Original Article

The Prevalence of Dengue Cases and Its Associated Factors Among Geriatric Patients Admitted to Hospital Pakar Universiti Sains Malaysia

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Abstract

Background: Dengue in elderly individuals is an increasingly important yet understudied area. There is a need to identify individuals in this population likely to progress to severe disease. This study aimed to determine dengue prevalence and associated factors among geriatric patients admitted to Hospital Universiti Sains Malaysia (USM), Kelantan. **Methods**: This retrospective study was conducted among the geriatric age group with dengue fever who were admitted to wards of Hospital USM from January to December 2018–2020. Information, including patient demographics, vital signs and blood investigations, was obtained from the laboratory information system and secondary data. From the data, we could determine whether there were associations between these variables and admission. The outcomes of patient admission (discharge home or death) were also studied. **Results**: A total of 204 patients were included in this study. Among those 204 patients, 83.8% (n = 171) were admitted to the ward, and 16.2% (n = 33) were discharged. More than half of them came from Kota Bharu (71.6%). The patients' ages ranged from 60 to 94 years, with a median age of 66 years (IQR = 8.00). The study also revealed that most patients had NS1 dengue antigen (47.5%). Most of the patients had hypertension (n (%) = 135 (66.2)). Two variables were significantly associated with dengue fever among geriatric patients. The platelet count and ALP level were found to be significantly associated factors. **Conclusion**: There is a high prevalence of admission to the ward for geriatric patients with dengue fever. A low platelet count and elevated ALP are significant factors for admission. However, other blood parameters, such as AST and ALT, should be considered when determining admission status based on many studies. The mortality rate is relatively low among geriatric dengue patients.

Keywords: *dengue fever, geriatric patients, platelet count, hospital admission*

INTRODUCTION

The incidence of dengue has grown dramatically worldwide in recent decades, with the number of cases reported to the WHO increasing from 505,430 cases in 2000 to 5.2 million in 2019. Most cases are asymptomatic or mild and self-managed; hence, dengue cases are underreported. Many cases are also misdiagnosed as other febrile illnesses. [1]

The highest number of dengue cases was recorded in 2023, affecting over 80 countries in all regions of the WHO. Since the beginning of 2023, ongoing transmission, combined with an unexpected spike in dengue cases, has resulted in a historic high of more than 6.5 million cases, and more than 7300 dengue-related deaths have been reported.

It is a global threat, with an estimated 50 million dengue infections occurring annually and approximately 2.5 billion people residing in dengue-endemic countries, especially Southeast Asia.[2] A significant health and economic burden is a well-known consequence of dengue cases.[3]

The incidence of dengue has also been rising steadily in Malaysia, affecting the economy through lost work days and school days.[4] Despite the aggressive measures taken by the relevant authorities, Malaysia is still facing a worsening dengue crisis in recent years, with a prediction of 940.0 per 100,000 population by 2040.[5] There is an urgent need to evaluate dengue cases with integrated strategies to combat this disease, such as a better understanding the clinic-laboratory spectrum for early detection and vaccination.[6]

Dengue in elderly individuals is an increasingly essential yet highly understudied area. There is an urgent need to refine the current diagnostic criteria to

improve the diagnosis, classification of disease severity, and identification of individuals in this population likely to progress to severe disease. Management strategies in this population would have to be adjusted to account for the increased number of comorbidities.[7]

Dengue incidence and mortality in Malaysia vary significantly across different age groups, highlighting the importance of age-stratified public health interventions. According to a study by Suppiah et al. (2023), individuals aged 25–34 years consistently presented the highest dengue incidence rates, reaching up to 413.3 cases per 100,000 population during the pre-pandemic period (2014–2019).[8] In contrast, the ≥75 years age group, although the lowest incidence rates were recorded, slightly increased during the COVID-19 pandemic, indicating potential underreporting or delayed healthcare access. Importantly, dengue-related mortality increases progressively with age. A comprehensive mortality analysis by Azhari et al. (2024) revealed that the dengue mortality rate among those aged ≥75 years was 1.64 deaths per 100,000 people, which was more than ten times higher than that reported in children aged 0–14 years (0.19/100,000). These findings suggest that while younger adults are more frequently infected, elderly individuals are more likely to experience severe outcomes and death due to age-related comorbidities and immune decline. Therefore, targeted interventions for high-incidence groups and enhanced clinical vigilance in the elderly population are crucial components of Malaysia's dengue control strategies.[9]

Kelantan is one of the major hotspots of dengue fever infection, where dengue cases until August 2014 (5367 cases) increased by approximately 575% compared with the corresponding period in 2013 (575 cases). A drastic increase in dengue cases admitted to Hospital USM from 2008–2014 was observed compared with those from 2001–2007 (1308 vs 2123, respectively). The hospital also serves as a referral centre for nearby states. A previous study revealed that 45 dengue patients aged above 60 years were admitted during six years (2008–2013).[6] This study aimed to determine the prevalence of dengue fever in geriatric patients requiring hospital admission and its associated factors for admission.

METHODOLOGY

This study focused on confirmed dengue cases among geriatric patients from January 2018 until December 2020. The confirmed cases were identified through the Laboratory Information System (LIS) of Hospital Pakar Universiti Sains Malaysia (USM), Kubang Kerian. The criteria for a confirmed case are one positive NS1, IgG, or IgM, among geriatric patients suspected of having dengue fever, regardless of the day of illness.

The confirmed dengue cases were identified from the Emergency Department or out-patient clinic (*Klinik Rawatan Keluarga*). Among 215 geriatric patients diagnosed with dengue fever, 171 were hospitalised, and 33 were treated as outpatients. 11 patients were excluded because of incomplete data, Finally, 204 patients were included for the study.

Geriatric patients were defined as those aged 60 years and above, and their folders were traced from the Record Office through the LIS. Information obtained from patient folders included patient demographics (ethnicity, sex, location, comorbidities), clinical signs (heart rate, temperature, systolic blood pressure, diastolic blood pressure, respiratory rate, and capillary refilling time), and blood parameters (total white count, haematocrit, platelet count, and liver enzyme (aspartate aminotransferase, alkaline phosphatase and alanine aminotransferase) levels) recorded upon admission. The study also examined the outcomes of patient admission (ward or ICU) and discharge home and death.

Statistical analysis

For statistical analysis, categorical data are presented as frequencies and percentages, whereas numerical data are presented as the means and standard deviations (SDs). Simple logistic regression (SLR) tests were used in the univariate analysis. Variables with a p-value less than 0.05 or those deemed important based on the univariate analysis were selected for the multivariate analysis. Multiple logistic regression (MLR) was utilised for multivariate analysis. Variable comparisons with a p-value less than 0.05 were considered significant. The data were analysed via SPSS software version 26.

RESULTS

Among 204 patients, 83.8% (n = 171) were hospitalised, whereas 16.2% (n = 33) received outpatient treatment. More than half of those hospitalised came from Kota Bharu (70.8%). The patients' ages ranged from 60 to 94 years, with a median age of 66 years. Most were Malay, and the remaining were Chinese and Siamese. The results of descriptive analysis also revealed that most of the hospitalised patients were positive for the NS1 dengue antigen (50.9%), followed by the IgM antigen (14.6%)

and the IgG/IgM antigen (14%). Only eleven patients (6.4%) were antigen positive.

Table 1 shows the comorbidities among geriatric patients with dengue fever. Most of the patients had hypertension (66.2%), and 44.1% had diabetes mellitus. Among those hospitalised, the number of patients with hypertension (69%) was greater than that without hypertension, followed by those with diabetes mellitus, hyperlipidaemia (HPL), other conditions, chronic obstructive pulmonary disease (COPD), asthma, and immunocompromised states. Details on the descriptive analysis of the patient's demographics are shown in Table 1.

Table 1: Demographic data and comorbidities of geriatric patients with dengue fever.

Variable	Total (n = 204), n (%)	Admission status, n (%)	
		No (n = 33)	Yes (n = 171)
Race			
Malay	192	31 (93.9)	161
Chinese	(94.1)	2 (6.1)	(94.2)
Siamese	10 (4.9)	0 (0.0)	8 (4.7)
	2 (1.0)		2 (1.2)
Gender			
Female	115	21 (63.6)	94 (55.0)
Male	(56.4)	12 (36.4)	77 (45.0)
	89 (43.6)		
Location			
Bachok	32 (15.7)	5 (15.2)	27 (15.8)
Gua Musang	1 (0.5)	0 (0.0)	1 (0.6)
Jeli	1 (0.5)	0 (0.0)	1 (0.6)
Kota Bharu	146	25 (75.8)	121
Kuala Krai	(71.6)	0 (0.0)	(70.8)
Machang	1 (0.5)	2 (6.1)	1 (0.6)
Melor	4 (2.0)	0 (0.0)	2 (1.2)
Pasir Puteh	1 (0.5)	0 (0.0)	1 (0.6)
Pasir Mas	7 (3.4)	1 (3.0)	7 (4.1)
Tanah Merah	6 (2.9)	0 (0.0)	5 (2.9)
Tumpat	1 (0.5)	0 (0.0)	1 (0.6)
	4 (2.0)		4 (2.3)
Dengue serology			
NS1	97 (47.5)	10 (30.3)	87 (50.9)
IgG	19 (9.3)	5 (15.2)	14 (8.2)
IgM	30 (14.7)	5 (15.2)	25 (14.6)
NS1/IgG	4 (2.0)	0 (0.0)	4 (2.3)
NS1/IgM	9 (4.4)	3 (9.1)	6 (3.5)
IgG/IgM	33 (16.2)	9 (27.3)	24 (14.0)
All	12 (5.9)	1 (3.0)	11 (6.4)
Age (years)	66.00 (8.00)[a]	65.00 (9.00)[a]	66.00 (8.00)[a]
Hypertension			
No	69	16 (48.5)	53 (31.0)
Yes	(33.8)	17 (51.5)	
	135 (66.2)		118 (69.0)
Diabetes mellitus			
No	114	22 (66.7)	92 (53.8)
Yes	(55.9)	11 (33.3)	79 (46.2)
	90 (44.1)		
HPL			
No	142	22 (66.7)	120
Yes	(69.6)	11 (33.3)	(70.2)
	62 (30.4)		51 (29.8)
Asthma			
No	199	33 (100.0)	166
Yes	(97.5)	0 (0.0)	(97.1)
	5 (2.5)		5 (2.9)
Immunocompromised			
No	201	33 (100.0)	168
Yes	(98.5)	0 (0.0)	(98.2)
	3 (1.5)		3 (1.8)
Others			
No	141	23 (69.7)	118
Yes	(69.1)	10 (30.3)	(69.0)
	63 (30.9)		53 (31.0)

[a]Median (IQR)
*Others: Ischemic heart disease, hepatitis, atrial fibrillation, old cerebrovascular attack, chronic kidney disease

Descriptive analysis of clinical signs among geriatric patients with dengue fever revealed that almost all patients had less than 2 seconds of capillary refill time, n (%) = 202 (99.0). The mean temperature of the 204 patients was 37.87°C. The mean (SD) heart rate of all patients was 90.69 (±18.66), which was slightly lower than the mean heart rate among those admitted to the ward (mean (SD) = 91.47 (±19.23)).

A descriptive analysis of blood parameters (TWC, HCT, platelet count, AST, ALP, ALT) among geriatric patients with dengue fever is shown in Table 2. The patients' median TWC, HCT, platelet count, AST, ALP, and ALT were 4.95, 39.25, 126.50, 58.00, 86.00, and 45.00, respectively. There was a significant difference in the platelet count between those hospitalised and those treated as outpatients, where the median platelet count of those hospitalised was 119.00, which was lower than that of those treated as outpatients (median (IQR) = 173.00 (107.00)). Further information regarding the descriptive analysis for blood investigations is shown in the table below.

Among the 171 hospitalised geriatric patients with dengue fever, 93.5% (n = 160) were successfully discharged home, whereas 6.4% (n = 11) died. Further analysis of the deceased patients revealed that the mean (SD) blood parameters for deceased geriatric

patients with dengue fever were a platelet count of 114.0x109 (±92.2), AST level of 555.8 (±1360.7), ALP level of 173.1 (±117) and ALT level of 321.1 (±655).

Table 2: Vital signs, blood investigations and outcomes of geriatric patients with dengue fever

Variable	Total (n = 204), Mean (SD)	Admission status, Mean (SD)/n (%)	
		No (n = 33)	Yes (n = 171)
Vital signs			
Heart rate	90.69 (18.66)	86.64 (14.92)[a]	91.47 (19.23)
SBP	127.50 (28.00)[a]	126.00 (24.00)[a]	129.00 (30.00)[a]
DBP	69.00 (18.00)[a]	68.00 (11.00)[a]	70.00 (18.00)[a]
RR	20.00 (2.00)[a]	18.00 (2.00)[a]	20.00 (2.00)[a]
Temperature (°C)	37.87 (1.00)	37.70 (1.00)[a]	37.88 (1.05)
CRT[b]			
<2 Sec	202 (99.0)	33 (100.0)	169 (98.8)
>2 Sec	1 (0.5)	0 (0.0)	1 (0.6)
2 Sec	1 (0.5)	0 (0.0)	1 (0.6)
Blood Investigations			
TWC	4.95 (4.30)[a]	4.80 (5.45)[a]	5.00 (4.30)[a]
HCT	39.25 (6.70)[a]	37.15 (4.03)	39.80 (7.20)[a]
Platelet count	126.50 (88.00)[a]	173.00 (107.00)[a]	119.00 (85.00)[a]
AST	58.00 (77.00)[a]	0.00 (31.00)[a]	65.00 (80.00)[a]
ALP	86.00 (52.00)[a]	0.00 (72.00)[a]	93.00 (57.00)[a]
ALT	45.00 (53.00)[a]	0.00 (36.00)[a]	53.00 (52.00)[a]
Outcome			
Discharged home			160 (93.5%)
Died			11 (6.4%)

[a] Median (IQR)
[b] Frequency (%)

According to the univariable analysis of the association between demographics and hospitalised geriatric patients with dengue, there was not enough evidence of a significant association between demographic variables and hospitalised geriatric patients. The associations between comorbidities and hospitalised geriatric patients were also determined via Pearson's chi-square and Fisher's exact tests. There was no significant association between comorbidities and admission. The p-value was greater than 0.05 for diabetes mellitus (χ2-statistic (df) = 1.86(1), p = 0.173), hypertension (χ2-statistic (df) = 3.78(1), p = 0.052), COPD (p>0.95), HPL (χ2-statistic (df) = 0.16(1), p = 0.688), asthma (p>0.95), and the immunocompromised state (p>0.95).

Table 3 shows the results of the simple logistic regression analysis and Fisher's exact test for the associations between clinical signs and hospitalised geriatric patients with dengue fever. The association between capillary refilling time and admission had a highly insignificant p-value (p>0.95). Simple logistic regression analysis for heart rate, systolic blood pressure, diastolic blood pressure, respiratory rate, and temperature also revealed nonsignificant p-values, p>0.05.

For the association between blood parameters and hospitalised geriatric patients with dengue fever, simple logistic regression analysis revealed that three out of the six variables were significantly associated with admission. AST was significantly associated with admission (b = 0.03, crude OR (95% CI) = 1.03 (1.02, 1.05), p<0.001). The crude OR was 1.03, indicating that geriatric patients with a one-unit increase in AST reading had 3.0% greater odds of being admitted to the ward. ALP was also significantly associated with admission, with a crude OR (95% CI) = 1.05 (1.03, 1.06), b = 0.05, and p<0.001. This finding indicates that geriatric patients with a one-unit increase in ALP reading are 5.0% more likely to be admitted to the ward. Another variable that was determined to have a significant association with admission was ALT. The crude OR (95% CI) = 1.03 (1.01, 1.05), b = 0.03, and p<0.001 indicate that patients with a one-unit increase in ALT reading have 3.0% greater odds of being admitted to the ward. The remaining three variables from the blood tests (TWC, HCT, and platelet count) were not significantly different (p>0.05). Further information on the results is shown in Table 3.

Table 4 presents the multiple logistic regression analysis results for the factors associated with hospitalised geriatric patients. Among the 18 variables tested, two were determined to be significantly associated with dengue fever among geriatric patients. The Hosmer–Lemeshow goodness-of-fit test on the model resulted in an insignificant p-value (p = 0.132), indicating that the model was fit. The model could correctly classify 91.2% of the admissions, and the area under the ROC curve was 0.88, indicating that the model can accurately discriminate the admission status among patients.

The platelet count was one of the significantly associated factors (adjusted OR (95% CI) = 0.995

(0.992, 0.998), b = -0.01, p = 0.003). The results show that patients with a one-unit increase in platelet count have 0.5% lower odds of being admitted to the ward when adjusted for other variables. Another variable that was determined to be significantly associated with admission was ALP reading, where the adjusted OR (95% CI) = 1.05 (1.03, 1.06), b = 0.05, p<0.001. The results indicate that those with a one-unit increase in ALP reading are 5.0% more likely to be admitted to the ward when adjusted for other variables.

Table 3: Association between vital signs and blood parameters in hospitalised geriatric patients with dengue fever at Hospital USM (n = 204).

Simple logistic regression				
Variable	**Regression coefficient (*b*)**	**Wald-statistic (df)**	**Crude OR (95% CI)**	***P*-value**
Heart rate	0.02	1.85 (1)	1.02 (0.99, 1.04)	0.174
Systolic blood pressure	0.00	0.00 (1)	1.00 (0.99, 1.02)	0.993
Diastolic blood pressure	0.01	0.41 (1)	1.01 (0.98, 1.04)	0.523
Respiratory rate	0.20	3.64 (1)	1.22 (1.00, 1.49)	0.056
Temperature (°C)	0.09	0.19 (1)	1.09 (0.74, 1.59)	0.662
TWC	-0.02	0.25 (1)	0.98 (0.90, 1.07)	0.619
HCT	0.05	2.78 (1)	1.05 (0.99, 1.12)	0.095
Platelet	-0.00	3.60 (1)	1.00 (0.99, 1.00)	0.058
AST	0.03	18.38 (1)	1.03 (1.02, 1.05)	<0.001
ALP	0.05	37.81 (1)	1.05 (1.03, 1.06)	<0.001
ALT	0.03	13.44 (1)	1.03 (1.01, 1.05)	<0.001
Fisher's exact test				
Variable	**Admission, *n* (%)**		***N***	***P*-value**
	Yes	**No**		
Capillary refilling time				
<2 seconds	169 (83.7)	33 (16.3)	202	>0.95
>2 seconds	1 (100.0)	0 (0.0)	1	
2 seconds	1 (100.0)	0 (0.0)	1	

Table 4: Factors associated with hospitalised geriatric patients with dengue fever in Hospital USM according to multiple logistic regression analysis (n = 204)

Variable	**Regression coefficient (b)**	**Wald-statistic (df)**	**Adjusted OR (95% CI)**	***P*-value**
Platelet count	-0.01	9.10 (1)	0.995 (0.992, 0.998)	0.003
ALP	0.05	37.54 (1)	1.05 (1.03, 1.06)	<0.001

The forward LR multiple logistic regression model variable selection method was applied. Multicollinearity between variables does not exist.
The model's interaction between variables was insignificant (p = 0.323).
Model goodness-of-fit and accuracy were checked: the Hosmer–Lemeshow goodness-of-fit test was not significant (p = 0.132); the overall correctly classified percentage from the classification table was 91.2%; and the area under the ROC curve was 0.88 (95% CI = (0.81, 0.94), p < 0.001).

DISCUSSION

Among the 204 patients diagnosed with dengue fever, 83.8% were hospitalised, and 16.2% were treated as outpatients. The patients' ages ranged from 60 to 94, and the median age was 66. Female patients were predominant compared with male patients. This study is consistent with a study conducted in Kota Bharu on the incidence of dengue fever from 1998 to 2003.[10]

In this study, six main health problems were recorded (diabetes mellitus, hypertension, COPD, HPL, asthma, and immunocompromised state) among geriatric patients, and none of these comorbidities were significant factors for admission or discharge. Among those admitted to the ward, the number of patients with hypertension was greater than that among those without hypertension. This finding is consistent with studies conducted at the Communicable Disease Center (CDC) at Tan Tock Seng Hospital, which reported similar results, with elderly individuals with hypertension having the highest admission rate (53.2%).[11] An almost identical percentage of hypertensive patients was found in a retrospective study of hospitalised geriatric patients with dengue fever at St. Luke's Medical Center, Philippines.[12]

There was no significant difference in HR, systolic blood pressure (SBP and DBP), RR, or temperature between discharge and hospital admission among geriatric patients. This study differs slightly from a study conducted in Singapore that compared vital

signs in patients with dengue among adults and elderly individuals. The elderly cohort admitted consistently presented higher mean BP readings (SBP, DBP, and PP) than the controls at any point of illness.[12]

Multiple logistic regression analysis revealed that the platelet count was significantly associated with hospital admission among geriatric patients with dengue fever. This study is consistent with a retrospective observational study in Kerala, India, which reported that thrombocytopenia (platelet count $<150x10^9$) was the major haematological abnormality, followed by leukopenia (total white blood cell count $<4x10^9$).[13]

However, the Adult Dengue Platelet Study (ADEPT) suggested that the platelet level in adult dengue patients was not a significant factor in determining admission and platelet transfusion if the patient had no complications. Most patients recover spontaneously without requiring platelet transfusion. According to the Malaysian Clinical Practice Guidelines, platelets alone are not indicated for admission unless a reduced platelet count accompanies a rise in the haematocrit level. There is also no role for prophylactic transfusion with platelets in dengue patients because it increases the risk of pulmonary oedema and respiratory distress.[14] A study conducted in Taiwan reported that the PLT has no significant value in geriatric dengue patients, either with or without mortality (94 vs 115, p-value=0.278). The other variables that have significant values are TWC (lymphocyte), AST, and serum creatinine.[15]

However, in geriatric patients, platelet kinetics during dengue infection show distinct patterns that can contribute to increased morbidity and mortality. Thrombocytopenia, a hallmark of dengue pathogenesis, often presents more severely in the geriatric population due partly to age-related declines in the bone marrow reserve, immune function, and vascular integrity. In a retrospective study by Lee et al. (2008), elderly dengue patients aged ≥65 years had significantly lower nadir platelet counts. They were at greater risk of mucosal bleeding and dengue shock syndrome (DSS) than their younger counterparts.[16] Similarly, Yap et al. (2013) conducted a study in Singapore and reported that older adults not only presented with more profound thrombocytopenia but also had delayed platelet recovery, which was correlated with a higher incidence of severe dengue and a more extended hospital stay.[17]

Another variable that was considered a significantly associated admission factor was the ALP level. However, limited information is available from other studies regarding ALP levels related to the incidence of dengue fever among the geriatric population. Geriatric patients with dengue fever and severe hepatitis (AST >1000 U/L) were independently associated with mortality.[15] Therefore, admission should be warranted. Several studies have highlighted the clinical importance of alkaline phosphatase (ALP) as a biomarker in the pathogenesis of dengue fever, particularly concerning hepatic dysfunction. Although the ALP does not directly contribute to the dengue virus's virological or immunopathological mechanism (DENV), its elevation has been consistently associated with disease severity. In a cross-sectional study by Sahni et al. (2022) in a tertiary care hospital in India, ALP levels were elevated in 58.3% of patients with severe dengue. In contrast, only 10.6% of patients without warning signs were elevated. These findings suggest that the ALP may be useful as a predictive marker of severe disease.[18] Similarly, Rauf et al. (2022) reported that elevated ALP levels, along with elevated transaminase (ALT and AST) levels, were significantly associated with poor clinical outcomes, including progression to dengue haemorrhagic fever (DHF).[19] The increase in ALP is believed to result from cholestatic liver injury, endothelial dysfunction, or a systemic inflammatory response, all of which are prominent features of severe dengue. These findings support the use of ALP, combined with other hepatic enzymes, for early risk stratification and monitoring of dengue patients.

Among the 171 hospitalised geriatric patients, 93.5% were successfully discharged home, and 6.4% (n = 11) died in the hospital. The causes of mortality were severe dengue with plasma leakage, compensated shock with multiorgan failure, and severe dengue fever with concurrent infection. A two-year epidemiological review of dengue-related deaths among elderly individuals in Malaysia between 2013 and 2014 revealed that 17.5% (n= 56) of cases overall, with the highest cause of mortality being severe organ involvement (72%), followed by dengue shock syndrome (68%).[20]

As a retrospective study, this study has several limitations. The number of cases gathered could not represent the general population of geriatric patients in the country since it was conducted in a single medical centre. Other limitations of this study are the small sample size, incomplete documentation, and missing data.

CONCLUSION

There is a high prevalence of admission to the ward for geriatric patients with dengue fever. Low platelet

count and elevated ALP are significant factors for admission. However, other blood parameters, such as AST and ALT, must be used to determine admission status based on many studies. The mortality rate is relatively low among geriatric dengue patients in Hospital Pakar USM.

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DECLARATION OF CONFLICTING INTERESTS

We declare no conflicts of interest related to this article's study, authorship, and/or publication.

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