3 mmHg and diastolic blood pressure 74.5 to 90.9 mmHg (Table 3). Measurement of pulse pressure and blood pressure were predictor of mortality patients with ischemic stroke in each respondent study, presented with hazard ratios, hazard mortality and 95% CI, showed in Table 4.

IV. DISCUSSION

The results of the systematic review study found that pulse pressure and systolic blood pressure and diastolic significantly could predict mortality of 4.1 to 30.6% in patients with ischemic stroke. The research used in this systematic review used RCT, retrospective and prospective design. Systematic review was not all research using blank methods, so the possibility of subjectivity though research using RCT (Iib). The possible bias is that not all research journals are blank method, the search language limitation used by researchers to review and publish the journal was not selected in the search method.

The results showed that an increase in 10 mmHg pulse pressure was associated with an increased risk of stroke (HR 1.046, 95% CI 1.025-1.068, $P < 0.001$). Results from 5 blood pressure research journals showed significant predictors for stroke (HR 1.053, 95% CI ($P < 0.001$, $I^2 = 81.4$). Subjects with higher diastolic blood pressure also had a higher stroke risk (HR 1.056, 95% CI 1.038-1.074, $P < 0.001$, $P < 0.001$), with heterogeneity at whole of the study $P < 0.001$). The pulse pressure result with mortality showed a significant deficiency (HR 1.022, 95% CI 0.983-1.063, $P = 0.270$) with high heterogeneity among the studies, on the other hand, a significant association was found between systolic blood pressure and the cause of mortality (HR 1.008, 95% CI 1.002-1.014, $P = 0.012$), whereas there was no significant relationship between diastolic blood pressure and mortality (collected HH 1.023, 95% CI 0.964-1.085, $P = 0.451$).

Pulse pressure has been recognized as a risk factor for stroke, but previous studies reported it had less predictive value compared with other blood pressure indices, such as systolic blood pressure. The collaboration of the Asia Pacific Cohort Study showed that a stronger stroke relationship was observed for SBP in men with 50-69 years of age and in women of all age groups. Diastolic blood pressure and mean arterial pressure (MAP) were also shown to have a stronger association with stroke and ischemic heart disease when compared with pulse pressure (Okada, et al., 2011). In another study, the ratios hazard for all strokes was 1.68 for 1.72 systolic blood pressure diastolic blood pressures and 1.80 for mean blood pressure, which was higher than that for pulse pressure 36. In the Ohasama study, pulse pressure is also a weak stroke predictor compared to other blood pressure indices (Inoue et al., 2009). However, in the Kao study, pulse pressure has a better predictive value for all causes of death or predictors of sectional hypertensive systolic blood pressure, while blood pressure has no predictive value. In addition, blood pressure may not be associated with any type of cardiovascular disease. Heart under 100 bpm in patients undergoing crisis hypertension (systolic blood pressure over 180 or diastolic blood pressure over 120) is associated with multi-organ damage (eg central nervous system, cardiovascular system).

Almost all articles in this study conducted proportional hazards regression analysis. For example, the Hazard ratio in the article was reported by Kao et al. adjusted for beginning characteristics including age, sex, smoking, medication (antihypertensive and lipid-lowering drugs), diabetes mellitus, previous myocardial infarction, previous stroke, congestive heart failure and hyperlipidemia (Kao et al., 2011). Nevertheless found that among nonsystolic hypertension in patients, pulse pressure was associated with an increased risk of stroke. In particular, increasing with one standard deviation (13.2 mmHg) in pulse pressure was associated with a 32% higher risk of stroke. (Okada et al., 2011).

In another study from Japan, in the elderly who had an average age of 70 years the pulse pressure had no effect than systolic blood pressure in men, and less influence than systolic and

diastolic blood pressure in women (Miura et al., 2009). Furthermore, the predictive value of pulse pressure remained significant after adjustment for MAP, but was attenuated and not statistically significant with systolic blood pressure, risk factors, and comorbid conditions. (Glasser et al., 2015).

Research studies Grabska et al., (2011) reported that pulse pressure increased during the acute phase of ischemic stroke and was a 30-day mortality risk factor [24]. Geeganage et al. (2011) found that systolic blood pressure, MAP, pulse pressure, and was positively associated with death with neurological damage, as well as neurological damage alone, then repeated stroke on day 10 (Geeganage et al., 2008). The Vemmos study (2004) describes data collected without stroke types, while Geeganage (2011) and Grabska (2009) reported only ischemic stroke patients. (Vemmos et al., 2004) (Grabska, et al., 2009)

V. CONCLUSION

Based on the results of systematic review showed that an increase in pulse pressure 10 mmHg also increased the risk of ischemic stroke. Systolic and diastolic blood pressures were also a potential predictor of stroke. Pulse pressure, systolic blood pressure and diastolic blood pressure are significantly associated with the occurrence of ischemic stroke mortality. Pulse pressure, systolic blood pressure and diastolic blood pressure can be used to identify patients at high risk of stroke and may be used to improve the prevention of mortality in ischemic stroke.

VI. SUGGESTION

Further studies could use more homogeneous and specific respondents in ischemic stroke, so it can be more accurate in determining the predictors of mortality in patients with ischemic stroke.

VII. REFERECES

- [1] Adams, H. P., Bruno, A., Connors, J. J. B., Demaerschalk, B. M., Khatri, P., McMullan, P. W., ... Wang, D. Z. (2013). AHA / ASA Guideline Guidelines for the Early Management of Patients With Acute Ischemic Stroke. <https://doi.org/10.1161/STR.0b013e318284056a>
- [2] Alonso, A., Ebert, D., Kern, R., & Hennerici, M. G. (2015). Outcome Predictors of Acute Stroke Patients in Need of Intensive Care Treatment, 10–17. <https://doi.org/10.1159/000430871>
- [3] Geeganage, C., Sare, G., & Bath, P. (2008). Pulse pressure as a predictor of stroke. *Expert Rev Neurother*, 8(2), 165–167.
- [4] Geeganage, C., Tracy, M., England, T., Sare, G., Moulin, T., Woimant, F., ... Bath, P. (2011). Relationship between baseline blood pressure parameters (including mean pressure, pulse pressure, and variability) and early outcome after stroke: data from the Tinzaparin in Acute Ischaemic Stroke Trial (TAIST). *Stroke*, 42(2), 491–493.
- [5] Glasser, S., Halberg, D., Sands, C., Mosher, A., Muntner, P., & Howard, G. (2015). Is pulse pressure an independent risk factor for incident stroke, reasons for geographic and racial differences in stroke. *Am J Hypertens*, 28(8), 987–994.
- [6] Gorica, M., & Jovanovic, D. (2017). Assessment of nursing care-associated predictors of in-hospital mortality in patients with acute ischemic stroke, (January). <https://doi.org/10.2298/VSP170422156S>
- [7] Grabska, K., Niewada, M., Sarzyn´ska-Długosz, I., Kamin´ski, B., & Członkowska, A. (2009). Pulse pressure—-independent predictor of poor early outcome and mortality following ischemic stroke. *Cerebrovasc Dis*, 27(2), 187–192.
- [8] Inoue, R., Ohkubo, T., Kikuya, M., Metoki, H., Asayama, K., Kanno, A., ... YImai, Y. (2009). Stroke risk of blood pressure indices determined by home blood pressure measurement: the Ohasama study. *Stroke*, 40(8), 2859–2861.

- [9] Kao, Y., CC, H., HB, L., TC, W., PH, H., SJ, L., & JW, C. (2011). Ambulatory pulse pressure as a novel predictor for long-term prognosis in essential hypertensive patients. *J Hum Hypertens*, 26(7), 444–450.
- [10] Miura, K., Nakagawa, H., Ohashi, Y., Harada, A., Taguri, M., Kushiro, T., ... Ueshima, H. (2009). Four blood pressure indexes and the risk of stroke and myocardial infarction in Japanese men and women: a meta-analysis of 16 cohort studies. *Circulation*, 119(14), 1892–1898.
- [11] Ntaios, G., Bath, P., & Michel, P. (2010). Blood pressure treatment in acute ischemic stroke : a review of studies and recommendations. <https://doi.org/10.1097/WCO.0b013e328334e9d9>
- [12] Okada, K., Iso, H., Cui, R., Inoue, M., & Tsugane, S. (2011). Pulse pressure is an independent risk factor for stroke among middle-aged Japanese with normal systolic blood pressure: the JPHC study. *J Hypertens*, 29(2), 319–324.
- [13] Song, D., Tanaka, E., Lee, K., Sato, S., Koga, M., & Kim, D. (2015). Factors Associated with Early Hospital Arrival in Patients with Acute Ischemic Stroke, 17(2), 159–167.
- [14] Vemmos, K., Tsivgoulis, T., Spengos, K., Manios, E., Daffertshofer, M., Kotsis, V., ... Zakopoulos, N. (2004). Pulse pressure in acute stroke is an independent predictor of long-term mortality. *Cerebrovasc Dis*, 18(1), 30–36.
- [15] Yint, P. H. Y. O. K. Y. A. W. M., Achmann, M. A. X. O. B., Oke, Y. O. O. N. K. O. N. G. L., Usgrave, S. T. D. M., Rice, G. I. L. L. M. P., Ale, R. A. H., ... Ay, D. I. J. D. (2016). Important factors in predicting mortality outcome from stroke : findings from the Anglia Stroke Clinical Network Evaluation Study, 1–7. <https://doi.org/10.1093/ageing/afw175>