

NURSING WORKLOAD AND NURSE PERFORMANCE IN A PEDIATRIC INPATIENT UNIT: A CROSS-SECTIONAL STUDY

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Abstrac

Nurses provide continuous care across all shifts; however, an imbalance between workload and nursing capacity may adversely affect nurse performance and the quality of patient care. Preliminary observations in the pediatric inpatient unit of a district general hospital in Southwest Aceh, Indonesia, indicated a substantial perceived workload associated with patient volume, limited nursing staff, and additional non-nursing responsibilities. This study aimed to determine the relationship between workload and nurse performance in the pediatric inpatient unit. A quantitative cross-sectional study was conducted among all 68 nurses assigned to the unit using total sampling. Data were collected from 24 November to 2 December 2025 using a 13-item workload questionnaire (Cronbach's $\alpha = 0.913$) and a 19-item nurse performance questionnaire (Cronbach's $\alpha = 0.990$). Fisher's exact test was used as the primary bivariate analysis because six of nine cells had expected frequencies below five, while the Pearson chi-square test was reported for comparison. Most nurses experienced a moderate workload (48; 70.6%), followed by a heavy workload (13; 19.1%) and a light workload (7; 10.3%). Nurse performance was predominantly adequate (37; 54.4%), followed by good (24; 35.3%) and poor (7; 10.3%) performance. Workload was significantly associated with nurse performance (Fisher's exact $p < 0.001$; $\chi^2 = 36.173$, $df = 4$), with a large effect size (Cramér's $V = 0.516$; 95% CI 0.40–0.65). All nurses with a heavy workload demonstrated suboptimal performance, compared with 56.4% among nurses with light or moderate workloads (PR = 1.77; 95% CI 1.41–2.24; OR = 21.0; 95% CI 1.19–371.0). These findings underscore the need for multidimensional workload monitoring, appropriate shift-level patient-to-nurse staffing standards, and delegation of clerical and logistical tasks to support personnel. Given the cross-sectional and single-unit design, the findings indicate association rather than causality..

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INTRODUCTION

Hospitals are complex healthcare institutions responsible for the provision of comprehensive health services, including inpatient, outpatient, and emergency care. The quality, safety, and continuity of these services depend substantially on the availability and effective management of qualified healthcare human resources (Putra & Sandhi, 2021; Stevens et al., 2025). Among healthcare professionals, nurses constitute one of the largest occupational groups and represent a critical component of hospital service delivery (Bhati et al., 2023; Guzmán-Leguel & Rodríguez-Lara, 2025).

Their strategic role is primarily attributable to the continuous and direct interaction they maintain with patients and their families throughout the care process. Beyond performing direct nursing interventions, nurses are responsible for conducting

comprehensive assessments, formulating nursing diagnoses, developing and implementing care plans, evaluating patient outcomes, documenting care, communicating with patients and families, coordinating care, and collaborating with other healthcare professionals (Mohamed et al., 2024; Xiong et al., 2025). The breadth and complexity of these responsibilities make workload an important organizational and clinical determinant that warrants careful consideration in nursing workforce management (Chang et al., 2025; Galanis et al., 2025; Waterfield & Barnason, 2022). Nursing workload refers broadly to the cumulative demands imposed on nurses in relation to the time, effort, cognitive resources, and professional competencies required to accomplish assigned responsibilities. An appropriate balance between job demands and individual capacity is essential for maintaining effective performance and ensuring the quality and safety of nursing care. Conversely, excessive or poorly distributed workload may compromise concentration, work efficiency, job satisfaction, and the consistent execution of professional responsibilities (Moreno-Martínez & Sánchez-Martínez, 2025; Wei et al., 2025; Zabin et al., 2025)

In hospital settings, workload is influenced not only by the number of patients assigned to a nurse but also by patient acuity and clinical complexity, frequency and intensity of nursing interventions, time pressure, documentation requirements, patient safety responsibilities, communication demands, and coordination with patients, families, and multidisciplinary teams. Importantly, workload may also increase when nurses are required to perform non-nursing or ancillary activities that could otherwise be delegated to appropriate support personnel. Such organizational conditions may reduce the time available for direct patient care and potentially interfere with the timely delivery of essential nursing interventions (Bani-Baker et al., 2025; Moradi et al., 2024; Wang et al., 2025). These concerns are particularly relevant in pediatric inpatient units, where nursing care involves distinctive clinical and psychosocial demands. Pediatric patients often require closer observation and more intensive assistance because their ability to communicate symptoms, understand treatment procedures, and independently fulfil basic needs remains developmentally limited (Bell & Condren, 2016; Patra & Wu, 2025). Consequently, pediatric nurses must simultaneously address the clinical needs of children and the informational, emotional, and educational needs of parents or family caregivers (Bell & Condren, 2016; Thestrup et al., 2024).

This dual focus increases the complexity of nursing practice and may intensify both the cognitive and emotional dimensions of workload. Empirical work in pediatric settings indicates that conventional nurse-to-patient ratios capture these demands poorly. Velozo et al. (2021) compared three workload instruments in a pediatric intensive care unit and found that estimated nursing time varied substantially depending on the instrument applied, while Batlle et al. (2025) demonstrated that patient complexity and the degree of family participation predicted pediatric nursing workload more accurately than patient census alone. Maria et al. (2026) similarly reported that facility-based care for small and sick children imposes sustained monitoring and caregiver-support demands that are rarely reflected in routine staffing formulas.

Preliminary observations conducted in the study unit identified indications of substantial workload among nursing staff. Approximately 60% of the nurses interviewed reported frequent fatigue and perceived their workload as heavy, and at full bed occupancy a single nurse could be responsible for six to seven patients. Nurses also reported spending considerable working time on activities outside core nursing

responsibilities, including environmental cleaning, checking logistical supplies, completing administrative tasks, and retrieving laboratory results. Although some of these activities are necessary for unit functioning, their accumulation reduces the time and attention available for direct patient care. Sustained exposure to excessive workload may contribute to physical and psychological fatigue and may adversely affect concentration, vigilance, and accuracy, which are essential competencies in maintaining safe and high-quality nursing care (Gao et al., 2026; Pi et al., 2025).

Nursing performance is therefore a critical outcome within hospital quality management because it reflects the extent to which nurses effectively execute their professional responsibilities and contribute to the achievement of patient-care objectives. Performance encompasses the quality and consistency with which nurses implement the nursing process, adhere to clinical standards and standard operating procedures, document care accurately, communicate effectively with patients and families, and collaborate with other healthcare professionals (Hu et al., 2026; Mathew et al., 2025). In this context, understanding factors associated with nursing performance is essential not only from a human-resource management perspective but also for maintaining service quality and patient safety.

Previous empirical studies have reported an association between nursing workload and performance. Alsadaan et al. (2023) identified a significant relationship between workload and nurse performance and emphasised the importance of organisational efforts to monitor and manage workload appropriately. Nurmeksela et al. (2021) further demonstrated that management of the physical, mental, and temporal dimensions of workload supports nurses' ability to carry out their responsibilities effectively and efficiently. Zhang et al. (2025) and Galanis et al. (2025) reported comparable relationships between workload and work outcomes in adult and mixed hospital populations. Collectively, these findings position workload as an important organisational determinant of variation in nursing performance.

Three gaps nevertheless remain in this body of evidence. First, most studies quantifying the workload–performance relationship have been conducted in adult, intensive care, or mixed inpatient populations; general pediatric wards, where nurses simultaneously manage developmentally dependent children and their family caregivers, remain comparatively under-represented. Second, the pediatric workload literature has concentrated on high-resource intensive care and home-hospitalisation settings (Battle et al., 2025; Velozo et al., 2021), whereas district-level pediatric wards in low- and middle-income countries, which typically operate with lower staffing ratios and limited ancillary support, have received little attention. Third, studies in this field frequently report significance testing without accompanying effect sizes or confidence intervals, which limits any judgement of the practical magnitude of the association and its usefulness for staffing decisions. Evidence derived from one healthcare setting also cannot be generalised directly to another, because workload and performance are shaped by staffing ratios, patient profiles, organisational arrangements, workflow, available support personnel, and service delivery systems. The present study addresses these gaps by quantifying the workload–performance association in a district pediatric inpatient unit in Indonesia, by reporting exact inference together with effect estimates and confidence intervals, and by interpreting the results against the demographic composition of the nursing workforce. Accordingly, this study aims to examine the relationship between nursing workload and nurse performance in the Pediatric Inpatient Unit of Teungku Peukan Regional General Hospital, Southwest Aceh.

Specifically, the study seeks to characterize the participating nurses, assess their workload and performance levels, and determine whether a statistically significant relationship exists between workload and nursing performance. The findings are expected to provide empirical evidence to support more responsive workload management and strengthen the quality and effectiveness of pediatric nursing services.

RESEARCH METHODS

Study Design and Setting

This study employed a quantitative approach with a cross-sectional design to examine the relationship between nursing workload and nurse performance. A cross-sectional design was selected because the independent variable, nursing workload, and the dependent variable, nurse performance, were assessed during the same data-collection period, allowing the study to characterize their distribution and examine their statistical association within the study population. The study was conducted in the Pediatric Inpatient Unit of Teungku Peukan Regional General Hospital (RSUD Teungku Peukan), Southwest Aceh, Indonesia. Data collection was conducted from 24 November to 2 December 2025.

Study Population and Sampling

The study population comprised all nurses assigned to the Pediatric Inpatient Unit of RSUD Teungku Peukan, totalling 68 nurses. Given the relatively small and accessible population, a total sampling approach was employed. Nurses were eligible for inclusion if they held a valid nursing registration and were formally assigned to the Pediatric Inpatient Unit at the time of data collection; had worked in the unit for at least three months, so that they had completed a full shift rotation; were actively delivering direct nursing care during the data-collection period; and provided written informed consent. Nurses were excluded if they held a purely administrative or managerial position without a direct patient-care assignment, were on annual, maternity, sick, or study leave during the data-collection period, or returned an incomplete questionnaire. All 68 nurses met the inclusion criteria, no nurse declined participation, and no questionnaire was returned incomplete; the final study sample therefore consisted of 68 nurses.

Study Variables and Measurement

The primary independent variable was nursing workload, operationally defined as the perceived workload experienced by nurses in the provision of nursing care to hospitalized patients. Nursing workload was assessed using a 13-item questionnaire adapted from Nursalam (2020). The total score ranged from 13 to 52 and was categorized as light workload (13–25), moderate workload (26–38), or heavy workload (39–52). Nurse performance constituted the dependent variable and was operationally defined as the ability of staff nurses to provide nursing care in accordance with established professional standards. Performance was assessed using a 19-item questionnaire based on Rumaisha (2019), employing a Likert-type response scale. Total scores were categorized as good performance (>57), moderate performance (37–57), and poor performance (<37).

Instrument Validity and Reliability

Both instruments underwent validity and reliability testing before use. Construct validity was examined through item–total (Pearson product-moment) correlations in a pilot sample of 30 nurses working in a comparable inpatient unit that did not take part

in the main study. Items were retained when the corrected item-total correlation exceeded the critical r-table value of 0.361 ($df = 28$, $\alpha = 0.05$, two-tailed). the workload questionnaire adapted from Nursalam (2020) yielded a Cronbach's alpha coefficient of 0.913, and the performance questionnaire based on Rumaisha (2019) yielded a Cronbach's alpha coefficient of 0.990. Both coefficients exceeded the commonly accepted threshold of 0.70, indicating satisfactory internal consistency and supporting the reliability of the instruments for assessing the study variables.

Data Collection Procedure

Data collection was initiated following formal research authorization from the hospital administration. Eligible nurses were informed about the study objectives, procedures, voluntary nature of participation, and confidentiality of the information provided. Nurses who agreed to participate provided written informed consent before completing the study instruments. The questionnaires were self-administered and distributed directly to the respondents by the researchers. Completed questionnaires were collected on the same day to minimize missing responses and ensure the completeness of the collected data.

Statistical Analysis

Descriptive analysis was conducted to summarise the characteristics of the respondents and the distributions of nursing workload and nurse performance, with categorical variables presented as frequencies and percentages. Bivariate analysis then examined the association between nursing workload and nurse performance. The Pearson chi-square test was computed first, but inspection of the 3×3 contingency table showed that six of the nine cells (66.7%) had expected frequencies below five, with a minimum expected count of 0.72, and that two cells contained observed zeros. These conditions violate the assumptions underlying the asymptotic chi-square approximation. Fisher's exact test for $r \times c$ tables was therefore adopted as the primary test of association, with the chi-square statistic reported alongside it for comparability with earlier studies. The strength of the association was quantified using Cramér's V, with a 95% confidence interval obtained by bootstrap resampling (20,000 replications). To express the finding in a form usable for staffing decisions, workload was additionally dichotomised (heavy versus light-to-moderate) and performance was dichotomised (good versus sub-optimal, that is, adequate or poor); the prevalence ratio and odds ratio with 95% confidence intervals were calculated for this 2×2 table, applying the Haldane-Anscombe correction of 0.5 to accommodate the zero cell. Statistical significance was set at a two-sided alpha level of 0.05 ($\alpha = 0.05$). All statistical analyses were performed using IBM SPSS Statistics version 25.

RESULTS AND DISCUSSION

Respondent Characteristics

A total of 68 nurses working in the Pediatric Inpatient Unit of Teungku Peukan Regional General Hospital (RSUD Teungku Peukan) participated in the study. The demographic and professional characteristics of the respondents are presented in Table 1.

Table 1. Distribution of Respondent Characteristics (n = 68)

Characteristic	n	%
Age (years)		
17-25	6	8.8
26-35	56	82.4

36–46	6	8.8
Educational level		
Diploma in Nursing (D3)	42	61.8
Bachelor of Nursing (S1)	20	29.4
Professional Nurse (Ners)	6	8.8
Sex		
Male	18	26.5
Female	50	73.5
Length of employment (years)		
1–2	30	44.1
3–4	14	20.6
>5	24	35.3
Total	68	100.0

Source: Primary data, 2025.

The respondent profile indicates that the sample was predominantly composed of nurses aged 26–35 years (56; 82.4%). Regarding educational attainment, most respondents held a Diploma in Nursing (D3) (42; 61.8%), followed by a Bachelor of Nursing degree (S1) (20; 29.4%) and professional nurse qualification (Ners) (6; 8.8%). Female nurses constituted the majority of the sample (50; 73.5%), whereas male nurses accounted for 18 respondents (26.5%). In terms of employment duration, the largest proportion had 1–2 years of work experience (30; 44.1%), followed by those with more than five years of experience (24; 35.3%) and 3–4 years of experience (14; 20.6%). Overall, the sample was characterized predominantly by nurses of early-to-mid working age, with diploma-level nursing education and relatively short employment tenure.

Nursing Workload

The distribution of nursing workload among the respondents is presented in Table 2.

Table 2. Distribution of Nursing Workload (n = 68)

Nursing workload	n	%
Light	7	10.3
Moderate	48	70.6
Heavy	13	19.1
Total	68	100.0

Source: Primary data, 2025.

Nearly one-fifth of the nursing staff fell into the heavy-workload category, which warrants attention from a workforce-management perspective even though the moderate category predominated. Nursing workload reflects the cumulative demands associated with the delivery of nursing services and is not determined solely by the number of patients assigned to a nurse. It is also shaped by patient acuity and clinical complexity, the frequency and intensity of nursing interventions, time constraints, documentation requirements, communication with patients and families, multidisciplinary collaboration, and activities outside core nursing responsibilities (Borges et al., 2021; Ivziku et al., 2021; Larson et al., 2017). A workload assessment that relies exclusively on nurse-to-patient ratios may therefore underestimate the actual demands experienced by nursing staff. This underestimation is likely to be larger in pediatric units, where continuous monitoring, assistance with basic needs, caregiver education, and rapid response to changes in a child's condition add cognitive and emotional demands to the physical ones (Batlle et al., 2025; Maria et al., 2026). The

pattern observed in the study setting is consistent with that argument: at full bed occupancy, individual nurses were responsible for six to seven patients while also checking logistical supplies, completing administrative tasks, and retrieving laboratory results, all of which compete directly with the time and attention required for direct patient care (Hong & Lee, 2025). From a nursing-management perspective, these findings indicate that workload allocation should be based on patient volume, patient dependency, clinical complexity, intensity of care, available working time, and the extent of non-nursing activities assigned to nursing staff, rather than on nurse headcount alone.

Nurse Performance

The distribution of nurse performance is presented in Table 3.

Table 3. Distribution of Nurse Performance (n = 68)

Nurse performance	n	%
Good	24	35.3
Moderate	37	54.4
Poor	7	10.3
Total	68	100.0

Source: Primary data, 2025.

The predominance of the moderate-performance category indicates that although most nurses were carrying out their assigned responsibilities, a substantial proportion had not yet reached the highest performance category, and one in ten fell below an acceptable standard. Nurse performance represents the extent to which nurses effectively execute their professional responsibilities in accordance with established standards of nursing practice. It encompasses the systematic implementation of the nursing process, including patient assessment, nursing diagnosis, care planning, implementation, evaluation, documentation, communication, and collaboration with other healthcare professionals (Vuong & Nguyen, 2022).

In the present study, performance was assessed using an instrument covering key components of nursing assessment, nursing diagnosis, care planning, and implementation. The relatively high proportion of nurses with moderate rather than good performance suggests an opportunity for strengthening the quality and consistency of nursing practice. From an organizational perspective, improvement strategies may include structured clinical supervision, competency development, systematic review of nursing documentation, timely performance feedback, reinforcement of adherence to standard operating procedures, and the development of a supportive practice environment (Alexandre-Sousa et al., 2026; Cunha et al., 2025). These interventions may be particularly relevant in pediatric inpatient settings, where consistency, timeliness, and accuracy of nursing care are essential to maintaining patient safety.

Association Between Nursing Workload and Nurse Performance

The cross-tabulation between nursing workload and nurse performance is presented in Table 4.

Table 4. Association Between Nursing Workload and Nurse Performance in the Pediatric Inpatient Unit (n = 68)

Nursing workload	Good performance, n (%)	Moderate performance, n (%)	Poor performance, n (%)	Total, n (%)
Light	4 (5.9)	3 (4.4)	0 (0.0)	7 (10.3)

Moderate	20 (29.4)	28 (41.2)	0 (0.0)	48 (70.6)
Heavy	0 (0.0)	6 (8.8)	7 (10.3)	13 (19.1)
Total	24 (35.3)	37 (54.4)	7 (10.3)	68 (100.0)

Source: Primary data, 2025.

Nurses with a light or moderate workload were distributed across the good and adequate performance categories only, whereas none of the 13 nurses with a heavy workload achieved good performance and seven of them (53.8%) were classified as poor performers. Fisher's exact test confirmed a statistically significant association between workload and nurse performance ($p < 0.001$). The Pearson chi-square statistic was $\chi^2 = 36.173$ ($df = 4$), although this asymptotic value should be read as indicative only, because six of the nine cells had expected frequencies below five. The association was strong rather than merely significant: Cramér's V was 0.516 (95% CI 0.40–0.65), corresponding to a large effect. Expressed in a form usable for staffing decisions, every nurse in the heavy-workload group showed sub-optimal performance, compared with 56.4% of nurses in the light-to-moderate group (prevalence ratio 1.77; 95% CI 1.41–2.24; odds ratio 21.0; 95% CI 1.19–371.0 after Haldane–Anscombe correction). The very wide odds-ratio interval reflects the zero cell and the modest sample size, and indicates that the direction of the effect is far better established than its precise magnitude. Two mechanisms plausibly connect heavy workload to reduced performance in this setting. The first is physical and psychological fatigue.

Sustained shift work under high patient loads depletes physiological recovery capacity, and meta-analytic evidence indicates that occupational fatigue among nurses is driven by patient load, shift intensity, and insufficient recovery time (Pi et al., 2025). Fatigue degrades precisely the capacities on which nursing performance depends: sustained attention, working memory, psychomotor accuracy, and the vigilance required to detect early deterioration. That risk is amplified in pediatric patients, whose clinical status can change rapidly and whose ability to report symptoms is developmentally limited. The second mechanism is cognitive load and task fragmentation. Under heavy workload, nurses do not simply work faster; they work in fragments, switching repeatedly between direct care, documentation, and ancillary tasks. Hong and Lee (2025) documented that interruptions during medication administration increase multitasking and error exposure, and Gao et al. (2026) showed that an adverse nursing work environment contributes to decision fatigue through job stress, moderated by resilience. When cumulative demands exceed the available cognitive and organisational resources, nurses ration their effort: documentation is deferred, family education is abbreviated, and lower-visibility elements of the nursing process are omitted first (Bani-Baker et al., 2025; Wang et al., 2025). This mechanism is consistent with the profile observed here, in which the deficit was one of completeness and consistency rather than outright task failure, since most heavy-workload nurses were rated adequate rather than poor.

These findings should be read alongside the demographic profile of the sample, which is itself relevant to the observed association. Diploma-prepared nurses constituted 61.8% of the workforce and 44.1% of respondents had between one and two years of employment. Both characteristics may operate as confounders: educational preparation shapes clinical reasoning and prioritisation capacity, whereas limited tenure restricts the repertoire of coping and task-management strategies that

experienced nurses use to absorb peak demand. A predominantly early-career, diploma-prepared workforce may therefore be more vulnerable to the performance consequences of a given workload than a more senior workforce facing identical demands, and part of the association reported here may be attributable to this composition rather than to workload alone. The age distribution was narrow (82.4% aged 26–35 years), so age is unlikely to account for the pattern. The bivariate design used in this study cannot separate these influences; a multivariable model adjusting for education, tenure, and shift type would be required, and the present sample of 68 nurses, containing only seven poor performers, cannot support such a model with acceptable precision. The direction of the association is nevertheless consistent with the wider literature. Alsadaan et al. (2023) reported a significant workload–performance relationship and emphasised organisational workload management; Galanis et al. (2025) found that workload predicted quiet quitting, turnover intention, and burnout among nurses in Greece; and Chang et al. (2025) linked peak workload and time pressure to work exhaustion and turnover intention. The effect size observed here sits at the upper end of what such studies typically report, which may reflect the concentration of demand in a single district pediatric unit with limited ancillary support. Because of the cross-sectional design, however, the present findings represent an association rather than evidence that workload directly causes changes in nurse performance, and a reciprocal pathway, in which lower-performing nurses require more time to complete the same tasks and therefore perceive a heavier workload, cannot be excluded.

Five actions follow directly from these findings and can be implemented by nurse managers without additional recruitment. First, the census-based staffing assumption currently in use should be replaced by a quarterly workload audit that scores each shift on patient volume, patient dependency, intensity of nursing interventions, and time spent on non-nursing activities, with the audit output forming the basis of the annual staffing proposal. Second, an explicit shift-level ceiling should be set for the pediatric unit; the present data suggest that performance deteriorates sharply at the six-to-seven patients per nurse observed at full occupancy, and any breach of the ceiling should trigger a documented escalation to the nursing director. Third, the ancillary tasks identified in this study should be reassigned, with environmental cleaning transferred to housekeeping staff, logistics checks to the ward storekeeper, and laboratory-result retrieval to a ward clerk or to the hospital information system, and the reallocation should be audited after three months. Fourth, shift rosters should be rebalanced so that nurses with less than two years of experience are not scheduled together on night or peak-occupancy shifts without a senior nurse, given the tenure profile of this workforce. Fifth, a short structured handover review should be instituted at the end of each shift, in which the charge nurse verifies completion of the nursing process and provides immediate feedback, converting workload monitoring and performance feedback into a routine rather than an annual exercise.

CONCLUSION

Nursing workload in the pediatric inpatient unit studied was predominantly moderate, and nurse performance was predominantly adequate. Workload and nurse performance were significantly and strongly associated: nurses carrying a heavy workload showed a consistently less favourable performance profile, none of them reached the good-performance category, and more than half were classified as poor

performers. Workload management should therefore be treated as a core component of any strategy intended to support nursing performance and improve the quality of pediatric inpatient services, rather than as a peripheral human-resource concern. Practically, hospital management should base pediatric staffing on periodic multidimensional workload audits rather than on patient census alone, set and enforce an explicit shift-level patient-to-nurse ceiling, and formally reassign cleaning, logistics, and result-retrieval tasks to support personnel. Nurse-unit managers should monitor workload at shift level, redistribute assignments when imbalance is detected, and provide structured feedback on completion of the nursing process at each handover. The principal limitations of this study are its cross-sectional, single-unit design, which precludes causal or temporal inference, and its bivariate analytical scope, which leaves the influence of education, tenure, and shift pattern unadjusted. Future research should use larger multicentre samples, incorporate additional individual and organisational determinants of nurse performance, and adopt longitudinal or multivariable designs capable of establishing the temporal and independent relationships between workload and nursing performance.

Statement on the Use of Artificial Intelligence

AI was used in the preparation of this manuscript. The authors used artificial intelligence tools solely to assist with language improvement, grammar checking, and editing for clarity and readability. The authors remain fully responsible for the accuracy, originality, integrity, and academic content of the manuscript. All AI-assisted content was reviewed and verified by the authors before submission.

Conflicts of Interest

The authors declare no conflict of interest.

Author Contributions

Conceptualization, Anwar and Restika Rosa; data collection, Anwar and Arista Ardilla; data validation, Restika Rosa and Fauziah; formal analysis, Anwar and Fauziah; writing—original draft preparation, Anwar; writing—review and editing, Restika Rosa and Arista Ardilla; visualization, Fauziah. All authors have read and approved the final version of the manuscript.

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