Scoring System Model for Early Detection of Maternity Blues in Bukittinggi, West Sumatera, Indonesia

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Abstract: *Background*: Maternity blues creates emotional instability in moms, causing them to become irritated, overly nervous, and feel incapable of being a good mother. Maternity blues may interfere with infant care and raise the risk of postpartum depression symptoms, disrupting mother and baby interactions. Maternity blues is often ignored so it is not diagnosed and if not treated properly it can become a problem and develop into postpartum depression or postpartum psychosis. Maternity blues is a serious condition that poses risks to both mothers and infants. If left untreated, Maternity blues can progress into postpartum depression, which has significant physical and psychological consequences. Early detection of Maternity blues is crucial for timely intervention and prevention.

Objectives: This study aims to develop a Scoring System Model for the early detection of maternity blues , allowing for effective screening and timely management.

Methods: A cross-sectional study was conducted in Bukittinggi City, West Sumatra, Indonesia, involving 126 postpartum mothers recruited consecutively. Data analysis included the calculation of odds ratios, logistic regression, and ROC curve analysis to determine the sensitivity and specificity of the prediction model. The scoring system's performance was assessed using calibration and discrimination values.

Results: The developed scoring system demonstrated good calibration and discrimination, with an Area Under the Curve (AUC) value of 0.806 (95% CI: 0.732–0.881). The Hosmer & Leme show test showed a p-value of 0.724, indicating a good fit for the model.

Conclusion: The proposed scoring system is a reliable tool for the early detection of maternity blues . By identifying at-risk mothers through prediction scores, appropriate interventions can be implemented to prevent the progression of maternity blues into more severe postpartum mental health disorders.

Keywords: Early detection, Maternity blues, scoring system.

INTRODUCTION

The postpartum period is a key time for the survival and rehabilitation of the mother's physical and mental health [1]. During this time, postpartum women are at risk of developing depressive symptoms, one of which is maternity blues [2]. One of them is maternity blues [3]. The prevalence of maternity blues remains high worldwide, affecting approximately 43% of postpartum mothers [4]. In different regions, the occurrence varies, with Africa reporting a prevalence of 49.6%, Europe at 41.8%, Asia at 33.1%, and America at 32.1% [5].

In Indonesia, the incidence of maternity blues is still not widely known [6]. In addition, there is an opinion that maternity blues is a side effect of postpartum fatigue [7]. Several studies have been conducted in Indonesia, including North Sulawesi, which found 62.5% blues [8], research at a Yogyakarta hospital showed that 43.3% of mothers experienced maternity blues and a 10% risk of postpartum depression [9]. Then research in Rokan Hilir Riau showed that 24.7% of mothers experienced maternity blues [10]. Research in Padang City found that 52.6% of postpartum mothers experienced maternity blues [11]. Currently, there is no official written government data on cases of maternity blues and depression in pregnant women or postpartum women. Based on a preliminary survey conducted by the author in two Puskesmas work areas in Bukitinggi, it was found that 44.4% of postpartum mothers experienced maternity blues and 2.7% of postpartum mothers were at risk of postpartum depression. The high prevalence of maternity blues highlights its potential to progress into postpartum depression if not addressed properly [12].

Maternity blues creates emotional instability in moms, causing them to become irritated, overly nervous, and feel incapable of being a good mother. Maternity blues may interfere with infant care and raise the risk of postpartum depression symptoms [13], disrupting mother and baby interactions [14]. Maternity

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blues is often ignored so it is not diagnosed and if not treated properly it can become a problem and develop into postpartum depression or postpartum psychosis [15,16]. Women with maternity blues have a 4-fold risk of developing postpartum depression [17], and 5%-25% of mothers with maternity blues are at risk of experiencing postpartum depression [18]. If the situation is not addressed, it may lead to maternal suicidal tendencies and potentially harm the baby [19].

Risk factors that cause Maternity blues are parity, low economic status, ethnic or racial background, gravidity status, pregnancy status, type of delivery, family history of mood disorders, or history of postpartum depression [20]. Several studies report that the husband's support is the main factor causing Maternity blues. In Indonesia, there are several specific risk factors that contribute to the occurrence of maternity blues among postpartum mothers. Strong cultural and social norms often place significant pressure on new mothers, particularly regarding expectations related to their roles as wives and mothers. The lack of emotional support from extended family, especially from husbands and mothers-in-law, is also a common trigger for symptoms of maternity blues. In addition, low levels of education, limited access to mental health services, and the stigma surrounding psychological issues lead many mothers to avoid seeking professional help. This situation is further worsened by the high number of home births or deliveries assisted by non-medical personnel, which limits opportunities for mental health screening and education. Therefore, understanding the social and cultural context in Indonesia is essential for effectively identifying and addressing the risk factors for maternity blues [21-23]. Prevention of Maternity blues can be done since pregnancy [24]. Implementing early detection is the best effort to prevent maternity blues in postpartum mothers and quickly find mothers who experience maternity blues so that it does not progress to postpartum depression. Developing early detection tools is one of the things that can be done as a preventive effort to prevent the emergence of mental welfare problems [25].

In Indonesia, the program for examining maternal mental health is through a family health program, namely mental health examination activities for pregnant women during ANC (Antenatal Care) activities and detecting the possibility of postpartum mothers experiencing baby blues during postpartum mother visits [26]. The government has published a guidebook for integrated antenatal care which includes an instrument for early detection of mental health in pregnant women using the SCL 90 questionnaire containing 90 questions. These instruments are general, uneconomical, and difficult to implement because they require a long time to complete the questionnaire [27,28].

There are several scales for detecting maternity blues, namely the Pitt, Stein, and Kenerley instruments. These three scales detect maternity blues symptoms through emotional and mood changes during antepartum and postpartum [29]. Apart from that, there is also a Suryani Model maternity blues early detection scale built based on Indonesian cultural patterns and the transition phase of a woman becoming a mother, emotional changes, and mood when interacting with the fetus/baby. The newly developed maternity blues scale examines several predictor factors such as social support, culture, and maternal transition period, but does not yet predict factors such as physical disorders, obstetric conditions, and risk factors for maternity blues in pregnant women [12].

Currently, there is no scoring system to detect maternity blues that is based on obstetric conditions and risk factors for maternity blues in the mother, so a scoring system needs to be developed to help predict the risk of maternity blues in the mother. This research aims to develop a Scoring System Model for the Early Detection of Maternity Blues in Postpartum Women in Bukittinggi City, West Sumatra, Indonesia.

OBJECTIVES

This study aims to develop a Scoring System Model for the early detection of maternity blues, allowing for effective screening and timely management.

METHOD

Study Design and Participants

This study employed a cross-sectional design and was carried out in Bukittinggi City, West Sumatra, Indonesia, involving postpartum mothers who were recruited consecutively between August 2023 and January 2024. The sample consisted of 126 postpartum mothers aged 3–14 days, determined using the Lemeshow formula. Inclusion criteria included postpartum mothers aged 18 years or older, within a postpartum period of 3–14 days, with no history of depression, The exclusion criteria were respondents with a history of depression, communication barriers, and impaired cognitive function. and who agreed to participate by signing an informed consent form [30].

Data Collection Instruments

The data collected included sociodemographic factors (age, education level, employment status, and income), obstetric history (type of delivery, history of perinatal complications, and parity), pregnancy status, childbirth readiness, husband's support, knowledge, attitudes, religiosity, and coping strategies. The instruments used in this study were validated research questionnaires. Pregnancy status was measured using the London Measure of Unplanned Pregnancy questionnaire (Cronbach's Alpha = 0.779) [31]. Husband's support was assessed using the Postpartum Partner Support Scale (Cronbach's Alpha of 0.96 [32]. Childbirth readiness was evaluated with a standard questionnaire adapted from the Demographic and Health Survey (DHS), WUS questionnaire part 4, no. 413f. Religiosity was measured using a modified version of The Centrality of Religiosity Scale (CSR-15 with a Cronbach's alpha value (0.92-0.96) [33]. Coping strategies were assessed using the Brief COPE questionnaire adapted from Rizki (2022) Cronbach's alpha value of 0.81 [34]. The maternity blues assessment was conducted using the Edinburgh Postnatal Depression Scale (EPDS), adapted from Nirmala Sari (2021) Cronbach's alpha value of 0.80 [35]. Additionally, knowledge and attitude variables were measured using a researcher-developed questionnaire, which was tested for validity and reliability, yielding Cronbach's alpha values of 0.794 and 0.783, respectively.

Intervention

This study focused on identifying the factors influencing maternity blues among postpartum mothers. Participants completed questionnaires covering various psychosocial and demographic variables. The study did not involve any clinical interventions but aimed to develop a scoring system for early detection of maternity blues.

Ethical Considerations

This study was approved by the Medical Research Ethics Commission, Faculty of Medicine, University of Andalas (Register Number: 334/UN.16.2/ KEP-FK/2023). All participants were informed about the study and provided written consent before participation.

Data Analysis

Data analysis involved calculating odds ratios, logistic regression, and ROC curve analysis to determine the sensitivity and specificity of the predictive values used in the scoring system. The scoring model demonstrated good calibration and discrimination, with an Area Under the Curve (AUC) value of 0.806 (95% CI: 0.732–0.881) and a Hosmer & Lemeshow test result of p = 0.724. The data processing technique in this study used SPSS Statistics version 30.0.0 software.

Table 1: Participant Characteristics

Variables	Mean or frekuensi (%)
Age in years, Mean	29.2
Age category, n (%)	
Risk	33 (26.2)
No risk	93 (73.8)
Education level, n (%)	
Low	72 (57.1)
High	54 (42.9)
Employment status, n (%)	
No	84 (66.7)
Yes	42 (33.3)
Income, n (%)	
Low	93 (73.8)
High	33 26.2)
Type of delivery, n (%)	
With action	47 (37.3)
Normal	79 (62.7)
History of perinatal complications, n (%)	
Yes	53 (42.1)
No	73 (57.9)
Parity, n (%)	
Primipara	65 (51.6)
Multipara	61 (48.4)
Pregnancy status, n (%)	
Unplanned	38 (30.2)
Planned	88 (69.8)
Childbirth readiness, n (%)	
Lack	13 (10.3)
Good	113 (89.7)
Husband support, n (%)	
Lack	45 (35.7)
Good	81 (64.3)
Knowledge, n (%)	
Lack	53 (42.1)
Good	73 (57.9)
Attitude, n (%)	
Negative	56 (44.4)
Positive	70 (56.4)
Religiosity, n (%)	
Religious	23 (18.3)
Highly religious	103 (81.7)
Coping strategies, n (%)	
Emosional focused coping	28 (22.2)
Problem focused coping	98 (77.8)
Maternity Blues, n (%)	
Yes	56 (44.4)
No	70 (55.6)

Table 2: Risk Factors for Maternity Blues in Postpartum Mothers

Risk factors	Maternity Blues		OR 95% CI	*P value*
	Yes	No		
Age category, n (%)			2.436 1.080-5.494	0.049*
Risk	20 (60.6)	13 (39.4)		
No risk	36 (38.7)	57 (61.3)		
Education level, n (%)			2.235 1.076-4.643	0.046*
Low	38 (52.5)	34 (47.2)		
High	18 (33.3)	36 (66.7)		
Employment status, n (%)			2.340 1.071-5.112	0.049*
No	43 (51.2)	41 (48.8)		
Yes	13 (31.0)	29 (69.0)		
Income, n (%)			3.333 1.363-8.150	0.012*
Low	48 (51.6)	45 (48.4)		
High	8 (24.2)	25 (75.8)		
Type of delivery, n (%)			1.015 0.491-2.100	1.000
With action	21 (44.7)	26 (55.3)		
Normal	35 (44.3)	44 (55.7)		
History of perinatal complications, n (%)			0.929 0.456-1.895	0.984
Yes	23 (43.4)	30 (56.6)		
No	33 (45.2)	40 (54.8)		
Parity, n (%)			2.222 1.083-4.560	0.044*
Primipara	35 (53.8)	30 (46.2)		
Multipara	21 (34.4)	40 (65.6)		
Pregnancy status, n (%)			2.556 1.171-5.578	0.028*
Unplanned	23 (60.5)	15 (39.5)		
Planned	33 (37.5)	55 (62.5)		
Childbirth readiness, n (%)			1.080 0.341-3.417	1.000
Lack	6 (46.2)	7 (53.8)		
Good	50 (44.2)	63 (55.8)		
Husband support, n (%)			3.118 1.463-6.645	0.005*
Lack	28 (62.2)	17 (37.8)		
Good	28 (34.6)	53 (65.4)		
Knowledge, n (%)			1.210 0.594-2.464	0.732
Lack	25 (47.2)	28 (52.8)		
Good	31 (42.5)	42 (57.5)		
Attitude, n (%)			1.711 0.840-3.485	0.193*
Negative	29 (51.8)	27 (48.2)		
Positive	27 (38.6)	43 (61.4)		
Religiosity, n (%)			1.463 0.591-3.621	0.553
Religious	12 (52.2)	11 (47.8)		
Highly religious	44 (42.7)	59 (57.3		
Coping strategies, n (%)			0.185 0.072-0.479	0.001*
Emosional focused coping	21 (75.0)	7 (25.0)		
Problem focused coping	35 (35.7)	63 (64.3)		

Note: *Eligible for multivariate logistic regression analysis, OR = odds ratio, CI = confidence interval.

RESULTS

Sociodemographic characteristics, obstetric history, pregnancy status, childbirth readiness, husband's support, knowledge, attitude, religiosity, coping strategies and maternity blues incidence in postpartum mothers in Bukittinggi City can be seen in Table **1**.

The development of the scoring system in this study was conducted in several stages. The initial step involved identifying and validating predictor variables to be incorporated into the scoring system. A total of 14 candidate predictor variables were examined using both bivariate and multivariate analysis to determine their significance levels. Variables that met the criteria in the multivariate model were considered as predictor factors.

Table **2** presents the analysis results, highlighting the association between risk factors and the incidence of maternity blues. The findings indicate that age, education level, employment status, income, pregnancy status, parity, husband's support, attitude, and coping strategies qualified for inclusion in the logistic regression analysis. Conversely, variables such as type of delivery, history of perinatal complications, childbirth readiness, and religiosity did not meet the threshold for further analysis (p-value ≥0.25).

As shown in Table **3**, primiparous parity emerged as the most significant risk factor contributing to maternity blues. The subsequent phase of the study focused on results of the multivariate logistic regression analysis will create a scoring system and probability simpler number. The scoring for each variable is determined by utilizing the B and SE values for each variable. The b/s.e value and the smallest value are used as a reference (divisor) to obtain the actual variable score (Table **4**).

Based on Table **4**, the B/SE value is obtained and the smallest value is 2.071918 which is used as a reference (divisor) to obtain the actual variable score. Furthermore, the score value of each variable is adjusted to a simpler number for use in daily practice.

Furthermore, to see whether the resulting scoring system has good calibration and discrimination values, a multivariate analysis was carried out on the scoring system with a single variable in the form of a total score. From the statistical calculations, The obtained AUC (Area Under the Curve) value was 0.806 (95% CI 0.732–0.881), with the Hosmer & Lemeshow test showing a p-value of 0.724, as presented in Figure **1**. The cutoff point for determining whether respondents experienced maternity blues was established based on the sensitivity and specificity values of each point, as

Table 3: Multivariate Analysis of Logistic Regression

Variables	Coefficient b	S.E	Wald	P *value*	OR	95% CI	
						Lower	Upper
Age	1.321	0.584	5.117	0.024	0.267	0.085	0.838
Income	1.360	0.633	4.619	0.032	3.898	1.127	13.479
Paritay	1.901	0.590	10.385	0.001	6.695	2.106	21.281
Pregnancy status	0.952	0.402	5.606	0.018	2.591	1.178	5.698
Husband support	1.539	0.535	8.263	0.004	4.659	1.632	13.3040
Coping strategies	1.043	0.388	7.227	0.007	0.352	0.165	0.754

Table 4: Conversion into the Scoring System

Variables	b	S.E	b/S.E	b/S.E: (2,071918)	Simplification of scores
Age	1.321	0.584	2.071918	1	1
Income	1.360	0.633	2.148499	1.036926	1
Paritay	1.901	0.590	3.222034	1.555044	2
Pregnancy status	0.952	0.402	2.368159	1.14294	1
Husband support	1.539	0.535	2.876636	1.388345	1
Coping strategies	1.043	0.388	2.688144	1.297374	1

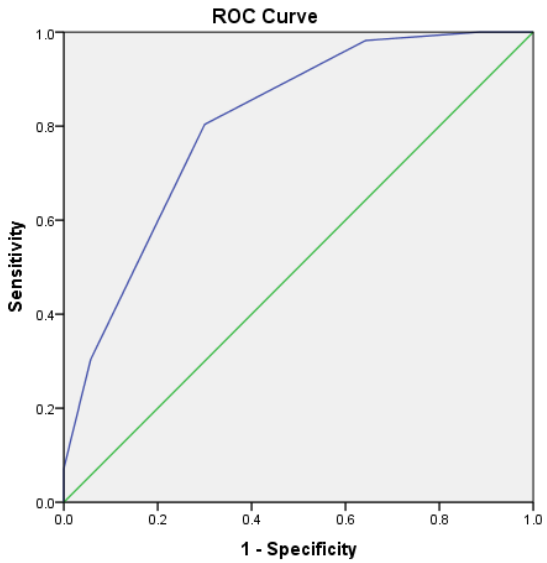

Figure 1: ROC curve of maternity blues scoring.

shown in Table **5**. The optimal cutoff score for identifying maternity blues is 4 (Figure **2**), with a probability of 59.16%, a sensitivity of 80.4%, and a specificity of 70.0%. Statistically, the quality of a predictive model is assessed based on calibration and discrimination values. For predictive models with categorical outcomes, calibration is evaluated using the Hosmer & Lemeshow test, while discrimination is assessed through the AUC value. A model is considered to have good calibration if the Hosmer & Lemeshow test yields a p-value greater than 0.05, indicating that the predicted outcomes align well with the observed data. Discrimination is considered strong if the AUC value exceeds 0.80, reflecting the model's ability to distinguish between respondents who experience and do not experience maternity blues. With an AUC of 0.806 and a Hosmer & Lemeshow p-value of 0.724, this model demonstrates good performance in terms of both calibration and discrimination.

Table 5: Probability, Sensitivity, and Specificity Based on Participant Scores

Score	Probability	Sensitivity (%)	Specificity s (%)
0	0.00665 (0.06%)	100.0	0.0
1	0.02504 (2.50%)	100.0	1.4
2	0.08966 (8.96%)	100.0	11.4
3	0.27416 (27.41%)	98.2	35.7
4	0.59161 (59.16%)	80.4	70.0
5	0.84746 (84.74%)	30.4	94.3
6	0.95517 (95.51%)	7.1	100.0
7	0.98791 (98.79%)	1.8	100.0

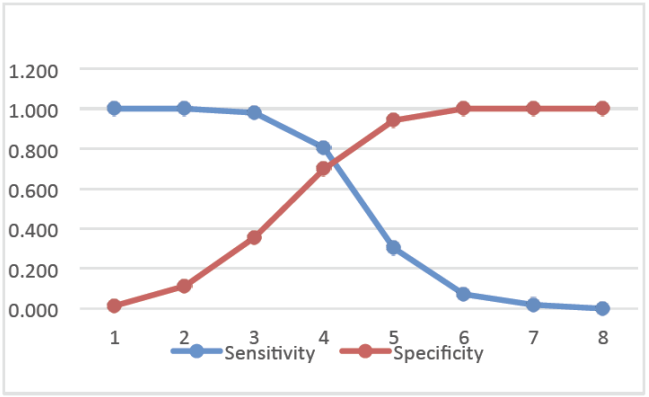

Figure 2: Maternity Blues score cut off point.

DISCUSSION

The development of a scoring system model for early detection of maternity blues through 6 predictor variables has produced a score to predict maternity blues. The range of score values in this scoring system model is between 0 and 7. Score 0 if the respondent has no risk factors at all. It can be seen in Table 5 the results indicate that a higher respondent score corresponds to an increased predicted probability of experiencing maternity blues. This scoring system is designed to be user-friendly, making it a practical tool for early detection among pregnant and postpartum women. Additionally, the system demonstrates a high level of sensitivity in predicting maternity blues. Therefore, the variables included in this scoring system have been validated and proven to be reliable.

The results of this study are in line with Manurung (2019) who also tried to develop an early detection model for maternity blues. Manurung's study used variables of Indonesian cultural patterns and the transition phase of a woman becoming a mother, emotional and mood changes when interacting with the fetus/baby, social support, culture, and the mother's transition period. The diagnostic value of Manurung's study is more or less the same as this study with a sensitivity value of 72.2% [36]. The determination of the respondent's score experiencing maternity blues or not, based on the cut-off point and AUC value can support that the scoring system for early detection of maternity blues as a screening tool for maternity blues. The sensitivity value that has been set is in accordance with the standard, so it can be stated that in predicting a mother experiencing maternity blues it is not just because of chance or coincidence [37]. From these

results, it can be seen that a simpler scoring system such as that used in this study can provide good predictions for maternity blues events.

This scoring system is built from 6 variables, namely age, income, parity, pregnancy status, husband's support and coping strategies. Factors that influence maternity blues are usually caused by several things so that the signs and symptoms of maternity blues are a multifactorial mechanism [38]. Previous studies have reported that age is the most dominant factor influencing the occurrence of maternity blues, followed by several other factors such as parity, husband's support, income and pregnancy status, and coping strategies are also factors influencing maternity blues [39,40]. The mother's age is too young related to the readiness of the role of becoming a mother, the age at risk is a mother aged <20 years and if the mother's age is more than 35 years what makes it a risk is the fatigue factor and the anatomical condition of the body that is no longer good for pregnancy and childbirth [41].

In primiparous mothers who do not have experience in caring for children, they often have difficulty adjusting to the alienation they experience and will easily experience maternity blues because after giving birth, primiparous mothers will be in a period of adaptation. In psychological adaptation, a woman will experience adjustments to her role as a parent. Most primiparous mothers will feel anxious and restless after giving birth because it is their first birth. By providing support to the mother during this period, she must provide support and attention from both her partner and family and provide the opportunity to get enough rest. In addition, positive support for the success of becoming parents of a newborn baby can help restore the mother's self-confidence [38]. Younger mothers throughout the postpartum period are reported to experience higher stress and use more emotion-focused coping than older mothers [42]. Meanwhile, unplanned pregnancies can be caused by a lack of maternal knowledge about contraception, a large number of children, a relatively young age, and an unestablished relationship or economic constraints. This has a negative impact on health, social, and psychological. Unintended pregnancies are associated with higher levels of depression, anxiety, and stress [43].

Other evidence that this scoring system can predict maternity blues is based on sensitivity testing. This is proven by the AUC statistical results that this scoring system can screen 126 postpartum mothers above 80%. Measurements have informed that if the AUC value is above the 50% standard, it means that this instrument can be accepted as a screening tool [44, 45]. The statistical results support this scoring system as an early detection tool.

This study minimizes errors in sample selection and measurement due to research limitations. The sample selection was not done randomly but was done by purposive sampling (judgmental sampling). This was decided due to the limited time of the study to obtain respondents who met the inclusion criteria. So that the technical decision of sampling with the time available during the study can meet the number of respondents according to the size in the preparation of measuring instruments that refer to the inclusion criteria.

The originality of the development of this scoring system is built based on obstetric conditions and maternal risk factors. This study has produced a scoring system for early detection of maternity blues. The results of the validation of the scoring system show that this scoring system is valid and reliable as a scoring system that predicts maternity blues. This scoring system has the lowest score of 0 and the highest is 7. So the score of mothers at risk of experiencing maternity blues is ≥ 4.

CONCLUSION

The scoring system model can be used for early detection of maternity blues with good calibration and discrimination. The scoring system model for early detection of maternity blues in mothers can be used as an initial screening of the possibility of maternity blues so that by knowing the prediction score before delivery, action can be taken to prevent the possibility of maternity blues. Further research is needed to determine the effectiveness of the scoring system model developed

ABBREVIATIONS

Maternity Blues = Maternity blues

OR = odds ratio

CI = confidence interval

AUC = area under the curve

ROC = receiver operating characteristic

b = coefficient beta

df = degree of freedom

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Medical Research Ethics Commission, Faculty of Medicine, University of Andalas (Register Number: 334/UN.16.2/ KEP-FK/2023). All subjects provided were informed under written consent before their participation.

COMPETING INTEREST

The authors declare no competing financial, institutional, or personal interest.

AVAILABILITY OF DATA AND MATERIALS

Data and materials for this study are available from the corresponding author at reasonable request and for non-commercial purposes.

AUTHORS' CONTRIBUTION

FW, YL, Y, and AY were conceptualizing designing, and interpreting the results of the study. FW, YL, Y, and AY were drafting. FW was revising the manuscript.

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