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The relationship between knowledge and self-efficacy of nurses regarding early initiation of cardiopulmonary resuscitation and automated defibrillation in Saudi Arabia

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Abstract

Background: Cardiopulmonary resuscitation (CPR) and early defibrillation are the most common procedures performed by nurses as the first responders to cardiac arrest patients in the hospital setting. Therefore, nurses are demanded to have high skills for effective performance. Self-efficacy and knowledge are considered significant factors affecting early initiation of CPR and automated defibrillation. However, previous studies mostly focused on nursing students instead of frontline nurses.

Objective: This research aimed to assess the relationship between nurses' knowledge and self-efficacy regarding the early initiation of CPR and automated defibrillation of cardiac arrest patients.

Methods: The study employed a cross-sectional, descriptive, correlational survey. Using convenience sampling, two hundred eighty-seven nurses working in critical areas and inpatient and outpatient departments, King Abdulaziz University Hospital (KAUH), Saudi Arabia, were selected. Resuscitation Knowledge and Self-Efficacy Scales were used for data collection (using Google Form) from November 2020 to January 2021. Descriptive statistics and Pearson correlation were used for data analysis.

Results: Overall, 61.3% of participants had moderate knowledge (13.659 ± 2.175), and 63.8% had high self-efficacy (44.627 ± 58.397). The highest domain of self-efficacy was responding and rescuing, while the lowest domain was debriefing and recording. There was a significant positive relationship between knowledge and self-efficacy ($p < 0.001$; $r = 0.207$).

Conclusion: The positive relationship explained a high level of self-efficacy if there was a high level of knowledge. Thus, it is recommended that nursing programs apply CPR and automated defibrillation curricula during nurses' internships, clear policies and procedures about CPR and automated defibrillation, continual updates about CPR and automated defibrillation, and knowledge and continuance training (on-job-training) about CPR and automated defibrillation, which can enhance and improve knowledge and self-efficacy among health care workers, especially for nurses.

Keywords

cardiac arrest; cardiopulmonary resuscitation (CPR); defibrillation; knowledge; nurses; self-efficacy; Saudi Arabia

Sudden cardiac arrest (SCA) is the leading cause of death worldwide, affecting individuals' health and increasing their mortality risk (Bray et al., 2017). About 70% of out-of-hospital cardiac arrests (OHCAs) occur at home, with

approximately 50% unwitnessed. OHCA prognosis is poor, with a relatively low survival-to-discharge rate. Only 11% of adult cases of non-traumatic cardiac arrest are resuscitated by emergency medical services (EMS) (Kleinman et al.,

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2015; CARES, 2017). In-hospital cardiac arrest (IHCA) prognosis is better, with a survival-to-discharge rate of 22.3%–25.5% in adults (Mozaffarian et al., 2015).

CPR and early defibrillation (CPR-D) are commonly performed by nurses, often first responders in the hospital setting (Jamieson et al., 2002). In addition, early CPR-D is associated with a considerably enhanced survival-to-discharge rate for out-of-hospital cardiac arrest (Bray et al., 2017). Pauses before and after the shock delivered by defibrillators are called preshock pauses. A study by Kleinman et al. (2015) found that the survival-to-discharge rate was higher for those who received preshock pauses of less than ten seconds with total preshock pauses of less than 20 seconds during CPR-D.

Time is one of the factors affecting CPR-D efficacy. The time between cardiac arrest onset to CPR and defibrillator use is associated with increased survival; therefore, even a few minutes of delay are potentially deadly (Koster et al., 2010). In addition, a study by Cartledge et al. (2020) found that most respondents were unsure about how to use the defibrillator. Those with less experience using defibrillators may therefore have a sense of decreased knowledge and self-efficacy.

It is important for nurses not only to have knowledge (know-how) and the right attitude (preparation) but also to believe in their ability (self-efficacy) to handle cardiac cases effectively (Turner et al., 2009). Self-efficacy and knowledge are considered significant factors affecting CPR-D delivery and can predict a nurse's CPR-D ability; therefore, nurses must be prepared in terms of knowledge and self-efficacy when performing CPR.

Potential damage to the tissues can be minimized by early use of CPR-D and basic life support (BLS) skills, significantly increasing the survival rate in cardiac arrest patients. Specialization in CPR-D is a must, especially for nurses, who are usually the first responders to cardiac arrest patients in the hospital. Increasing nurses' knowledge is basic to CPR-D performance. Previous studies found a relation between knowledge and self-efficacy. Moon and Hyun (2019) examined the effects of a "blended training program" relying on e-learning materials produced by leading Korean public health establishments with knowledge on CPR-D, attitude, and self-efficacy. They found that the intervention group who received the blended training program had shown significant enhancements in their knowledge, emotional attitude, behavior and attitude, cognitive attitude, and self-efficacy scores after completing the e-learning program.

Partiprajak and Thongpo (2016) measured the participants' knowledge and self-efficacy in relation to CPR-D three months after training. Although the participants displayed positive chest-compression performance compared to the first results, their knowledge and self-efficacy decreased. Moreover, Kim et al. (2017) found that the participants' satisfaction showed a significant association between BLS education and CPR self-efficacy.

Previous studies focused on nursing students and other targeted groups instead of on frontline nurses. Little is

known about the relationship between nurses' knowledge and self-efficacy regarding early initiation of CPR and automated defibrillation of cardiac arrest patients in Saudi Arabia. This study resolves a gap in the literature by focusing on nurses' knowledge base, which might be connected to nurses' self-efficacy when performing CPR-D. Sharp et al. (2016) stated that one's sense of efficacy is a powerful human characteristic that affects choices and task effort. It is not based on the ability to do a task but rather on the perceived ability to complete those tasks. Self-efficacy influences the choices individuals make and their time and effort expended on a job. When nurses have a healthy sense of self-efficacy, they will tend toward attitudes and behaviors that support the assistance of cardiac arrest patients.

Methods

Study Design

This study used a cross-sectional, descriptive, and correlational design to describe the relationship between nurses' knowledge and self-efficacy regarding early initiation of CPR and automated defibrillation of cardiac arrest patients at King Abdulaziz University Hospital (KAUH).

Participants

The study population included nurses working in outpatient clinics, critical care units, emergency departments, medical departments, obstetrics and gynecologic departments, pediatric departments, and surgical departments at KAUH, Jeddah, Saudi Arabia. Convenience sampling was used to assure surveillance of all staff nurses. KUAH has a population of 1123 staff nurses (719 inpatients and 404 outpatient). We calculated the sample size using the online Raosoft calculating program with a confidence level of 95% and a margin of error of 5%; therefore, a minimum sample of 287 respondents was required (Raosoft, 2004). Our inclusion criteria were staff nurses working in inpatient or outpatient wards or critical areas; registered and certified nurses; and nurses who could read, speak, and write English. Our exclusion criterion was nurses who were not working with patients, such as those in administration.

Measures

Three questionnaires were used. First, a general questionnaire was used to measure demographic and individual characteristics: the working department, age, gender, length of experience, and frequency of witnessing or performing CPR-D. Second, the Resuscitation Knowledge Scale of Byun (2014) was used to measure participants' knowledge about CPR-D. The scale consisted of 20 items: two for checking for breathing, two for checking for consciousness, seven for chest compressions, five for applying the defibrillator, and four for maintaining airway and delivering rescue breaths. The total score ranges from 0 to 20. The score distribution is low (0–9), moderate (10–14), and high (15–20).

Third, the Resuscitation Self-Efficacy Scale (RSES) of Desiani et al. (2017) was used to assess nurses' self-efficacy. The validity of the RSES was 0.56–0.84 based on Roh et al. (2012) as cited in Desiani et al. (2017). The scale consisted of 17 questions to assess four domains: recognition, debriefing and recording, responding and rescuing, reporting. The participants answer these questions by confirming whether they feel least confident, natural, or very confident. However, self-efficacy is low if the total score is lower than the mean, and self-efficacy is high if the total score is greater than or equal to the mean. Both instruments were administered in the English language. No Arabic translation was necessary since English is one of the inclusion criteria.

We have obtained permission to use the second and third instruments from the original authors.

Data Collection

Data were collected electronically from the target group of nurses through a Google form link and shared data with the head nurses in KAUH. We sent a reminder to the head nurses after two weeks to increase the response rate. The challenge we faced was that participants' responses were initially weak, necessitating frequent visits to the hospital to motivate participants to answer the survey and extend the survey times so that more nurses could respond (two months). The link to the questionnaires was accessible until enough samples were reached.

Data Analysis

Descriptive statistics (means, SD, frequencies, percentages, and ranges) and Pearson correlation were used for data analysis. The alpha level of significance was set at 0.05. The assumptions of normality were met, with Kolmogorov–Smirnov ($p > 0.05$).

Ethical Consideration

Official approval was obtained from the Research Ethical Committee of the Faculty of Nursing at King Abdulaziz University (Ref NO 1M.19) and the Unit of Biomedical Ethics Research Committee at KAUH No (HA-02-J-008) (Reference NO 517-20). To meet the ethical consideration of the research process, the participants' names were encoded for anonymity. There was no potential risk to participants, and it was clear that they had the right to decline to participate. To avoid bias during data gathering, it was ensured that we knew none of the participants.

Results

The total sample was 287 nurses who worked in inpatient and outpatient departments at KAUH. **Table 1** shows the demographic characteristics of the nurses, most of whom were female (91.3%). Most were middle-aged (31 to 39) 36.428 ± 7.598 . The most represented specialty was pediatrics (30.7%). The participants' experience was varied.

Table 1 Demographic characteristics of the participants ($N= 287$)

Variables	N	%
Age		
20-30	65	22.6
31-39	116	40.4
40 or above	106	36.9
Mean±SD	36.428±7.598	
Gender		
Female	262	91.3
Male	25	8.7
Working departments		
Outpatients	42	14.6
Critical care units	30	10.5
Emergency department	36	12.5
Medical department	44	15.3
Obstetrics and gynecology	16	5.6
Pediatric department	88	30.7
Surgical department	31	10.8
Clinical experiences		
Less than one year	9	3.1
1-less than five years	52	18.1
5-10 years	64	22.3
More than ten years	162	56.4
Mean±SD	9.196±4.166	
Frequency of CPR witnessed or performed		
0	15	5.2
1-5	93	32.4
More than 5	179	62.4

Impressively, most participants had more than ten years of experience (56.4%), with a mean of 9.196 ± 4.166 . The frequency of CPR being performed or witnessed differed

among participants: the percentage of participants who saw or performed CPR more than five times was 62.4%.

Significantly, as shown in **Table 2** and **Figure 1**, 61.3% of study participants had a moderate knowledge score.

Table 2 Knowledge level of participants regarding cardiopulmonary resuscitation and automated defibrillation

Scale Items	Knowledge Scale Score							
	Low		Moderate		High		Score	
	N	%	N	%	N	%	Range	Mean±SD
Confirm the reaction	56	19.5%	0	0.0%	231	80.5%	0-1	0.805±0.397
Request help	152	53.0%	0	0.0%	135	47.0%	0-1	0.470±0.500
Circular request	7	2.4%	82	28.6%	198	69.0%	0-2	1.666±0.522
Chest compression	24	8.4%	122	42.5%	141	49.1%	0-7	5.247±1.228
Airway maintenance and artificial respiration	50	17.4%	152	53.0%	85	29.6%	0-4	2.143±0.774
Defibrillation	54	18.8%	107	37.3%	126	43.9%	0-5	3.328±0.952
Total Knowledge	10	3.5%	176	61.3%	101	35.2%	5-18.	13.659±2.175

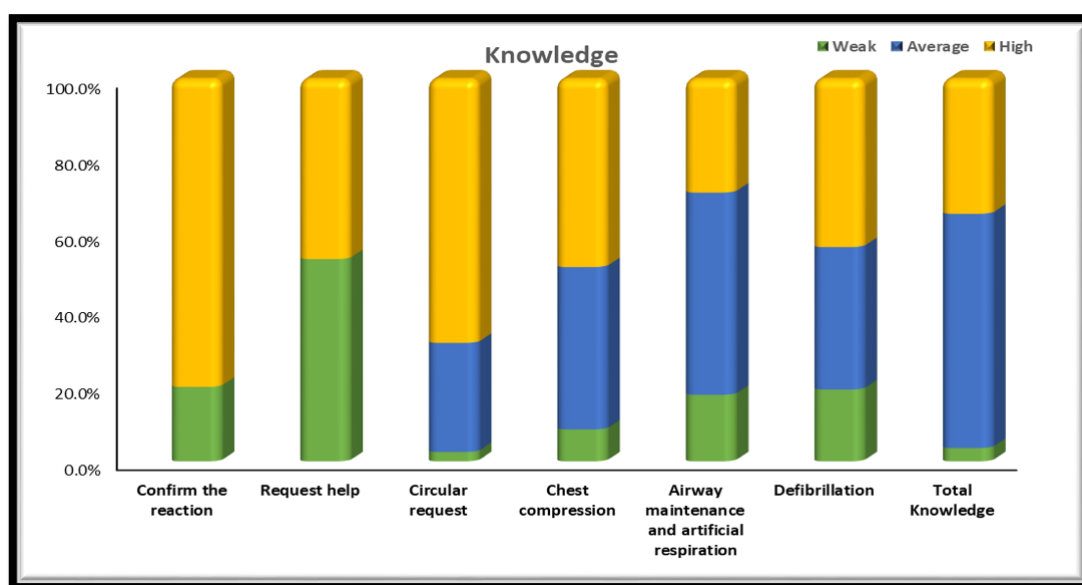


Figure 1 Knowledge level of participants regarding cardiopulmonary resuscitation and automated defibrillation

As shown in **Table 3** and **Figure 2**, 63.8% of participants had a high score on self-efficacy, and the highest domain was the responding and rescuing domain ($13.139 \pm$

61.397). In contrast, the lowest domains of self-efficacy were debriefing and recording (10.244 ± 66.397).

Table 3 Self-Efficacy level of Participants Regarding Cardiopulmonary Resuscitation and Automated Defibrillation

	Self-Efficacy					
	Low		High		Score	
	N	%	N	%	Range	Mean±SD
Recognition	85	29.6%	202	70.4%	4-12.	10.868±1.755
Debriefing and recording	128	44.6%	159	55.4%	4-12.	10.244±66.397
Responding and rescuing	119	41.5%	168	58.5%	5-15.	13.139±61.397
Reporting	120	41.8%	167	58.2%	4-12.	10.376±1.953
Total Self-Efficacy	104	36.2%	183	63.8%	17-51	44.627±58.397

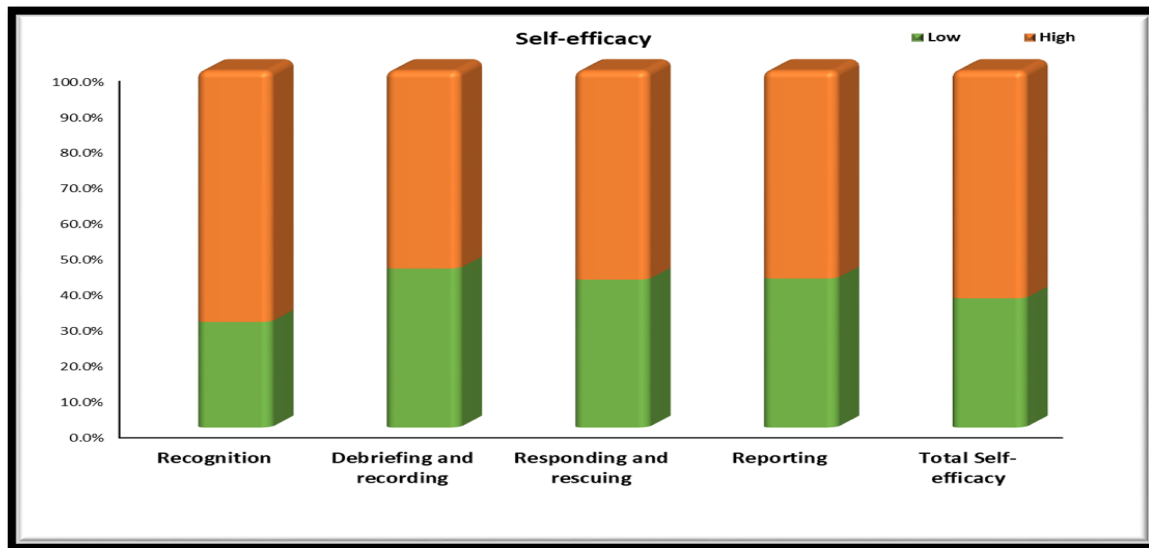


Figure 2 Self-efficacy score of the studied participants regarding cardiopulmonary resuscitation and automated defibrillation

The scattered design was used to describe the correlation between knowledge and self-efficacy, as shown in **Figure 3**, with a p -value of $<0.001^*$ and a r -value of 0.207. Ultimately, the correlation was weak and significantly

positive between knowledge and self-efficacy. The positive relationship indicated that there was a high-level self-efficacy if there was a high level of knowledge.

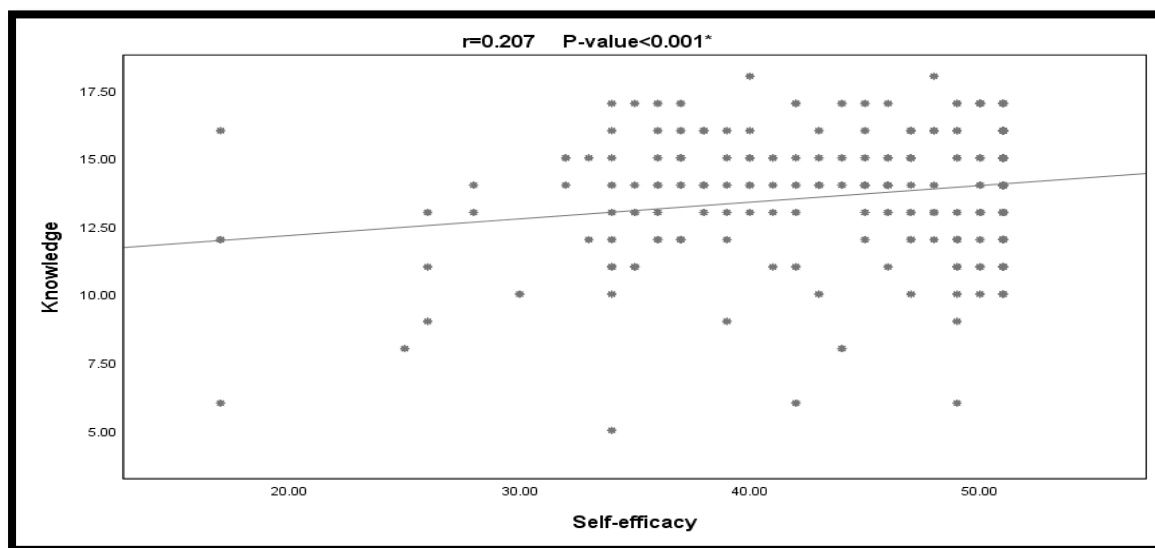


Figure 3 Correlation between nurses' knowledge score and nurses' self-efficacy of cardiopulmonary resuscitation and automated defibrillation

Discussion

This study aimed to assess the relationship between nurses' knowledge and self-efficacy regarding the early initiation of CPR-D of cardiac arrest patients. Our study found that the mean score for resuscitation knowledge was moderate, a finding that parallels that of [Sachdeva \(2020\)](#) in a tertiary care hospital in India that aimed to assess knowledge and practice of CPR-D among nurses. The similarity in both studies may indicate the need to work on nurses' CPR-D knowledge. These findings have often been

associated with inadequate continuing education programs regarding CPR-D, and most of the participants were working in the pediatrics department and might have answered the questions considering that the patients are children instead of adult patients. In another study, nurses enrolled at Umm Al-Qura University were found to have moderate levels of CPR-D knowledge and practical skills ([Shammah et al., 2018](#)).

In addition, our study found that the participants had high overall self-efficacy scores, indicating that they were confident in their CPR-D skills, could stay calm while

applying CPR-D, and had little or no problem focusing on the task. The study also observed that the respondents tended to control their anxiety and sense of distress and perform according to their skill levels. Thus, self-efficacy was considered adequate in this regard, and this verified that confidence could encourage nurses to decide to perform CPR-D in instances of cardiac arrest.

Waloyo (2016) reported a self-efficacy rate of 75%, which was higher than the findings of this study. Besides the overall scale scores, the nurses in this research were very confident in terms of scales of self-efficacy subscale scores we have obtained in the present study were 55.4% for debriefing, 65.9% for documentation on quality improvement, 59.6% for remaining calm and focused, 65.9% for performing re-evaluation, 63.4% for reporting, 56.8% for using existing resources and external experts, 65.5% for using appropriate means of communication, and 70% for understanding when to request help.

In comparison to the findings of this study, Desiani et al. (2017) reported lower rates of confidence in terms of the subscales of self-efficacy. According to their data, the rates of nurses who were confident about their skills were 35.5% for debriefing, 46.1% for the correct management of a defibrillator, 38.1% for explaining clinical laboratory findings and critical values and 30.2% for using existing resources and external experts.

Besides, various methods could be used for debriefing to improve CPR-D knowledge and quality: oral debriefing, oral debriefing with voice recording, self-debriefing, debriefing with an instructor, and oral debriefing with video recording (Verkuyl et al., 2018). However, some training facilities or universities may not have easy access to the devices needed for the education of their learners. For instance, when evaluating training for defibrillators' use, the lack of exposure to a defibrillator during training could significantly dampen training outcomes, which is another matter that should be considered. This leaves many nurses uncertain about using these devices, leading to less experience and lower levels of knowledge and self-efficacy. In addition, the lack of availability of a defibrillator during training courses will often result in a lack of theoretical and practical knowledge in carrying out defibrillation with an Automated External Defibrillation (AED) (Aranzabal-Alegria et al., 2017). Besides the obvious problems associated with having lower levels of practical skills, the gap in theoretical knowledge could also lead to lower self-efficacy, which tends to be more evident in some self-efficacy subscales explaining clinical laboratory findings and critical values and using existing resources external experts.

According to the relationship between knowledge and self-efficacy regarding CPR-D, knowledge and self-efficacy had a weak and positive correlation. The positive relationship explains how there would be a high level of self-efficacy if there were a high level of knowledge. Partiprajak and Thongpo (2016) highlighted the importance of having high levels of knowledge and self-efficacy for obtaining a better standard of care and higher effectiveness of CPR-D performance. Dayapoglu and Tan (2016)

emphasized the significance of awareness, which was correlated with CPR-D self-efficacy. In managing cardiac arrest cases, Turner et al. (2009) suggested that healthcare professionals' self-efficacy is as essential as the other main factors: knowledge, skill, and attitude. Gusnia and Saragih (2013) have strengthened this idea by considering self-efficacy as the dominant factor for adapting novice nurses to the profession.

Considering all these findings, the effect of self-efficacy on CPR-D performance was strong. Still, having higher levels of self-efficacy in terms of CPR-D has other benefits for healthcare workers' performance in terms of their attitudes and behaviors.

The major strength of this study was that no data were missing due to the use of an online survey, which required answering all the questions. On the other hand, this study has some limitations. The sample in this study represented participants only from KAUH in Jeddah, which might affect the generalizability of the findings to all hospitals in Saudi Arabia. Additionally, the format was ideal for measuring the nurses' CPR-D performance by the observation method. However, because of the COVID-19 pandemic, we preferred to use the former method.

In addition, this study has several implications for improving knowledge about CPR-D among nurses. First, applying the CPR-D curricula during internships for healthcare providers is recommended to increase the likelihood of witnessing CPR-D and improving nurses' practices. Second, the results indicated that continually updating CPR-D knowledge and skills can be helpful for healthcare workers, particularly for nurses, who are usually the first to encounter cardiac arrest patients in the hospital. Moreover, we recommend further research to explore the factors affecting nurses' knowledge and self-efficacy to improve CPR-D's early initiation. Finally, future study is required to identify the effect (whether positive or negative) on self-efficacy of witnessing and practicing CPR-D.

Conclusion

Knowledge and self-efficacy are key elements that affect the early initiation of CPR-D by nurses in patients with cardiac arrest. In addition, considering their influence on various factors, they are also good indicators of CPR-D performance. Thus, increasing the levels of knowledge of nursing staff and supporting their self-efficacy for potential clinical scenarios is critical.

Declaration of Conflicting Interest

The authors declare no conflicting interest in this study.

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Authors' Contributions

ZA conceptualized, analyzed, and drafted the manuscript. AA, ME critically reviewed and revised the manuscript. All authors agreed on the final version of the article to be published.

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Data Availability Statement

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

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