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Impact of Family Support and Treatment Timeliness on Post-Stroke Severity: A Clinical Correlation Study

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ABSTRACT

Background: Early treatment and strong family support are vital in determining stroke recovery outcomes. Family involvement facilitates early recognition of symptoms, timely access to care, and adherence to rehabilitation. However, evidence regarding their combined influence on post-stroke severity remains limited. ***Purpose*****:** This study aimed to examine the relationship between family support and treatment timeliness with the level of post-stroke severity among patients treated at Sultan Agung Islamic Hospital, Semarang, Indonesia. ***Methods*****:** A quantitative cross-sectional study was conducted involving 110 post-stroke patients selected through purposive sampling. Family support was measured using the Family APGAR questionnaire, treatment timeliness through a structured questionnaire, and stroke severity using the National Institutes of Health Stroke Scale. Data was analyzed using the Gamma correlation test and ordinal logistic regression. ***Results*****:** Significant relationships were found between family support and stroke severity ($p = 0.001$; $r = -0.707$) and between treatment timeliness and stroke severity ($p = 0.001$; $r = 0.767$). Regression analysis showed that treatment timeliness had a stronger effect on stroke severity ($p < 0.001$), while family support was not significant when both variables were included simultaneously in the model. ***Conclusion*****:** Both family support and early treatment influence post-stroke severity, with treatment timeliness being the most dominant factor. ***Implications for Nursing*****:** Nurses should strengthen family education programs to enhance early symptom recognition and rapid decision-making during stroke emergencies. Family empowerment and timely medical response can improve recovery outcomes and reduce post-stroke complications.

Keywords: Family support, Treatment timeliness, Severity, Post-Stroke.

What does this paper add?

1. This study identifies treatment timeliness as the most influential factor in determining post-stroke severity, surpassing the contribution of family support.
2. It underscores the crucial role of family empowerment and education in promoting early symptom recognition and rapid treatment-seeking behavior.
3. The findings provide a foundation for nursing interventions that integrate family-centered approaches to improve recovery outcomes and reduce post-stroke complications.

Introduction

Stroke is a major public health concern and one of the leading causes of death and long-term disability

worldwide. Despite advances in medical management, many patients continue to experience severe neurological deficits due to delayed treatment initiation. The concept of the "golden period" emphasizes that early recognition and rapid medical intervention within the first few hours after symptom onset are critical for improving outcomes and preventing permanent brain damage. In many cases, family members play a decisive role in recognizing early symptoms, seeking emergency care, and supporting recovery after hospital discharge. Family support contributes not only to the timeliness of treatment, but also to the patient's adherence, motivation, and emotional stability during rehabilitation.

However, in Indonesia, treatment delays and limited awareness among families remain significant challenges that worsen stroke outcomes. Understanding how family support and treatment timeliness interact to influence post-stroke severity is essential for developing nursing interventions that enhance early response, strengthen family involvement, and improve overall recovery among stroke survivors.

Background

Stroke remains one of the leading causes of death and long-term disability worldwide, accounting for nearly 11% of all global deaths each year (Suyanto et al., 2023; World Health Organization, 2025). Despite advances in acute management, the incidence and burden of stroke continue to rise, particularly in developing countries where access to emergency care and public awareness of early symptoms remain limited (Kementerian Kesehatan RI, 2023). In Indonesia, stroke prevalence has increased steadily due to an aging population, unhealthy lifestyles, and delays in seeking treatment (Khan, 2024). The severity of post-stroke outcomes is largely influenced by how quickly medical intervention begins after symptom onset. Early treatment within the "golden period" significantly improves neurological recovery and reduces disability, whereas delays often lead to more severe impairments (Li et al., 2024).

Family support also plays a vital role in determining treatment timeliness and recovery outcomes. Emotional and instrumental assistance from family members can motivate patients to seek care promptly and adhere to prescribed therapies. When families recognize stroke warning signs early, such as sudden weakness, facial asymmetry, or speech difficulty, they are more likely to initiate emergency response without hesitation. Moreover, family members often assist in transportation, decision-making, and communication with healthcare professionals, all of which contribute to faster hospital arrival and treatment initiation. In the rehabilitation phase, continuous encouragement and assistance from family members help patients maintain motivation and comply with medical advice (Bakas et al., 2022; Wang et al., 2022).

However, research examining the combined influence of family support and treatment timeliness on post-stroke severity remains limited, especially in Indonesia, where family-centered care is an integral part of the cultural and social fabric (Mendrofa et al., 2025). Understanding how these two factors interact is essential for designing nursing interventions that enhance early response, strengthen family participation, and improve recovery outcomes among stroke survivors (Wu et al., 2025).

Methods

This study employed a quantitative cross-sectional design to explore the relationship between family support, treatment timeliness, and post-stroke severity. The research was conducted at Sultan Agung Islamic Hospital, Semarang, Indonesia, a tertiary referral center that provides both acute and rehabilitative stroke care.

The multivariate model included family support and treatment timeliness as independent variables. Sociodemographic factors and clinical comorbidities were not included in the regression model and were therefore not statistically controlled.

Population and Sample

The study population consisted of 196 post-stroke patients treated at Sultan Agung Islamic Hospital, Semarang. After applying inclusion and exclusion criteria, 110 patients were included in the final sample. The reduction was primarily due to the exclusion of individuals with recurrent stroke (n = 58) or significant cognitive and speech impairments (n = 18) that hindered reliable communication. Additionally, 10 eligible patients declined participation.

The purposive sampling technique was chosen, because it allowed the researchers to specifically include patients who met the study's operational criteria, first-onset stroke, ability to communicate clearly, and cohabitation with family members. This approach

ensured the inclusion of participants capable of providing accurate self-reports and participating in structured interviews. However, purposive sampling also introduces the potential for selection bias, as it relies on the researcher's judgment rather than random selection. Consequently, the findings may not fully represent all stroke patients, particularly those with more severe neurological impairment or those treated in other healthcare settings.

To mitigate these limitations, the sample size was determined based on a power analysis using G*Power 3.1, assuming a medium effect size ($r = 0.30$), $\alpha = 0.05$, and power $(1–\beta) = 0.90$. The analysis indicated a minimum of 88 participants; thus, the final sample of 110 exceeded the required threshold, ensuring adequate statistical power for correlation and regression analyses.

Despite these efforts, the exclusion of patients with recurrent strokes or severe cognitive deficits may have introduced bias. These groups often represent more severe cases and may exhibit different patterns of family support, treatment timeliness, and recovery. Excluding them was necessary to ensure the validity of responses and reduce measurement error, but it also means that the study's results should be interpreted cautiously when generalizing to the broader stroke population.

Future research could employ consecutive sampling or probability-based methods to minimize bias and improve representativeness. Including proxy respondents or using validated observer-based tools for patients with cognitive impairment could also help capture a wider spectrum of stroke experiences, thereby increasing external validity.

Measurements

Three validated instruments were utilized in this study to measure family support, treatment timeliness, and stroke severity.

1. Family Support

Family support was measured using the *Family APGAR Questionnaire* developed by Smilkstein, which assesses five dimensions of family functioning: Adaptability, Partnership, Growth, Affection, and Resolve. Each item is rated on a 3-point Likert scale (0 = rarely, 1 = sometimes, 2 = almost always), with higher scores indicating stronger perceived family support.

The Indonesian version of the *Family APGAR* was previously validated by Setyoadi et al., (2024), demonstrating good internal consistency (Cronbach's α=0.87) and cultural relevance for use among Indonesian stroke survivors. Given the Indonesian Muslim cultural context, family involvement in health-related decision-making is particularly strong, as caregiving responsibilities are often shared among extended family members. This cultural characteristic supports the conceptual relevance of the Family APGAR in this setting. Both instruments were reviewed by local clinical experts to ensure cultural appropriateness, clarity of language, and alignment with local health system practices.

2. Treatment Timeliness Questionnaire (TTQ)

The *Treatment Timeliness Questionnaire* (TTQ) was an adapted instrument derived from the American Heart Association (AHA) stroke management framework and prior empirical studies on pre-hospital delay (Choi et al., 2019; Rocha et al., 2022). It was developed to capture both the objective and behavioral aspects of delay in stroke treatment.

The adaptation process included forward–backward translation, cultural adjustment, and expert validation by a panel of three neurologists and two senior stroke nurses to ensure clinical appropriateness. A pilot test with 20 post-stroke patients produced a Cronbach's α of 0.82, confirming satisfactory internal consistency.

The original Treatment Timeliness Questionnaire (TTQ) was developed in English based on the American Heart Association (AHA) acute stroke response framework. In this study, we used the Indonesian version of the instrument, which was translated from the original English version. The translation process followed a forward–backward procedure conducted by bilingual experts to maintain semantic accuracy. The translated version was then culturally adapted and reviewed by a panel consisting of three neurologists and two senior stroke nurses. A pilot test involving 20 post-stroke patients confirmed that the questionnaire was clear and reliable (Cronbach's $\alpha = 0.82$). Therefore, the validated Indonesian version of the TTQ was used for data collection in this study.

The questionnaire contains 12 items grouped into four domains:

a) Symptom recognition (e.g., "How soon after the first symptom did you recognize it as a stroke?").
b) Decision-making delay (e.g., "How long did it take

before deciding to seek hospital care?").

c) Transportation delay (e.g., "What was the waiting time before transportation was arranged?").
d) Hospital response (e.g., "How long after arrival did you receive medical evaluation?").

Based on total elapsed time from symptom onset to treatment initiation, responses were classified according to AHA standards as: *Fast (<3 hours), Fairly slow (3 – 6 hours), Slow (6 – 12 hours),* and *Very slow (>12 hours).*

3. Stroke Severity

Stroke severity was assessed using the *National Institutes of Health Stroke Scale (NIHSS)*, a clinician-rated instrument that evaluates 15 neurological domains including consciousness, motor strength, coordination, language, and sensory function. The NIHSS has well-established validity and strong interrater reliability (typically > 0.90), making it widely accepted for both clinical and research applications (Vahedian-Azimi et al., 2024).

Data Collection

Data was collected between March and May 2025 at Sultan Agung Islamic Hospital, Semarang. Before data collection, the research team conducted an orientation session to standardize data collection procedures and ensure interrater consistency. Data was obtained through structured interviews, along with direct observation, and review of patients' medical records. Each participant was interviewed in a quiet, private environment to minimize distraction and ensure comfort.

Data on treatment delay components was obtained from two sources. Time of hospital arrival, medical evaluation, and treatment initiation were extracted from medical records, whereas symptom onset and initial decision-making time were collected through patient and family self-report. When discrepancies occurred between self-reported times and medical records, the information documented in medical records was prioritized for analysis.

Trained research assistants, all of whom were registered nurses with prior experience in stroke rehabilitation, administered the instruments. The *Family APGAR* questionnaire was used to assess the level of family support through participants' subjective perceptions of family functioning, while the *Treatment Timeliness Questionnaire* evaluated the time elapsed between stroke symptom onset and the initiation of hospital-based medical intervention. Medical records were used to cross-check time of admission, onset documentation, and clinical diagnosis to enhance data accuracy.

Data was manually checked for completeness at the end of each collection day. Inconsistent or missing responses were verified directly with the respondents or confirmed through family caregivers. This approach helped minimize recall bias and improve the reliability of self-reported data.

Ethical Considerations

This study adhered strictly to ethical principles in research involving human subjects. Ethical approval was obtained from the Health Research Ethics Committee of Sultan Agung Islamic Hospital, Semarang, Indonesia (Approval No. 135/KEPK-RSIA/VII/2025). In addition, permission was granted by the hospital management to access patient records and conduct data collection within the clinical setting.

Prior to participation, respondents were informed about the study's objectives, procedures, and potential benefits. Confidentiality and anonymity were ensured by assigning each participant a numerical identification code, and all information was securely stored with restricted access to the research team only. Participants were assured that their involvement was voluntary and that they could withdraw at any stage without penalty. Written informed consent was obtained from all respondents in accordance with the Declaration of Helsinki's ethical standards.

Data Analysis

Data was analyzed using Statistical Package for Social Sciences (SPSS). Descriptive statistics, including frequency distributions, means, and standard deviations, were computed to summarize demographic and clinical characteristics of the participants. Prior to inferential analysis, data normality and coding consistency were verified.

For the bivariate analysis, the Gamma correlation test was used to assess the direction and strength of the association between ordinal variables, specifically, family support, treatment timeliness, and stroke severity. This non-parametric test was selected, because it is appropriate for data measured on ordinal scales and accounts for tied ranks.

To determine the simultaneous effects of independent variables on stroke severity, Ordinal Logistic Regression with a logit link function was employed. The model's adequacy was evaluated using the Goodness-of-Fit test (Pearson Chi-square and Deviance) and three Pseudo R-Square coefficients (Cox–Snell, Nagelkerke, and McFadden). A *p*-value < 0.05 was considered statistically significant. These methods provided a comprehensive understanding of both the individual and combined influences of family support and treatment timeliness on post-stroke severity.

Results

1. Characteristics of Respondents

A total of 110 post-stroke patients participated in the study. Table 1 presents their demographic and clinical characteristics. The majority were male (60.9%), and most had completed elementary education (52.7%). Approximately one-third of the respondents were farmers (31.8%), reflecting the rural demographic of the study setting.

Most families reported moderate family support (79.1%), while only 11.8% indicated high support levels. Regarding treatment timeliness, 20.0% of patients received medical care within 3 hours ("fast"), whereas 79.1% were categorized as "fairly slow" (3 – 6 hours). In terms of stroke severity, nearly a half of the respondents (45.5%) experienced severe neurological deficits, and 27.3% had very severe conditions.

Table 1. Characteristics of respondents (n = 110)

Variable	Category	n	%
Gender	Male	67	60.9
	Female	43	39.1
Education	Non-Formal Education	6	5.5
	Elementary school	58	52.7
	Junior high school	20	18.2
	Senior high school	21	19.1
	Bachelor's or higher	5	4.5
Occupation	Unemployed	18	16.4
	Farmer	35	31.8
	Housewife	20	18.2
	Laborer	10	9.1
	Entrepreneur	16	14.5
	Other	11	10.0
Family Support	Low	10	9.1
	Moderate	87	79.1
	High	13	11.8
Treatment Timeliness	Fast (< 3 hours)	22	20.0
	Fairly Slow (3 – 6 hours)	87	79.1
	Slow (6 – 12 hours)	1	0.9
Stroke Severity	Mild	6	5.5
	Moderate	24	21.8
	Severe	50	45.5
	Very Severe	30	27.3

2. Correlation between Family Support and Stroke Severity

The Gamma correlation test revealed a significant negative relationship between family support and post-stroke severity ($r = –0.759$, $p < 0.001$), indicating that patients who received stronger family support tended to have milder stroke outcomes.

Table 2. Correlation between family support and post-stroke severity (n = 110)

Variable	r	p-value
Family Support ↔ Stroke Severity	-0.759	<0.001

3. Correlation between Treatment Timeliness and Stroke Severity

Severity (r = 0.767, p < 0.001). Faster initiation of medical care was strongly associated with milder neurological deficits.

Table 3. Correlation between treatment timeliness and post-stroke severity (n=110)

Variable	r	p-value
Treatment Timeliness ↔ Stroke Severity	0.767	<0.001

4. Multivariate Analysis

Ordinal logistic regression was used to determine the simultaneous effects of family support and treatment timeliness on stroke severity. The model was significant ($\chi^2 = 54.878$, df = 4, p < 0.001) and demonstrated good fit (Pearson p = 0.929; Deviance p = 0.888).

Treatment timeliness was the only significant predictor of stroke severity (p < 0.001), whereas family support lost its significance when both variables were included simultaneously in the model (p > 0.05). The model explained approximately 43.2% of the variance in stroke severity (Nagelkerke $R^2 = 0.432$).

Table 4. Ordinal logistic regression of family support, treatment timeliness, and stroke severity (n = 110)

Predictor	β	SE	Wald	p-value	95% CI
Family Support (Low–High)	16.36	404.28	0.002	0.968	-776.01 – 808.72
Treatment Timeliness (Slow–Fast)	-17.12	0.62	764.22	<0.001	-18.33 – -15.90

5. Summary of Findings

Overall, both family support and treatment timeliness showed significant bivariate associations with post-stroke severity. However, only treatment timeliness remained a significant independent predictor in the multivariate model. This finding indicates that while family support facilitates recovery through motivation and adherence, rapid medical intervention during the acute phase remains the most critical determinant of neurological outcomes.

All self-report instruments administered in this study (Family APGAR and TTQ) were used in their validated Indonesian-language versions.

Discussion

This study examined the relationship between family support, treatment timeliness, and post-stroke severity among patients treated at a tertiary care hospital. The findings highlight that while both variables were significantly associated with stroke severity in bivariate analysis, only treatment timeliness remained a significant independent predictor in the multivariate model. This result underscores that the speed of receiving medical care during the acute phase is a decisive determinant of neurological outcomes.

Family support plays a critical role in improving treatment timeliness by facilitating early recognition of stroke symptoms, prompt decision-making, and rapid access to emergency medical services. Previous studies have shown that patients with strong family involvement are more likely to arrive at hospitals within the therapeutic window, thereby reducing neurological damage and post-stroke severity (Bakas et al., 2022; Deyhoul et al., 2020; Wang et al., 2022).

Cultural factors may have influenced the study findings. In the Indonesian Muslim context, family members often play a central role in recognizing illness, making treatment decisions, and arranging access to care. This strong family orientation may amplify the indirect role of family support in facilitating treatment timeliness, while its direct association with stroke severity becomes less apparent after accounting for

acute clinical factors (Mendrofa et al., 2025).

The disappearance of the significant association between family support and stroke severity in the regression model suggests an indirect relationship rather than a direct causal effect. Family support may influence stroke outcomes indirectly by facilitating earlier treatment-seeking behavior and improved treatment timeliness; however, this study did not formally test a statistical mediation model. Once treatment timeliness was statistically controlled, the direct effect of family support on severity diminished, implying that its contribution operates largely through behavioral and logistical facilitation rather than direct physiological mechanisms. This interpretation is consistent with previous studies showing that family support improves clinical outcomes primarily by enhancing care-seeking behavior and continuity of care, not by directly altering disease progression (Deyhoul et al., 2020; Wang et al., 2022).

Several potential confounding factors may have also affected the relationship between family support and stroke severity. Differences in stroke subtype (ischemic vs. hemorrhagic), baseline severity at admission, time of symptom onset, and availability of emergency medical services could modify the observed associations. For instance, patients with hemorrhagic strokes typically present with more severe neurological deficits and limited recovery potential, regardless of family involvement. Similarly, those with access to emergency transport or proximity to hospitals may receive timely care even with minimal family support. Moreover, comorbid conditions, such as hypertension and diabetes, might further confound the association, as they influence both the risk of severe stroke and recovery potential. Future studies using multivariable models that adjust for these clinical variables could yield more precise estimates of the independent effects of family support.

The strong predictive value of treatment timeliness observed here reinforces the well-established principle that *"time is brain."* Early intervention limits neuronal damage, prevents complications, and enhances functional recovery. In contrast, delays in recognizing stroke symptoms, arranging transportation, or initiating treatment significantly worsen outcomes. Therefore, public health and nursing interventions should prioritize family education and emergency response preparedness, ensuring that caregivers can recognize early stroke signs and act swiftly.

Family support has been widely recognized as an important factor in reducing pre-hospital delays in acute stroke management. Bakas et al. (2022), in their systematic review, highlighted that active family involvement improves care-seeking behavior and coordination during medical emergencies. Likewise, Wang et al. (2022) reported that stronger family functioning is associated with better psychological adjustment and clinical recovery among first-ever stroke survivors. Other studies have shown that early recognition of stroke symptoms by family members can significantly shorten onset-to-door time, especially in collectivist settings where health decisions are often made within the family unit (Deyhoul et al., 2020). Rapid decision-making by relatives has also been identified as a key predictor of early hospital arrival (Choi et al., 2019). Taken together, these findings suggest that family support may influence stroke outcomes primarily by facilitating faster treatment initiation. This explanation aligns with the present findings, in which family support appears to operate indirectly through treatment timeliness rather than exerting a direct physiological effect on stroke severity.

Implications for Nursing

The findings of this study highlight the vital role of nurses in improving both the timeliness of stroke treatment and family involvement in patient care. Nurses are often the first point of contact for stroke patients and their families; therefore, their ability to provide clear information and rapid coordination of care is essential for minimizing treatment delays and reducing post-stroke severity.

Nurses also have a key responsibility to educate families about the early signs and symptoms of stroke. Early recognition and quick decision-making by family members can shorten the time between symptom onset and hospital arrival. Community-based health education programs led by nurses can strengthen public knowledge about stroke emergencies and improve the effectiveness of the referral system, especially in rural areas with limited access to health services.

In addition, family empowerment should be an integral part of nursing practice. Families who understand the recovery process are better equipped to assist patients with rehabilitation, medication adherence, and lifestyle changes. Nurses can apply the Family-

Centered Empowerment Model (FCEM) to guide families in developing confidence, problem-solving skills, and motivation to participate in care. This approach enhances both physical recovery and psychological well-being for patients and caregivers.

From a broader perspective, nursing education and policy development should focus on strengthening family-based interventions. Hospitals and community health centers can integrate structured family education modules into stroke management protocols. By combining timely clinical care with active family participation, nursing practice can help reduce complications, prevent recurrent strokes, and improve the overall quality of life for patients.

Conclusion

This study concludes that both family support and treatment timeliness are important factors influencing post-stroke severity. Faster medical treatment was found to be the strongest predictor of better outcomes, while strong family support contributed to patient motivation, adherence, and recovery. These findings highlight the need for early stroke recognition and rapid response, supported by family involvement throughout the rehabilitation process. Strengthening nursing roles in patient education, family empowerment, and community awareness can help reduce stroke-related disability and improve the quality of life of stroke survivors.

Limitations

This study has several limitations that should be acknowledged. First, the cross-sectional design prevents causal inferences regarding the relationships among variables. The observed associations may be influenced by unmeasured temporal or behavioral factors.

In addition, important potential confounders, including age, sex, stroke subtype, baseline NIHSS score, comorbidities (e.g., hypertension and diabetes), and socioeconomic factors, were not included in the multivariate analysis. The absence of these variables may have limited the precision of the estimated effects of family support and treatment timeliness on stroke severity.

The sample was drawn from a single tertiary hospital and relied on purposive sampling, which may limit the generalizability of the findings to broader populations or community settings.

Treatment timeliness data was partly based on self-reported recall from patients and family caregivers, introducing potential recall bias despite verification through medical records.

Future studies are encouraged to employ longitudinal or multicenter designs with larger, more diverse samples and comprehensive adjustment for clinical covariates. Incorporating qualitative approaches to explore the lived experiences of families could also enrich the understanding of how family dynamics influence treatment-seeking behavior and recovery after stroke.

Conflict of Interests

There is no conflict of interests to declare by the authors.

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Author Contributions

Study Design: **KR**. Data Collection: **SY, KR, RW**. Data Analysis: **SY, KR, DCR**. Study Supervision: **SY, MAN**. Manuscript Writing: **DCR**. Critical Revision for Important Intellectual Content: **SY, MAN**.

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