



# Investigating Attention Deficit Hyperactivity Disorder Symptoms, Emotional Dysregulation and Family Functioning in Children: A Community-Based Study in Elementary Schools in Surabaya, Indonesia

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**Objectives:** Research on emotional dysregulation related to attention deficit hyperactivity disorder (ADHD) symptoms and its effects on family functioning in children is scarce. This is the first study conducted in Indonesia to examine the intricate relationships between ADHD symptoms, emotional regulation, and family functioning in children.

**Methods:** A cross-sectional survey was conducted involving primary caregivers of children aged 9–13 years old across three elementary schools in Surabaya, using validated questionnaires comprising the Indonesian ADHD Rating Scale, Emotion Regulation Checklist, and Family APGAR scale.

**Results:** The findings revealed a positive association between ADHD features and the emotional lability/negativity subscale (ERLN) ( $r=0.528$ ;  $p<0.001$ ), but not the emotion regulation subscale (EREG). Moreover, family functioning positively correlated with ERLN ( $r=-0.269$ ;  $p=0.003$ ) and negatively correlated with EREG ( $r=0.331$ ;  $p<0.001$ ). Parental education emerged as a significant demographic factor, with higher education levels linked to better emotion regulation ( $r=0.297$ ;  $p=0.001$ ).

**Conclusion:** These findings underscore the importance of addressing ADHD symptoms and emotional dysregulation in children in order to enhance family functioning and overall well-being. Implications for future research and interventions targeting emotion regulation, especially in children with ADHD and their families, are also discussed.

**Keywords:** Attention deficit hyperactivity disorder; Emotion regulation; Family relations; Neurodevelopmental disorders; Psychological wellbeing.

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## INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterized by symptoms of inattention, hyperactivity-impulsivity, or a combination of both [1]. Diagnosis should be based on clinical manifestations beginning before 12 years of age and the persistence of symptoms for at least 6 months. A meta-analysis in 2023 reported a global ADHD prevalence of 5.6%–7.6% in children and adolescents [2], while the prevalence in Indonesia was thought to be around 4.2%–26.4% [3]. Although the condition emerges during childhood, some symptoms may persist until adult-

hood [4].

Children with ADHD often face social and interpersonal difficulties, behavioral problems, and academic challenges [5,6]. Impairments in executive functioning, such as working memory, inhibition, and cognitive flexibility, have been implicated in how ADHD negatively affects individuals [7]. However, recently, there has been growing interest in exploring emotional dysregulation as an important feature of the ADHD population [1,8,9]. Emotional regulation is the process responsible for evaluating and modifying emotional reactions to accomplish goals [10]. It has been suggested that children with ADHD have deficits in emotion recognition and regulation while also having higher emotional reactivity to stressful situations.

Emotional dysregulation also occurs in other clinical pop-

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ulations such as children with autism, who may have alexithymia, cognitive inflexibility, and increased emotional disorganization [11]. Problems in regulating emotions might also exist in children with post-traumatic stress disorder, conduct disorder, mood disorder, etc. [12]. However, a twin study found that emotional dysregulation was more strongly linked to ADHD than to autism spectrum disorder (ASD), intellectual disability, or other mental health conditions [13]. Poor emotion recognition might be observed in both ADHD and ASD populations, and dysfunction in children with ADHD tends to be secondary to general information processing difficulties, whereas deficits in children with ASD might be primary in nature [14].

Lower emotional inhibition and higher emotional lability in children with ADHD could lead to worse functional outcomes and comorbidities (e.g., depression and aggression) [15]. Furthermore, parents and families of children with ADHD tend to struggle more because of patients' symptoms [16]. Moreover, studies have shown that parent-child interactions may display more conflict, higher parental distress and depression, and disrupted family functioning [17]. However, few studies have attempted to link ADHD symptoms to emotional dysregulation and family functioning. It remains unclear how the symptoms of inattention and hyperactivity-impulsivity coexist and interact with the emotion regulation domain.

Given that emotion regulation is gaining more attention as a potential major symptom of ADHD, it is plausible that it also has considerable influence on how families function. This study aimed to examine the association between children's ADHD symptoms and emotion regulation and between these variables and family functioning. An improved understanding of the mechanisms underlying these variables could better explain the associated impacts and identify potential intervention targets for children and families with ADHD. We hypothesized that there would be an association among ADHD symptoms, emotional regulation, and family functioning. It was also speculated that participants suspected of having ADHD would have lower emotion regulation and family functioning than typically developing participants. We also predicted that those with poor emotion regulation would have poor family functioning.

## METHODS

This cross-sectional survey was conducted in Surabaya, Indonesia. This study was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Airlangga (ethical exemption no. 68/EC/KEPK/FKUA/2024).

### Participants

Participants were recruited from three public elementary schools adjacent to each other, which were government-funded and served students living within the district. The recruitment of participants included a population of parents/primary caregivers of children in the third to sixth grades, aged 9–13 years, who agreed to participate and were able to communicate well in Indonesian. Participants were excluded if they had severe physical or mental illness, or if their children had a history of severe physical or organic mental disorders (including epilepsy and cerebral palsy). The required sample size was calculated, resulting in a minimum of 47 participants.

### Measures and data collection

Participation was voluntary and informed consent was obtained from each respondent before the responses were collected. The respondents had been informed they were able to withdraw from the survey at any time, should they wish to. The study utilized questionnaires formed from multiple sources to record variables such as stated below.

### Demographic data

The participants were first asked to provide information about themselves (age, status, education, and occupation) and their children (age, sex, and grade).

### ADHD symptom screening

The Indonesian ADHD Rating Scale (IARS) was used to screen students for ADHD symptomatology. It was developed in 2004 by Saputro as an instrument to aid in the early detection of ADHD in children as reported by parents, teachers, or clinicians [18,19]. IARS which is composed of 35 items, could be used to assess inattention (20 items), hyperactivity (12 items), oppositional behavior (two items), and social difficulty (one item). It has a sensitivity and specificity of 61.3% and 76.8%, respectively, with a Cronbach's alpha of 0.7482 for parents [18]. Participants were instructed to rate their children's condition using a 4-point Likert scale (0=never or rarely; 3=always) with total scores ranging from 0 to 105. For parents, a total score above 30 may indicate a possible risk for ADHD (above 29 for teachers and above 22 for clinicians) [19].

### Emotion regulation

Children's emotion regulation was assessed using the Emotion Regulation Checklist (ERC), an instrument constructed by Shields and Cicchetti [20] in 1997 that can be filled in by parents or teachers. The ERC comprises 24 components with 4-point Likert scales evaluating the emotion regulation process of children, divided into two large subscales: lability/negativity (16 items) and emotion regulation (8 items). The lability/negativity subscale assesses the child's ability to regulate emotions, while the emotion regulation subscale assesses the child's ability to regulate emotions in a positive manner.

ty/negativity subscale (ERLN) measured the likelihood of sudden mood changes, inflexibility, and negative emotions. The higher the score, the higher the probability of a child having emotional lability or negativity. The emotion regulation subscale (EREG) assesses appropriate emotions, empathy, and self-awareness. Higher scores indicate a higher ability to regulate emotions. Most items were scored ranging from 1 (never) to 4 (always), while other items were rated negatively. The scale has been translated into Indonesian, having Cronbach's alpha of 0.96 for lability/negativity and 0.83 for emotion regulation [21]. The cutoff value was determined from the median of both subscales.

### Perception of family function

We used the Family APGAR Scale to assess participants' satisfaction with their family functions. Designed by Smilkstein et al. [22], the scale consists of five items containing aspects such as adaptation, partnership, growth, affection, and resolve. Ridwan et al. [23] adapted and validated the Indonesian scale with a Cronbach's alpha of 0.89. We used a 3-point Likert scale (0=never, 2=always). A total score of 7–10 meant a highly functional family, 4–6 indicated moderate dysfunction, and 0–3 indicated severe dysfunction [22,23].

### Data analysis

Demographic information is presented in a table showing percentages, means, and standard deviations, whereas scale responses were divided into categories and are shown in charts with medians and interquartile ranges. Correlations between the variables were tested using Spearman's rho (2-tailed). We further explored the variables that were correlated by comparing the medians between different groups using the Mann-Whitney and Kruskal-Wallis tests. Significant results ( $p \leq 0.05$ , with 95% confidence interval) from the correlation and comparison tests are presented in the tables. Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS) version 25 (IBM Corp., Armonk, NY, USA).

## RESULTS

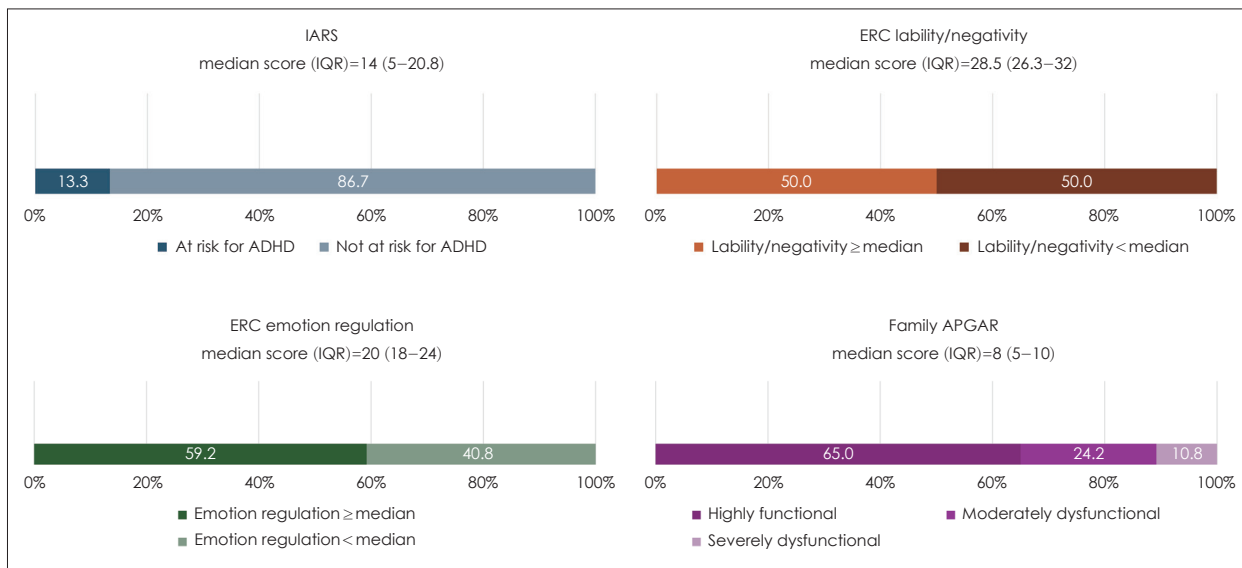
From all three schools, a total population of 358 parents/primary caregivers was initially screened, 239 of whom fulfilled the inclusion criteria and were offered to complete the questionnaires. Of these, 120 agreed to participate and completed all the questionnaires successfully. Table 1 showed the demographic characteristics from the participants. Most of them were mothers, had female children, and were studying in the 5th grade with a mean age of  $10.6 \pm 0.7$  years. Most parents finished high school, but only 8.3% had continued higher education. More than half of the participants were homemakers.

**Table 1.** Sociodemographic characteristics of participants

Variable	Value (n=120)
Child's age	
9 yr	7 (5.8)
10 yr	40 (33.3)
11 yr	67 (55.8)
12 yr	5 (4.2)
13 yr	1 (0.8)
Child's sex	
Male	54 (45.0)
Female	66 (55.0)
Child's school grade	
3rd grade	4 (3.3)
4th grade	37 (30.8)
5th grade	77 (64.2)
6th grade	2 (1.7)
Relation with child	
Father	36 (30.3)
Mother	82 (68.9)
Other caregiver	1 (0.8)
Parent's age (yr)	$38.7 \pm 6.5$ (26–56)
Parent's status	
Married	106 (88.3)
Widow/widower	12 (10.0)
Not married	2 (1.7)
Parent's education	
Elementary school	25 (20.8)
Middle school	23 (19.2)
High school	62 (51.7)
Diploma	3 (2.5)
Bachelor	7 (5.8)
Parent's occupation	
Homemakers	63 (52.5)
Self-employed	17 (14.2)
Employee	36 (30.0)
Other	4 (3.3)

Data are presented as n (%) or mean  $\pm$  standard deviation (range).

Based on the IARS responses, 16 children (13.3%) were considered to be at risk for ADHD. Of the children at risk for ADHD, 75% were male. Half of the children scored higher than the median on the ERLN subscale, indicating that 50% were susceptible to labile or negative emotions. However, the results from the EREG subscale demonstrated that 59.2% of the children scored higher than the median value, possibly indicating good emotion regulation ability. From their Family APGAR scale responses, almost a quarter (24.2%) of the parents indicated that their family might show signs of moderate dysfunction, whereas 10.8% of families may be severely dysfunctional (Fig. 1).



**Fig. 1.** Classification of participants based on scale responses. ADHD, attention deficit hyperactivity disorder; ERC, Emotion Regulation Checklist; IARS, Indonesian ADHD Rating Scale; IQR, interquartile range.

**Table 2.** Correlations between variables

Variable	IARS	ERC liability/negativity	ERC emotion regulation	Family APGAR
IARS				
ERC liability/negativity	0.528 (p<0.001)*			
ERC emotion regulation	-0.106 (p=0.251)	-0.424 (p<0.001)*		
Family APGAR	-0.168 (p=0.066)	-0.269 (p=0.003)*	0.331 (p<0.001)*	
Parent's education	-0.071 (p=0.440)	-0.161 (p=0.079)	0.297 (p=0.001)*	0.144 (p=0.118)

Correlations were tested using Spearman's rho. The only demographic data shown was parent's education which had a significant correlation. \*indicated significant correlations. ERC, Emotion Regulation Checklist; IARS, Indonesian Attention Deficit Hyperactivity Disorder Rating Scale

The IARS score moderately correlated with the ERLN score (r=0.528; p<0.001), but was not associated with the EREG score. In contrast, Family APGAR had a low correlation with both the ERLN (r=-0.269; p=0.003) and EREG subscales (r=0.331; p<0.001). Correlations between demographic variables and scale scores were also explored. The only other significant correlation was between parental education and EREG scores (r=0.297; p=0.001) (Table 2). Children's ages, school grades, and parents' ages did not correlate with any of the scales.

Furthermore, correlated variables were explored to identify differences between the categories (Table 3). It could be seen that there was a significant difference of EREG scores between categories of parent's education. We also conducted a post hoc analysis using Dunn's test to determine which categories had a significant difference. Parents with a bachelor's degree scored significantly higher than those with only elementary or middle school education (median=25 vs. 19; p=0.026 and 0.011, respectively). This may mean that children of parents with higher education may have better control over

their emotions.

Children who may have a risk for ADHD had significantly higher ERLN scores than those who did not, indicating that those with ADHD may have more labile or negative emotions (median=33.5 vs. 28; p=0.001). Families who had children with more labile/negative emotions had lower functioning based on the Family APGAR scale (p=0.048), whereas families with children more capable of regulating emotions had higher functionality (p=0.003). In addition, there was no difference in the score distribution between different categories based on children's sex, school grade, parents' marital status, and occupation.

## DISCUSSION

This study investigated the relationship between ADHD symptoms and emotion regulation in children and their family functioning. Of the 120 children screened, 13.3% were deemed at risk for ADHD. This number was higher than the global prevalence of cases in children and adolescents, but was

**Table 3.** Comparison of medians and interquartile range of significant variables between groups

Variable	Value	p
EREG		0.001*
Elementary school	19 (17–22.5)	
Middle school	19 (17–22)	
High school	22 (19–25)	
Diploma	17 (16–17)	
Bachelor	25 (21–29)	
ERLN		0.001
At risk for ADHD	33.5 (28.8–39.8)	
Not at risk for ADHD	28 (26–30.8)	
Family APGAR		
ERLN		0.048
ERLN < median (lower lability/negativity)	9 (6.3–10)	
ERLN ≥ median (higher lability/negativity)	8 (5–10)	
EREG		0.003
EREG ≥ median (higher regulation)	9 (6–10)	
EREG < median (lower regulation)	7 (5–9)	

Data are presented as median (interquartile range). Comparison of EREG between groups used Kruskal–Wallis test. Comparison of ERLN and Family APGAR between groups used Mann–Whitney test. \*Dunn's test revealed significant differences in EREG median scores between groups of different parents' education level: 1) elementary school vs. bachelor ( $p=0.026$ ) and 2) middle school vs. bachelor ( $p=0.011$ ). ADHD, attention deficit hyperactivity disorder; ERC, Emotion Regulation Checklist; EREG, ERC emotion regulation subscale; ERLN, ERC emotional lability/negativity subscale

still within the range of Indonesian prevalence data [2,3]. This may be because our study utilized a screening instrument rather than a diagnostic assessment by clinicians. Research conducted by Rabitho and Setiawati [24] in elementary schools in Surabaya, using the IARS, found a similar percentage of suspected ADHD cases (15.1%). Another study in primary schools in Yogyakarta, Indonesia, utilizing the Indonesian version of the Conners 3 Teacher Rating Scale, found that a higher percentage of students screened positive for ADHD (45.9%) [25]. Most of the children at risk for ADHD were male, in line with other studies conducted in elementary schools in Surabaya using the IARS [24,26] and the Abbreviated Conners Rating Scale [27,28].

As predicted, ADHD symptoms based on the IARS were positively associated with the susceptibility to labile/negative emotions, as represented by the ERLN ( $r=0.528$ ;  $p<0.001$ ). When ERLN values were compared between groups based on ADHD symptoms, children at risk for ADHD scored significantly higher than those who were not at risk. Similarly,

in a study by Anastopoulos et al. [29] in the United States, children with ADHD were almost six times more emotionally labile than those without. This was also supported by a meta-analytical finding that adolescents with ADHD were more prone to emotional reactivity in stressful situations [8].

It is suggested that ADHD is also linked to deficits in emotion regulation, which differs from our findings, as indicated by EREG not correlating with IARS. We also did not find a difference in the ability to regulate emotions between those at risk for ADHD and those not at risk. Children with ADHD have difficulty with emotional response inhibition, especially when attending to emotional facial expressions [30]. Emotional dysregulation in ADHD may result from problems in recognizing and adequately paying attention to emotional stimuli, which may also involve poor executive function and higher cognitive control [31,32]. Groves et al. [33] found that poor emotion regulation and ADHD symptoms were specifically related to underdeveloped working memory. Future research should explore and consider executive functions in addition to ADHD symptoms in a larger sample of children to be able to provide clearer results.

Another finding that supported our hypothesis was the link between the Family APGAR and both ERLN and EREG. Evidence from our study suggests higher family functioning among children with higher emotion regulation and lower emotional lability/negativity. Children with ADHD are more susceptible to emotional dysregulation, which impairs their social lives, including those of their families [34]. A study on American children with an age range similar to ours found that supportive practice of emotion socialization by parents was linked to better emotion regulation ability in children, while non-supportive practice was related to more labile emotions [35].

Interestingly, in our study, family functioning was not associated with ADHD symptoms. There was no significant difference in family functioning between the suspected and non-ADHD groups. A similar result was found by Schmenzler et al. [36], who reported no interaction between ADHD symptoms and family functioning in Dutch children aged 11–16 years old. This was different from a Norwegian study that found that parents of children with ADHD had poorer family functioning than those of typically developing children [37]. Families of children with ADHD are at risk of being dysfunctional, experiencing increased stress, and having difficulty with family cohesiveness [38]. In their study, Cussen et al. [39] reported poorer family functioning, characterized by lower parental quality of life, less warmth, and more hostile parenting styles in children positively screened for ADHD. Furthermore, parents of children with ADHD often have fewer positive interactions and a lower capacity to re-

flect on and understand their children's expressed emotions and behaviors [40,41].

In addition, we did not find any influence of most sociodemographic profiles on the variables investigated. The only correlated variables were EREG and parental educational level ( $r=0.297$ ;  $p=0.001$ ). Sex, age of the children and parents, parents' marital status, and occupation had no influence on the variables. Graziano and Garcia [8] noted in their analysis of 77 studies, an association between emotion lability/negativity and youth age, in which the former should be higher in older children. It would make sense that our study differed due to the age range in our inclusion criteria.

Our study participants were between the age of 9–13 years old, with most being 11 years old. During this stage, children develop more complex emotional skills, such as coping strategies for negative emotions (e.g., positive refocusing and behavior diversion) [42,43]. Children start to consider how their emotions interact with others' perspectives, which might influence family functioning and the parent-child relationship. Parents' support and validation of children's emotional display play a major role in developing emotion regulation ability and social competence during this age period [44]. This is particularly important in children with ADHD because they are more vulnerable to negative affect and have lower inhibitory control, therefore requiring more guidance from their parents [45].

Parents with higher educational levels were found to have children with better emotional regulation, with the highest being those with parents with bachelor's degrees. This could be explained by the fact that parents with higher education have more knowledge of positive parenting, better access to resources, and a higher socioeconomic status. They may possess a better ability to learn and practice more effective communication and positive parenting techniques, especially when dealing with their children's emotional and behavioral difficulties. Several studies have shown that increased ADHD severity, parental depression, and anxiety may be associated with low parental education [46-48]. Hjern et al. [48] proposed that lower educational levels may be related to social disadvantages and increased childhood adversity.

### Strengths and limitations

To the best of our knowledge, this is the first study to investigate the relationships among ADHD symptoms, emotion regulation, and family functioning in Indonesia. We also used samples from the community rather than solely clinical samples, which could better represent actual sociodemographic conditions [39]. The use of the IARS combined with various validated instruments helped implement the study's findings in the Indonesian context.

Some limitations include the reliance on self-report measures, which may introduce a response bias. The use of a screening instrument instead of a diagnosis by clinicians could result in the overestimation or underestimation of ADHD prevalence. The restriction of the participants' age range in this study may limit the generalizability of the interpretation of the results to younger children or adolescents.

Additionally, only one parent or caregiver, usually the mother, was interviewed. The participation of both parents and other groups, such as teachers, in future research may provide a more comprehensive understanding of these constructs. Furthermore, the parents were not examined for ADHD symptoms; therefore, it is unclear whether they also had ADHD. Undiagnosed ADHD in parents may contribute to disruptive behaviors in children and impair family functioning [39].

Possible confounding factors in children, such as conduct problems and cognitive function, were not explored or adjusted. We also did not investigate other variables, such as emotional/ facial recognition or callous traits that could possibly be used to provide a more complete picture of emotional regulation in children [8]. Incorporating cognitive examinations and executive function assessments in children might also lead to a better understanding of the relationship between these aspects, ADHD symptoms, and emotion regulation skills. The criteria used in our study may differ from those used in other studies; therefore, it is relatively difficult to compare the findings. The cross-sectional nature of the study may limit its ability to determine the causality between variables. Whether impairments in how families operate influence children's ability to regulate emotions or vice versa remains uncertain [34]. Further longitudinal studies are needed to determine the causality.

## CONCLUSION

This research investigated the association between ADHD symptoms and emotional regulation in children and their family functioning. In our study, there was a positive correlation between ADHD symptoms and emotional lability/negativity but not with emotional regulation. Family functioning was linked with emotional lability/negativity and regulation, but not with ADHD symptoms. Clinicians should pay more attention to impairments in ADHD children's ability to modulate their emotions to lessen their family's burden and improve their psychological well-being. This study could be used as a reference for future studies exploring aspects of emotion regulation in ADHD and for developing effective treatment modalities. The importance of involving parents in the psychosocial treatment of children with ADHD symptoms cannot be overstated, especially for developing positive

parenting and emotion regulation skills that can be transferred to and practiced by their children. Based on our findings, interventions targeting the management of emotions, involving caregivers, and supporting them could be beneficial for reducing symptoms and increasing functioning.

#### Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

#### Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

#### Author Contributions

Conceptualization: Yunias Setiawati, Dhenni Hartopo. Data curation: Dhenni Hartopo, Friandi Danang Rabitho, Winson Chuanardi. Formal analysis: Winson Chuanardi. Investigation: Friandi Danang Rabitho. Methodology: Dhenni Hartopo, Friandi Danang Rabitho. Project administration: Yunias Setiawati. Resources: Dhenni Hartopo, Friandi Danang Rabitho. Software: Winson Chuanardi. Supervision: Yunias Setiawati. Validation: Yunias Setiawati. Visualization: Winson Chuanardi. Writing—original draft: Winson Chuanardi. Writing—review & editing: Yunias Setiawati, Winson Chuanardi.

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