



Research article

Self-confidence in conducting forensic psychiatric evaluations among general psychiatrists in Indonesia



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ABSTRACT

Objective: Several general psychiatrists experience lack of confidence when they perform forensic psychiatric evaluations that may be due to limited or insufficient training. This study aimed to determine whether structured forensic psychiatry educational modules are associated with general psychiatrists' self-confidence in conducting forensic psychiatric evaluations in Indonesia.

Method: A cross-sectional study was conducted with 246 general psychiatrists. A questionnaire was developed exclusively for this study by a group of experts based on relevant references and it was distributed online. Sample questions included: "How often do you perform forensic psychiatric evaluations?", "As a general psychiatrist, are you confident in conducting forensic psychiatric evaluations?", and "Do you experience any difficulties when conducting forensic psychiatric evaluations?" Data were analyzed through SPSS 20 for Windows; a p-value <0.05 indicated statistical significance.

Results: Compared to general psychiatrists who did not study structured forensic psychiatry educational modules during their residency training, those exposed to such modules reported confidence in conducting forensic psychiatric evaluations in the following cases: insanity defense in cases of violence, insanity defense, fitness to stand trial, malingering, capacity to consent to treatment, risk of recidivism, guardianship, and parenting capacity. Furthermore, those with higher self-confidence were less likely to experience difficulties in conducting forensic psychiatric evaluations.

Conclusion: Structured forensic psychiatry educational modules during general psychiatry residency training played an important role in the development of psychiatrists' self-confidence.

1. Introduction

Forensic psychiatric evaluation is a challenging field within psychiatry since it encompasses the complicated issues of both mental health and the law [1, 2]. The reciprocal influence between the mental system and the legal system reinforces the need for greater integration of psychiatric and legal perspectives regarding the various manifestations of mental health conditions [3]. For instance, forensic psychiatric reports

are often requested by judicial bodies to decide on specific legal matters. These reports contain the assessment of an individual's psychological condition as well as the assessing psychiatrist's opinions and recommendations.

When managing forensic psychiatric cases, general psychiatrists may experience a sense of detachment from their clinical roles as a treating psychiatrist, because the assessing psychiatrist for a forensic case works as an objective evaluator for a third party and does not provide

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treatment. Other aspects of forensic psychiatric practice, such as report writing and giving expert opinion in court, may also engender feelings of confusion and incompetence [4]. These skills require further specific training to increase psychiatrists' self-confidence, improve the quality of assessment, and avoid unintentional mistakes or deliberate unethical behavior [5].

Self-confidence is crucial for the development of clinical decision-making skills; these skills lead to successful forensic psychiatric evaluations, especially among general psychiatrists [6, 7]. A study by Martin and Daffern found that general psychiatrists' confidence levels were proportionate to several educational factors, including knowledge, experience, skills, and training [8]. Confidence building usually develops during the period of psychiatric residency training; clinical practice and mentoring during the residency training contributes significantly to this development [7]. For example, several Canadian psychiatry residents mentioned that more practical experiences regarding forensic psychiatry during their residency training would have enhanced their self-confidence in producing psychiatric medico-legal reports [9]. The associations between these two aspects of training and confidence have been explained by a neurobiological process involving the prefrontal cortex and thalamus [10].

A survey in Singapore found that 66.7% of psychiatrists agreed that general psychiatrists should be able to conduct forensic psychiatric evaluations and produce forensic psychiatry reports [11]. Although there are more than 1000 general psychiatrists in Indonesia, only 15 forensic psychiatrists are available for the whole country. Consequently, forensic psychiatrists are unable to meet the demand of forensic evaluations and general psychiatrists are expected to provide forensic services too.

Furthermore, forensic psychiatry education is not without its challenges as well. There are nine psychiatric residency centers in Indonesia, all of which are university based and takes 4 years to complete. That time is mostly spent on becoming a treating psychiatrist. Even though the Indonesian College of Psychiatrists requires forensic psychiatry to be taught as didactics and at least 1 month of clinical rotation, the teaching methods and learning activities vary widely between different centers. Hence, it cannot be ascertained that they are sufficiently designed to train general psychiatrist in forensic psychiatry and instill confidence. Additionally, only a few forensic psychiatrists teach at universities. The forensic psychiatry subspecialist training is only available in one center (Faculty of Medicine Universitas Indonesia – Cipto Mangunkusumo Hospital, Jakarta) and takes 2 years to complete. This is a major barrier in expanding forensic psychiatric services in the country.

Furthermore, one study revealed that a majority of general psychiatrists who have completed forensic psychiatry training still do not feel confident when conducting forensic psychiatric evaluations [12]. They mentioned that they require additional knowledge and practical skills regarding medicolegal issues as well as writing techniques concerning legal reports in particular, to build their confidence in managing forensic cases [12]. Previous studies mentioned that structured educational modules on forensic psychiatry are crucial to enhancing self-confidence in performing forensic psychiatric evaluations among general psychiatrists [9, 13].

Furthermore, law practitioners in Indonesia have not yet fully appreciated the dynamic interaction of mental health and the law, including forensic psychiatric practices. They may harbor misconceptions about the role of psychiatrists, putting psychiatrists at risk of legal lawsuits, which can negatively impact psychiatrists' self-confidence in performing their role as an assessing doctor.

Therefore, our study aimed to identify the self-confidence of Indonesian general psychiatrists in conducting forensic psychiatric evaluations and producing forensic psychiatric reports. We also explored the influenced of structured forensic psychiatric education module during the residency training towards their recent self-confidence in conducting forensic psychiatric evaluations and producing forensic psychiatric report in several forensic psychiatry cases. The results of this study

may provide insights about the general psychiatry residency training needs in forensic psychiatry in order to gain self confidence and further other competencies.

2. Materials and methods

2.1. Study design and participants

This is a nationwide cross-sectional study utilizing online questionnaire conducted between June and August 2019. Study respondents were randomly collected by their willingness to participate and to fulfill the questionnaire completely, from a database of 1000 Indonesian psychiatrists who trained between 1977 and 2015. Respondents were included on the study analysis if they are still actively practicing. On the other hand, they were excluded if they had had participated in forensic psychiatric workshops or courses after the completion of residency. During the study period, 246 general psychiatrists completely fulfilled the questionnaire, met the study criteria, and agreed to participate into the study by signing the online informed consent. Thus, they were included on the study analysis. Even this study only covered 246 respondents, however the power of this study can be still accepted based on the OpenEpi version-3 for power calculation in cross sectional study (power based on normal approximation = 76.5% and normal approximation with continuity correction = 71.17%). This study has been given ethical clearance by the Health Research Ethics Committee of the Faculty of Medicine Universitas Indonesia.

2.2. Questionnaire and procedure

The study questionnaire was developed by a group of experts consisted of forensic psychiatrist, forensic psychologist, and psychiatry residents. The theoretical construct of questionnaire was based on several relevant references such as, Hecimovich and Volet (2009) [7], Desmarais et al. (2010) [13], Chern and Ling (2012) [11], and Neal and Brodsky (2016) [14]. The questionnaire consisted of three parts. The first part included demographic characteristics and forensic psychiatric experience: gender, residency center, availability of structured forensic psychiatry module, content of module, mode of teaching, and lawsuit or misuse regarding their forensic psychiatric report. The second part asked about respondents' experience with forensic psychiatry after qualifying as a psychiatrist: "how often do you perform forensic psychiatric evaluations?" and "have you ever considered referring forensic evaluations to a forensic psychiatrist?". This part showed a medium level reliability with a Cronbach's α of 0.78. The last part also consisted of two questions: "as a general psychiatrist, please rate your self-confidence in conducting forensic psychiatric evaluations" and "did you experience any difficulties when conducting forensic psychiatric evaluations?". Respondents are asked to answer specifically according to the type of evaluation they have conducted: competence to stand trial, insanity defense, violence risk assessment, malingering, malpractice, fitness-to-work/study, capacity to consent to treatment, guardianship, risk of recidivism, parenting capacity, and forensic psychiatric report writing. The third part of questionnaire was also exhibited a good reliability with a Cronbach's α of 0.87. The whole questionnaire was designed in GoogleForms® and distributed through social media channels (Whatsapp® groups and Facebook®).

2.3. Data analysis

Only fully completed questionnaires were included in the analysis. All data were managed and analyzed using SPSS for Mac version 20.0. The chi-square test, odds ratio, and confidence intervals were used to determine the association between participants' forensic psychiatry educational background and their self-confidence in conducting forensic psychiatric evaluation. The statistical significance for all the analyses was set at a p -value of .05.

3. Results

There were 246 respondents in this study from all psychiatry residency-training centers in Indonesia. Most of the participants (67.1%) were female psychiatrists who enrolled in the psychiatry residency-training program after 2009. The ratio of participants who received structured forensic psychiatry educational modules to those who did not was nearly equal (50.8% vs. 49.2%, respectively). Participants who studied structured forensic psychiatry educational modules reported various teaching methods, such as lectures (48%), forensic psychiatry report writing based on simulated written cases (45.9%), clinical and forensic psychiatric evaluations with actual patients (37%) (Table 1). The study found that participants who studied structured forensic psychiatry educational modules during their psychiatry residency training, were more likely to be confident in their abilities to conduct forensic psychiatric evaluations and produced forensic psychiatry reports than those who did not have exposure to structured educational modules (84% vs. 73.6%, OR = 1.888, $p < 0.05$, Table 2). Participants who studied structured forensic psychiatry educational modules during their residency training – as opposed to those who did not – confirmed their confidence in conducting forensic psychiatric evaluations in certain cases. These cases included: insanity defense in cases of violence (OR = 2.031, 95% CI 1.187–3.475), insanity defense (OR = 1.741, 95% CI 1.025–2.958),

Table 1. Participants' characteristics.

Characteristics	n (%)
Psychiatry residency training center background	
Airlangga University (East Java)	29 (11.8)
Diponegoro University (Central Java)	26 (10.6)
Gajah Mada University (Special Region of Yogyakarta)	21 (8.5)
Hasanuddin University (South Sulawesi)	31 (12.6)
Indonesia University (Jakarta)	22 (8.9)
Negeri Sebelas Maret University (Central Java)	25 (10.2)
Padjajaran University (West Java)	32 (13)
Sumatera Utara University (North Sumatera)	31 (12.6)
Udayana University (Bali)	29 (11.8)
Forensic psychiatry educational module in psychiatry residency training	
Yes	125 (50.8)
No	121 (49.2)
Teaching methods in forensic psychiatry educational module (Note: respondents are allowed to choose >1 answers)	
Lecture	118 (48)
Direct practice (forensic psychiatry assessment)	91 (37)
Forensic psychiatry report writing based on case simulation/scenario	49 (19.9)
Forensic psychiatry report writing based on real cases	113 (45.9)
Number of psychiatrists charged with a legal lawsuit based on their forensic psychiatric evaluations	
Insanity defense in violence cases	6 (2.4)
Insanity defense case	10 (4.1)
Fit to stand trial case	3 (1.2)
Malingering and malpractice case	1 (0.4)
Fit to work/study case	11 (4.5)
Competence to consent to treatment case	2 (0.8)
Risk of recidivism case	4 (1.6)
Guardianship case	3 (1.2)
Parenting capacity	4 (1.6)
Number of psychiatrists charged with a legal lawsuit based on misused documents	
Prescription	35 (14.2)
Patient medical resume	13 (5.3)
Psychiatrists' personal note	4 (1.6)
Referral letter	12 (4.9)
Mental health clinical report	40 (16.3)

Table 2. Association between having studied structured forensic psychiatry educational modules and self-confidence to produce forensic psychiatric reports.

General Psychiatrists	Self-confidence to produce forensic psychiatric reports			
	Confident n (%)	Not Confident n (%)	OR (95%CI)	p-value
Studied structured forensic psychiatry educational modules n (%)	105 (84)	20 (16)	1.888 (1.009–3.530)	<.05
Did not study structured forensic psychiatry educational modules n (%)	89 (73.6)	32 (26.4)		

fitness to stand trial (OR = 1.936, 95% CI 1.165–3.215), malingering (OR = 1.929, 95% CI 1.162–3.202), the capacity to consent to treatment (OR = 1.685, 95% CI 1.017–2.790), risk of recidivism (OR = 1.694, 95% CI 1.023–2.806), guardianship (OR = 1.685, 95% CI 1.016–2.795), and parenting capacity (OR = 1.807, 95% CI 1.085–3.011). Concerning reports, participants who studied structured forensic psychiatry educational modules were more confident in compiling forensic psychiatric reports compared to those that did not study the structured modules (OR = 1.888; 95% of CI = 1.009–3.530, $p < .05$) (Table 3). It is also important to note that some participants who studied structured forensic psychiatry educational modules still did not feel confident in conducting forensic psychiatric evaluations such as, cases on malingering/malpractice (42.4%), capacity to consent to treatment/testamentary consent (41.6%), and risk of recidivism assessment (45.6%). There was no proportional difference in self-confidence between male and female general psychiatrists concerning the skill of writing forensic psychiatry reports (85% male psychiatrists vs. 75.8% female psychiatrists, $p > .05$).

The topics covered in structured forensic educational modules included: treatment and assessment roles of psychiatrists (52%), insanity defense assessment in violence cases (54.9%), and forensic psychiatry report writing skills (80.9%). Few participants endured legal prosecution after conducting forensic psychiatric evaluations; the charges mostly pertained to evaluations of being unfit to work/study and the misuse of forensic psychiatry legal reports (Table 1). Participants revealed that after their graduation as general psychiatrists, the average number of forensic psychiatric evaluations completed by them was less than five per year. Moreover, the most common cases of evaluation concerned malingering, malpractice, and being fit to work/study (Table 4).

Concerning evaluations, a majority of participants experienced difficulties in conducting forensic psychiatric evaluations (71.4%). Consequently, 61.8% of the participants “always” and “often” referred these evaluations to forensic psychiatrists. When asked what motivated their referrals, participants responded that they felt incompetent (78.2%), burdened by complicated legal procedures (43.2%), fearful of the consequences of inadequate legal protection (33.7%), reluctant to be summoned to court (32.1%), and possessed inadequate assessment instruments (26.7%) (Table 4).

Notably, participants who were confident were less likely to experience difficulties in conducting forensic psychiatric evaluations than those who did not feel confident (OR = 0.061; 95% CI 0.048 to 0.077, $p < .05$) (Table 5).

4. Discussion

This study found that general psychiatrists who had undergone structured forensic psychiatry educational modules during their residency have more self-confidence in their skill to conduct forensic evaluations and wrote its report. This result concurred with several existing studies that explained the importance of structured forensic psychiatry educational modules in general psychiatry residency training [1, 9, 11]. For example, several studies mentioned that the limited availability of forensic psychiatrists working in academic settings may impact the

Table 3. Associations between studying structured forensic psychiatry educational modules and self-confidence to conduct forensic psychiatric evaluations.

Self-confidence to conduct forensic psychiatric evaluations on cases related to:	Psychiatry Residency Training		OR (95%CI)	p-value
	Studied a structured forensic psychiatry educational module n (%)	Did not study a structured forensic psychiatry educational module n (%)		
Insanity defense in violence cases				
Confident, n (%)	92 (73.6)	70 (57.9)	2.031 (1.187–3.475)	.009*
Not Confident, n (%)	33 (26.4)	51 (42.1)		
Insanity defense				
Confident, n (%)	89 (71.2)	71 (58.7)	1.741 (1.025–2.958)	.039*
Not Confident, n (%)	36 (28.8)	50 (41.3)		
Fitness to stand trial				
Confident, n (%)	70 (56)	48 (39.7)	1.936 (1.165–3.215)	.010*
Not Confident, n (%)	55 (44)	73 (60.3)		
Malingering/malpractice				
Confident, n (%)	72 (57.6)	50 (41.3)	1.929 (1.162–3.202)	.011*
Not Confident, n (%)	53 (42.4)	71 (58.7)		
Fit to work/study				
Confident, n (%)	86 (68.8)	74 (61.2)	1.401 (0.828–2.370)	.209
Not Confident, n (%)	39 (31.2)	47 (38.8)		
Capacity to consent to treatment/testamentary capacity				
Confident, n (%)	73 (58.4)	55 (45.5)	1.685 (1.017–2.790)	.042*
Not Confident, n (%)	52 (41.6)	66 (54.5)		
Risk of recidivism assessment				
Confident, n (%)	68 (54.5)	50 (41.3)	1.694 (1.023–2.806)	.040*
Not Confident, n (%)	57 (45.6)	71 (58.7)		
Guardianship/curatelle				
Confident, n (%)	76 (60.8)	58 (47.9)	1.685 (1.016–2.795)	.043*
Not Confident, n (%)	49 (39.2)	63 (52.1)		
Parenting capacity				
Confident, n (%)	80 (64)	60 (49.6)	1.807 (1.085–3.011)	.022*
Not Confident, n (%)	45 (36)	61 (50.4)		

* p < .05.

quality of those modules and the quality of general psychiatry residency training in general. It will also impact the self-confidence of general psychiatrists working on forensic psychiatric cases after graduation [4, 12, 15, 16]. Another study explained that a reluctance to engage in forensic psychiatric evaluations originally emerges from a lack of sufficient training using structured forensic psychiatry educational modules that associated with the lack of self confidence respectively [11].

Nevertheless, not all psychiatrists who had structured forensic psychiatry educational modules feel confident in conducting forensic psychiatry evaluations and producing forensic psychiatry reports. Hence, confidence in conducting these evaluations and reports probably does not depend solely on their structured forensic psychiatry educational experiences in psychiatry residency training but also depends on how to gain those confidence. Previous studies have indicated that structured

Table 4. The number of cumulative forensic psychiatry evaluations performed in a year based.

Characteristics	n (%)					
	None at all	<5/year	1–3/month	4–5/month	6–10/month	>10/month
Number of psychiatrists with cumulative forensic psychiatric evaluations performed in a year						
Insanity defense in violence case	31 (12.6)	133 (54.1)	69 (28)	9 (3.7)	2 (0.8)	2 (0.8)
Insanity defense case	35 (14.2)	120 (48.8)	74 (30.1)	9 (3.7)	4 (1.6)	4 (1.6)
Fitness to stand trial case	57 (23.2)	126 (51.2)	56 (22.8)	6 (2.4)	0 (0)	1 (0.4)
Malingering & malpractice case	60 (24.4)	134 (54.5)	50 (20.3)	2 (0.8)	0 (0)	0 (0)
Fit to work/study case	19 (7.7)	106 (43.1)	75 (30.5)	16 (6.5)	15 (6.1)	15 (6.1)
Competence to consent to treatment case	51 (20.7)	137 (55.7)	50 (20.3)	2 (0.8)	6 (2.4)	0 (0)
Risk of recidivism case	57 (23.2)	124 (50.4)	53 (21.5)	8 (3.3)	3 (1.2)	1 (0.4)
Guardianship/curatelle case	44 (17.9)	129 (52.4)	58 (23.6)	8 (3.3)	4 (1.6)	3 (1.2)
Parenting capacity case	30 (12.2)	123 (50)	73 (29.7)	14 (5.7)	4 (1.6)	2 (0.8)
Number of psychiatrists who have ever considered referring any forensic evaluation to a forensic psychiatrist						
Always	57 (23.2)					
Often	95 (38.6)					
Rarely	75 (30.5)					
Never	19 (7.7)					

Table 5. Association between self-confidence and difficulties in conducting forensic psychiatric evaluations.

Self-confidence	Difficulties in conducting forensic psychiatric evaluations		OR (95% CI)	p-value (X ² test)
	Yes n (%)	No n (%)		
Confident n (%)	71 (49)	74 (51)	0.061 (0.048–0.077)	<.05
Not confident, n (%)	96 (95)	5 (5)		

forensic psychiatry educational modules may improve in quality if they also included issues related to self-confidence in those modules. They also emphasized that having forensic psychiatry knowledge and clinical experiences may enhanced further self-confidence but self confidence it self need to be developed by strengthening critical thinking, self awareness, and self appreciation during the residency period. Thus, it is important to increase psychiatry residents' skills and confidence in performing forensic psychiatric evaluations and producing forensic psychiatry reports [8, 15, 16]. The University of Massachusetts, which has integrated the self-confidence theme into their general psychiatry resident training curricula during forensic psychiatry fellowships, reported a boost in their confidence [17]. Thus, proper structured forensic psychiatry educational modules may not only improve knowledge and clinical skills in forensic psychiatry, but also build self-confidence.

Self-confidence is essential for conducting forensic psychiatric evaluations and producing forensic psychiatry reports because such evaluations/reports are assumed to be associated with information-seeking decisions that are very important in forensic psychiatry evaluation and producing the "lege artis" legal reports. This adaptive behavior is needed in order to become an assessing psychiatrist and increase quality of critical thinking and decision-making. A British study used time-resolved multivariate decoding of scalp EEG signals to demonstrate that neural indices of self-confidence are functionally involved in information-seeking decisions. Moreover, Desender et al. revealed that self-confidence may serve as the main variable prediction for information-seeking decisions [17]. Therefore, it can be assumed that structured forensic psychiatry educational modules may incorporate strategies to enhanced self-confidence among psychiatry residents instead of forensic psychiatry knowledge and clinical assessing skills exclusively. Furthermore, it may increase general psychiatrists' enthusiasm to gain more information and clinical experiences on forensic psychiatry, and finally they feel more secure and confident in performing forensic psychiatric evaluation and producing forensic psychiatry reports. Furthermore, Desmarais et al. (2010) mentioned that low levels of confidence were also associated with impaired critical decision-making abilities; this high likelihood of making more mistakes, in turn, triggered feelings of inadequacy and uncertainty [13].

This study also found that general psychiatrists reported difficulties in conducting forensic psychiatric evaluations, which may related to their limited confidence. It can also explain their eagerness to refer the evaluations to forensic psychiatrists. Other studies have displayed similar findings by revealing how general psychiatrists experience difficulties, fear, and avoidance when facing forensic psychiatric evaluations, especially in child and adolescent populations. General psychiatrists feel even more pressured when asked to provide evaluations on potential developmental issues, such as when conducting insanity defense, fitness to stand trial, and child custody evaluations [18, 19].

The strength of this study was the first to investigate general psychiatrists' self-confidence regarding forensic psychiatric evaluation and producing forensic psychiatry legal reports in Indonesia based on their previous residency training experiences. Our findings showed that structured forensic psychiatry educational modules associated to self confidence of general psychiatrists to conduct forensic psychiatric

evaluation. Therefore, it is suggested that psychiatry residency-training centers may develop high-quality of structured forensic psychiatry educational modules that include the self confidence aspects for psychiatry residency training purposes. For example, including strategies on how to enhance self awareness, self appreciation, self esteem, and emotional regulation in conducting forensic psychiatric evaluation and producing forensic psychiatry reports – especially with regards to maintaining and sharpening critical and rational thinking skills.

This study has several limitations. The cross-sectional design limits the extent to which inferences can be made about causality. Some factors that may contribute to self-confidence (age, gender, and personality traits) were not considered in this primary study. Hence, further research that elaborates on these issues is needed. Furthermore, the questionnaire was self-rated by respondents, and thus, it may still have prone to subjective and recall bias though it has already been validated. Furthermore, the questionnaire was disseminated online, therefore it may not covered all general psychiatrists in Indonesia who did not access Internet regularly, and it may associate to the low response rate of the respondent in this study. Thus, it is suggested that future study need to be done not only by online but also offline questionnaire.

In conclusion, these study findings have academic and practical importance as they may serve as the preliminary data on Indonesian general psychiatrists' perceptions and confidence regarding forensic psychiatry services. These preliminary findings may also suggest the urgent need for incorporating strategies to enhance self-confidence in structured forensic psychiatry educational modules in the near future especially in developing countries with limited number of forensic psychiatrists; however, further advanced researches are needed.

The findings from this preliminary study will also form part of a more extensive ongoing study: "Development of Forensic Psychiatry Assessment Instrument and Module: Focusing on Psycho-medico-legal Analysis Thinking Skills among Indonesian Psychiatrists." This ongoing study includes several other factors such as personality traits, metacognition, emotional reactivity and regulation, and decision-making style. Considering the results of this preliminary study, self-confidence should be cataloged as one vital component to be addressed in the aforementioned structured forensic psychiatry educational modules formulation and implementation. Moreover, psychiatry residency-training center may also refer these study findings to re-evaluate whether their structured forensic psychiatry educational modules were sufficiently enhancing general psychiatrists' confidence to conduct forensic psychiatry evaluations and producing forensic psychiatry reports.

Declarations

Author contribution statement

Natalia Widiasih Raharjanti: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Agus Purwadianto, Diantha Soemantri, Saptawati Bardosono, Marlina S. Mahajudin, Elizabeth K. Poerwandari, Tjhin Wiguna: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Monika Kristi Levanita: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Humbert Mardongan Tua Sorimangaraja Silalahi, Putu Trahinari Satvika Rumthi, Timotius Kevin P. Manullang: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

Adhitya Sigit Ramadianto: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

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