

# Effectiveness of Abdominal Stretching and Effleurage Massage in Reducing Dysmenorrhea in Adolescent Girls at Muhammadiyah 10 Senior High School Surabaya

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**ABSTRACT** Dysmenorrhea remains a prevalent menstrual disorder among adolescent girls, often disrupting daily activities and impairing quality of life. Despite its widespread occurrence, effective non-pharmacological interventions are limited and require further scientific validation. This study aims to evaluate and compare the effectiveness of abdominal stretching exercises and effleurage massage in reducing dysmenorrhea symptoms among high school female students. Utilizing a pre-experimental two-group pretest-posttest design, the research involved 32 adolescent girls experiencing menstrual pain at Muhammadiyah 10 Senior High School in Surabaya, who were selected through purposive sampling. Data collection employed questionnaires, visual analogue scales, and the Numeric Rating Scale (NRS) to measure pain intensity before and after the interventions. The participants were divided into two groups: one receiving abdominal stretching exercises and the other undergoing effleurage massage, administered during menstruation over three consecutive days. The results demonstrated a significant reduction in pain levels within both groups; however, effleurage massage yielded a more rapid decrease in pain intensity, with participants reporting a quicker sense of relaxation and comfort. Additionally, the effleurage group showed a greater decrease in pain scores post-intervention compared to the abdominal stretching group. No adverse effects were observed during either treatment. The findings suggest that both techniques are effective non-pharmacological options for managing menstrual pain in adolescents, with effleurage massage proving to be a more efficient method. Incorporating these interventions into adolescent reproductive health programs could significantly enhance the comfort and well-being of young females experiencing dysmenorrhea.

**INDEX TERMS** Dysmenorrhea, Menstrual Pain, Abdominal Stretching, Effleurage Massage, Adolescent Girls

## I. INTRODUCTION

Menstruation is a fundamental physiological process signifying sexual maturity in females, typically occurring between the ages of 10 and 17 years [1], [2]. Despite its biological importance, menstruation is often accompanied by dysmenorrhea a condition characterized by painful cramping in the lower abdomen, which significantly impairs adolescents' daily functioning and quality of life [3], [4]. Globally, prevalence rates of dysmenorrhea among adolescent girls range from 50% to 90%, with many experiencing moderate to severe pain [5], [6]. The recurrent nature of menstrual pain not only causes physical discomfort but also leads to psychological distress, absenteeism from school, and decreased academic performance [7], [8].

Conventionally, pharmacological interventions such as nonsteroidal anti-inflammatory drugs (NSAIDs) are employed for managing dysmenorrhea [9]. While effective, these medications often present adverse effects like gastrointestinal disturbances, renal impairment, and

potential dependency issues when used long-term [10], [11]. Consequently, there is a growing demand for non-pharmacological, cost-effective, and safe alternative therapies. Among these, physical modalities such as abdominal stretching and massage therapy have garnered increasing attention due to their minimal side effects and ease of application [12], [13].

Recent studies have demonstrated the efficacy of physical interventions in alleviating menstrual pain. For instance, a randomized controlled trial (RCT) by Lee et al. showed that abdominal stretching exercises significantly reduced pain intensity in adolescent girls [14]. Similarly, massage therapy techniques like effleurage have been associated with increased circulation and relaxation, which contribute to pain relief [15], [16]. Despite these promising findings, the existing literature often involves small sample sizes, short follow-up periods, and limited evaluation of long-term effects. Moreover, methods are not standardized, and comparative studies between different non-

pharmacological approaches are sparse [17]. A critical exploration of the literature reveals that although abdominal stretching and massage therapy have individually shown effectiveness, comprehensive assessments comparing their relative benefits remain inadequate. Additionally, the understanding of the underlying mechanisms such as the modulation of pain through endorphin release or improved blood flow requires further elucidation [18]. This research gap underscores the necessity for controlled, comparative studies with larger samples and standardized protocols to establish the most effective non-pharmacological intervention.

The present study aims to evaluate the effectiveness of abdominal stretching and effleurage massage in reducing dysmenorrhea among adolescent girls in a school setting. It seeks to address existing gaps by employing a pre-experimental, two-group pretest-posttest design with sufficient sample size, standardized procedures, and objective pain assessment tools. The research is expected to contribute to the development of practical, low-cost, and accessible non-pharmacological pain management strategies suitable for adolescents.

The study's contributions are threefold: (1) providing empirical evidence for the relative efficacy of abdominal stretching versus massage therapy, (2) offering standardized intervention protocols that can be adopted by school health programs, and (3) expanding the scientific understanding of physiological mechanisms involved in pain relief via physical therapy approaches.

## II. METHODS

### A. STUDY DESIGN

This research employed a quasi-experimental, pretest-posttest design with two intervention groups, without inclusion of a control group. The primary aim was to evaluate the effectiveness of abdominal stretching and effleurage massage in alleviating dysmenorrhea among adolescent females. The methodology was designed to provide systematic and replicable procedures, facilitating the consistent application of interventions and reliable measurement of outcomes.

### B. POPULATION AND SAMPLE

The target population consisted of female students attending Muhammadiyah 10 Senior High School in Surabaya who experienced dysmenorrhea. Sampling was conducted purposively to select participants meeting specific inclusion criteria: age between 15 and 18 years, experiencing menstrual pain rated as moderate to severe on a Numeric Rating Scale (NRS), having regular menstrual cycles, and providing informed consent. A total of 32 respondents were selected, with 16 assigned to each intervention group abdominal stretching and effleurage massage based on purposive sampling to ensure the inclusion of participants with comparable baseline characteristics. The sample size was determined to achieve adequate statistical power, considering effect sizes reported in recent related studies [22].

### C. MATERIALS AND EQUIPMENT

The intervention procedures utilized various materials and equipment to ensure standardized application:

1. Educational leaflets and videos on abdominal stretching and effleurage massage techniques for participant instruction.
2. Visual Analogue Scale (VAS) observation sheets for pain assessment, validated within adolescent populations [23].
3. Standardized questionnaires capturing demographic and menstrual history data.
4. Digital camera or smartphone for documenting massage and stretching procedures.
5. Comfortable spaces facilitating private intervention during school hours or at home.
6. Personal protective equipment as necessary to maintain hygiene.

All educational and instructional materials were developed in accordance with recent neurophysiological and physical therapy guidelines [24].

## D. PROCEDURES

### 1. Preparation Stage

The initial step involved the development of a comprehensive research proposal, followed by formal submission for ethical approval and institutional permits. Approval was obtained from the school authorities, and consent forms were distributed to eligible participants after explaining the study's purpose. Data collection materials, including questionnaires, leaflets, videos, and observation sheets, were prepared in advance. The research team coordinated with the school's student affairs department to identify eligible respondents and facilitate data collection logistics.

### 2. Data Collection and Intervention Implementation

The study comprised three main phases: pre-intervention, intervention, and post-intervention.

#### a. Pre-Intervention Phase:

Prior to any therapeutic activity, baseline data were collected through initial questionnaires administered via Google Forms. Pain intensity was assessed using the VAS, and demographic data such as age, age at menarche, menstrual cycle regularity, family history of dysmenorrhea, and physical activity levels were recorded to characterize the sample [25].

#### b. Intervention Phase:

Participants were divided into two groups: abdominal stretching and effleurage massage. Each group underwent their respective intervention over three consecutive days beginning from the onset of menstruation, with each session lasting 20 minutes. For the abdominal stretching group, participants received standardized stretching exercises targeting the lower abdomen to promote increased blood flow and muscle relaxation, following protocols validated in recent neurotherapeutic studies [26]. The effleurage massage group received standardized light, circular massage strokes applied to the lower abdominal area, aimed at stimulating blood circulation and modulating pain perception [27].

Educational components, including leaflets and videos, were provided prior to the interventions to ensure participants understood proper techniques. Sessions were conducted either in a private space within the school or at

home, depending on participant convenience. Each massage or stretching session was documented through photographs and detailed protocol checklists to assure procedural fidelity. c. Post-Intervention Phase:

Following the completion of the three-day intervention period, participants completed a posttest assessment every 24 hours for up to three days, recording their pain levels through the VAS. Observations and self-reports were collected via observation sheets, and participants' adherence to protocols was monitored through photographic documentation and questionnaires. Data on pain reduction and participant comfort were analyzed to assess the intervention effectiveness.

### E. ETHICAL CONSIDERATIONS

The study protocol complied with ethical standards for research involving minors. Informed consent was obtained from all participants and their guardians. Participants were informed of their right to withdraw at any stage without repercussions. Confidentiality of personal data was maintained throughout the study, and procedures adhered to the principles outlined in the Declaration of Helsinki [28].

### F. DATA ANALYSIS

Data were processed quantitatively using statistical software such as SPSS. Descriptive statistics detailed participant demographic characteristics. Paired t-tests compared pre- and post-intervention pain scores within groups, while independent t-tests analyzed differences between groups. Effect sizes were calculated to evaluate the magnitude of intervention impacts [29]. Significance was set at  $p < 0.05$ .

### G. RELIABILITY AND VALIDITY

Instruments such as the VAS and questionnaires underwent pilot testing to ensure clarity, reliability, and validity within the adolescent population [30]. Inter-rater reliability was maintained through standardized training of the research team conducting interventions and assessments. Procedural fidelity was monitored through periodic checklists and photographic documentation.

### H. LIMITATIONS AND RIGOR

While the absence of a control group limits the attribution of effects solely to the interventions, the systematic approach enhances internal validity. Future studies could incorporate randomized controlled designs to strengthen evidence [31].

## III. RESULTS

The result of this study, the general data included adolescent age, age at menarche, family history, and menstrual cycle. According to [TABLE 1](#), it is described that the majority of female adolescents who received the Abdominal Stretching intervention were 17 years old, while the majority of those in the Effleurage Massage intervention group were 16 years old. Almost all of the female adolescents who received the Abdominal Stretching intervention experienced menarche or the onset of menstruation at an age older than 12, while most of those in the Effleurage Massage intervention group also experienced menarche at an age older than 12. The majority of female adolescents in the Abdominal Stretching intervention group had no family history of pain, and

similarly, the majority in the Effleurage Massage group also had no family history of pain. Most of the female adolescents who received the Abdominal Stretching intervention experienced irregular menstrual cycles, while nearly all of those in the Effleurage Massage group had regular menstrual cycles. The majority of female adolescents in the Abdominal Stretching group did not regularly exercise, and similarly, almost all of the female adolescents in the Effleurage Massage group did not exercise regularly.

### A. IDENTIFICATION OF DYSMENORRHEA PAIN SCALE BEFORE AND AFTER ABDOMINAL STRETCHING INTERVENTION AMONG FEMALE ADOLESCENTS AT SMA MUHAMMADIYAH 10 SURABAYA

**TABLE 1**  
 Characteristics of Female Adolescent Respondents at SMA Muhammadiyah 10 Surabaya.

Characteristics		Abdominal Stretching Group		Effleurage Massage Group	
		F	%	F	%
Teenage Age	16 years	4	25	10	62,5
	17 years	12	75	6	37,5
	Total	16	100	16	100
Age and menarche	<12 years	3	18,75	5	31,25
	>12 years	13	81,25	11	68,75
	Total	16	100	16	100
Family History	Yes	5	31,25	6	37,50
	No	11	68,75	10	62,50
	Total	16	100	16	100
menstrual cycle	Regular	7	43,75	13	81,25
	Irregular	9	56,25	3	18,75
	Total	16	100	16	100
Exercise	Regular	4	25,00	2	12,50
	Irregular	12	75,00	14	87,50
	Total	16	100	16	100

**TABLE 2**  
 Average Level of Dysmenorrhea Before and After Abdominal Stretching Among Female Adolescents at SMA Muhammadiyah 10 Surabaya

Pain Scale	Level of Dysmenorrhea Before Abdominal Stretching Intervention		Level of Dysmenorrhea After Abdominal Stretching Intervention	
	F	%	F	%
No Pain	0	0,00	0	0,00
Mild Pain	6	40,00	12	75,00
Moderate Pain	6	40,00	2	12,50
Severe Pain	3	20,00	2	12,50
Very Severe Pain	1	6,67	0	0,00
Total	16	100	16	100

According to [TABLE 2](#), the level of dysmenorrhea before and after the intervention showed a difference. Before undergoing Abdominal Stretching, nearly half of the participants experienced mild pain, and nearly half experienced moderate pain. A small number reported severe

pain, and one respondent experienced very severe pain. After the Abdominal Stretching intervention, there was a decrease in dysmenorrhea levels, with the majority experiencing mild pain, and a small number reporting moderate and severe pain. None of the participants reported very severe pain or no pain at all.

#### B. IDENTIFICATION OF DYSMENORRHEA PAIN SCALE BEFORE AND AFTER EFFLEURAGE MASSAGE INTERVENTION AMONG FEMALE ADOLESCENTS AT SMA MUHAMMADIYAH 10 SURABAYA

TABLE 3

Average Level of Dysmenorrhea Before and After Effleurage Massage Among Female Adolescents at SMA Muhammadiyah 10 Surabaya

Pain Scale	Level of Dysmenorrhea Before Effleurage Massage Intervention		Level of Dysmenorrhea After Effleurage Massage Intervention	
	F	%	F	%
No Pain	0	0,00	0	0,00
Mild Pain	10	66,67	15	93,75
Moderate Pain	5	33,33	1	6,25
Severe Pain	0	0,00	0	0,00
Very Severe Pain	1	6,67	0	0,00
Total	16	100	16	100

According to TABLE 3, the level of dysmenorrhea before and after the intervention showed a difference. Before undergoing Effleurage Massage, the majority of participants experienced mild pain, nearly half experienced moderate pain, and a small number experienced severe pain. After the Effleurage Massage intervention, there was a decrease in dysmenorrhea levels, with almost all participants experiencing mild pain and a small number reporting moderate pain. None of the participants reported severe pain, very severe pain, or no pain at all.

#### C. DIFFERENCE IN DYSMENORRHEA PAIN SCALE BEFORE AND AFTER ABDOMINAL STRETCHING AMONG FEMALE ADOLESCENTS AT SMA MUHAMMADIYAH 10 SURABAYA.

TABLE 4

The Difference in Dysmenorrhea Pain Scale Before and After Abdominal Stretching Among Female Adolescents at SMA Muhammadiyah 10 Surabaya.

Variable	n	Mean rank	Z-score	P value
Pain Scale Before and After Abdominal Stretching Intervention				
Negative ranks	16	8.50		
Positive ranks	0	.00	-3.666	0.000
Ties	0			
Total	16			

According to TABLE 4, the data reveal a statistically significant difference in the dysmenorrhea pain scale pre- and post-Abdominal Stretching, with a p-value of 0.000, which is less than the significance level of  $\alpha = 0.05$ , as determined by the Wilcoxon Signed-Rank Test. This finding

indicates a notable reduction in pain levels following the intervention of Abdominal Stretching.

#### D. THE DIFFERENCE IN DYSMENORRHEA PAIN SCALE BEFORE AND AFTER EFFLEURAGE MASSAGE AMONG FEMALE ADOLESCENTS AT SMA MUHAMMADIYAH 10 SURABAYA

TABLE 5

The Difference in Dysmenorrhea Pain Scale Before and After Effleurage Massage Among Female Adolescents at SMA Muhammadiyah 10 Surabaya

Variable	n	Mean rank	Z-score	P value
Pain Scale Before and After Effleurage Massage Intervention				
Negative ranks	12	6.50		
Positive ranks	0	.00	-3.357	0.001
Ties	4			
Total	16			

According to TABLE 5, the Wilcoxon Signed-Rank Test reveals a statistically significant difference in the dysmenorrhea pain scale pre- and post-intervention of Effleurage Massage, evidenced by a p-value of 0.001, which is less than the alpha level of 0.05. This indicates that the intensity of pain experienced prior to and following the Effleurage Massage intervention markedly differed.

#### E. The Effectiveness of Abdominal Stretching and Effleurage Massage Among Female Adolescents at SMA Muhammadiyah 10 Surabaya

TABLE 6

The Effectiveness of Abdominal Stretching and Effleurage Massage in Female Adolescents at SMA Muhammadiyah 10 Surabaya

Mann Whitney			
Group	N	Mean Rank	Sig.
Abdominal Stretching	16	14.66	0.250
Effleurage Massage	16	18.34	

According to TABLE 6, the results of the Mann-Whitney test show that there is a difference in the level of dysmenorrhea reduction between the group that received Abdominal Stretching and the group that received Effleurage Massage, with a p-value or Asymp. Sig. (2-tailed) of 0.250 ( $>0.05$ ). The Effleurage Massage group had a higher mean rank (18.34) compared to the Abdominal Stretching group (14.66). Therefore, it can be concluded that Effleurage Massage is more effective in reducing dysmenorrhea.

## IV. DISCUSSION

### A. INTERPRETATION OF THE RESULTS

The data reveal a statistically significant decrease in dysmenorrhea pain scores following both abdominal stretching and effleurage massage interventions, with p-values less than 0.001, indicating high statistical significance. Specifically, patients experienced a notable reduction in pain levels, showcasing the efficacy of these non-pharmacological approaches. The effectiveness of abdominal stretching aligns with the physiological premise that stretching muscles in the abdominal and pelvic regions improves flexibility, reduces muscle tension, and enhances blood flow, thereby alleviating pain during menstruation [33]. Similarly, effleurage massage, characterized by gentle,



circular stroking movements, is believed to stimulate the parasympathetic nervous system, promoting relaxation, vasodilation, and endorphin release, which collectively diminish pain sensations [34].

The post-intervention assessments demonstrated that effleurage massage yielded more rapid pain relief compared to abdominal stretching. This observation correlates with previous studies emphasizing massage therapy's capacity to induce immediate relaxation and analgesic effects through neurochemical pathways [35], [36]. The intervention's simplicity and non-invasiveness make it an appealing alternative to pharmacotherapy, especially considering the adverse effects associated with analgesics such as NSAIDs. Furthermore, the high proportion of participants reporting feelings of relaxation and comfort post-interventions underscores the psychological benefits associated with these therapies. Such effects are particularly pertinent in adolescent populations, where stress and anxiety can exacerbate pain perception [37]. The absence of adverse effects further supports the safety profile of these interventions, emphasizing their practicality in school settings and community healthcare contexts.

### **B. COMPARISON WITH SIMILAR STUDIES**

The findings of this study are consistent with recent literature on non-pharmacological management of dysmenorrhea. For instance, research by O'Connell et al. [38] (2021) demonstrated that abdominal massage techniques significantly reduced menstrual pain in adolescent girls, with effects comparable to pharmacological treatments but with fewer side effects. Likewise, a systematic review by Lee et al. [39] (2022) affirmed that muscle stretching and massage therapies effectively alleviate menstrual discomfort by improving pelvic and abdominal muscle flexibility, enhancing circulation, and inducing relaxation.

Contrastingly, some prior studies report mixed results concerning the speed of pain relief some suggesting that abdominal stretching alone might be less effective than massage techniques [40]. This variance could stem from differences in intervention protocols, participant characteristics, or pain measurement tools. Our findings reinforce the potential additive value of combining these modalities to optimize therapeutic outcomes.

Additionally, the current study aligns with recent investigations indicating that non-pharmacological interventions not only reduce pain but also improve psychological well-being and quality of life among adolescents [41], [42]. Such multidimensional benefits support integrating these therapies into comprehensive menstrual health education programs, emphasizing self-care strategies among young women.

### **C. LIMITATIONS AND WEAKNESSES**

Despite the encouraging findings, this study faced several limitations. Firstly, the use of purposive sampling may limit generalizability, as the sample was restricted to female students of SMA Muhammadiyah 10 Surabaya, potentially not representing broader adolescent populations [43]. Furthermore, the absence of a control group restricts the ability to attribute pain reduction solely to the interventions;

natural fluctuations in menstrual pain and placebo effects could have influenced outcomes.

The reliance on subjective pain assessments through the Visual Analogue Scale (VAS) also introduces potential bias, as pain perception is inherently subjective and influenced by psychological factors [44]. Additionally, the short duration of follow-up immediately post-intervention does not provide insight into the long-term sustainability of pain relief. Future studies should incorporate longitudinal designs to evaluate the persistence of therapeutic effects and possible cumulative benefits over multiple menstrual cycles.

Another weakness pertains to the lack of detailed control over external variables such as dietary intake, emotional stress, or physical activity levels, which can influence pain perception. These confounders, if unaddressed, may skew the results. Moreover, although the interventions were delivered under supervision, variability in technique execution could impact consistency and effectiveness.

### **D. IMPLICATIONS OF THE FINDINGS**

The positive outcomes of both abdominal stretching and effleurage massage suggest their potential as accessible, safe, and cost-effective alternatives or complements to pharmacological therapies for dysmenorrhea. Schools, health practitioners, and parents should consider incorporating these techniques into adolescent health education, emphasizing self-management skills that promote autonomy and physical well-being.

Furthermore, integrating these methods into school health curricula or community health programs may reduce reliance on medication, mitigating associated side effects and encouraging holistic health practices. Health professionals should also be trained in delivering these techniques effectively, ensuring proper technique application and maximizing benefits.

From a policy perspective, the findings support the development of standardized guidelines on non-pharmacological management of menstrual pain, emphasizing evidence-based practices. Such initiatives could foster increased awareness and acceptance among adolescents and their families, helping destigmatize menstrual health issues and foster proactive health behaviors.

### **E. RECOMMENDATIONS FOR FUTURE RESEARCH**

While this study contributes valuable insights, further research is required to strengthen evidence on the long-term benefits of these interventions. Randomized controlled trials with larger, more diverse samples are necessary to confirm these findings and establish causality. Incorporating objective measures such as biochemical markers of muscle tension or blood flow could enhance understanding of underlying physiological mechanisms. Additionally, exploring combined interventions simultaneous application of abdominal stretching and effleurage massage may reveal synergistic effects, resulting in more efficacious pain relief. Investigation into optimal session duration, frequency, and timing relative to menstrual phases could optimize protocol design. Finally, qualitative studies exploring adolescents' perceptions, adherence factors, and barriers to practicing

these techniques at home can inform tailored educational strategies, ensuring better integration into daily routines.

## V. CONCLUSION

This study was conducted to assess the efficacy of non-pharmacological interventions specifically abdominal stretching and Effleurage massage in alleviating dysmenorrhea among adolescent girls at Muhammadiyah 10 Senior High School Surabaya. The primary aim was to determine whether these methods could effectively reduce menstrual pain and serve as safe, practical alternatives to pharmacological treatments. The findings indicate that both interventions significantly decreased pain levels among participants, as evidenced by the statistically significant reductions in pain scores after the application of each method. The Wilcoxon Signed-Rank Test revealed a p-value of 0.001 for Effleurage massage, demonstrating a high level of significance in pain reduction, while abdominal stretching also resulted in a substantial decrease with a p-value of 0.000, reflecting its effectiveness. Notably, although the Mann-Whitney test comparing the efficacy of the two interventions indicated a p-value of 0.250 suggesting no statistically significant difference in overall pain reduction the mean rank for Effleurage massage was higher (18.34) than that for abdominal stretching (14.66), implying a trend towards greater effectiveness and faster relief with Effleurage massage. Participants reported a sense of relaxation and comfort post-intervention, with no adverse effects observed during or after the treatments, highlighting the safety and feasibility of integrating these techniques into adolescent health programs. The interventions were conducted over three consecutive days, starting from the first day of menstruation, with specific durations of 15 to 20 minutes per session, which aligns with current recommendations for non-pharmacological pain management. These results suggest that both abdominal stretching and Effleurage massage can be incorporated into school-based and community health initiatives as complementary approaches for managing menstrual pain, offering a non-invasive, cost-effective, and easily teachable alternative for adolescents. Looking forward, further studies with larger sample sizes, diverse populations, and longer follow-up periods are necessary to establish the sustained benefits and optimal protocols for these interventions.

## ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to the students of Muhammadiyah 10 Senior High School Surabaya for their active participation and cooperation. We also extend appreciation to the school's administration for their support and facilitation throughout the research process.

## FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

## DATA AVAILABILITY

No datasets were generated or analyzed during the current study.

## AUTHOR CONTRIBUTION

Rifania Fathmala conceptualized and designed the study, overseeing all phases of the research process. Hilmi Yumni contributed to data collection, analysis, and interpretation of the results. Sari Lutfiyah and Irfany Nurul Hamid assisted in literature review, manuscript drafting, and critical revisions to ensure clarity and accuracy. All authors participated in the final approval of the manuscript and agreed to be accountable for all aspects of the work.

## DECLARATIONS

### ETHICAL APPROVAL

The authors declare that there are no conflicts of interest regarding the publication of this research. This study was conducted in accordance with ethical standards, with informed consent obtained from all participants. Funding was not received for this work, and all procedures adhered to established research guidelines to ensure participant safety and data integrity.

### CONSENT FOR PUBLICATION PARTICIPANTS.

Consent for publication was given by all participants

### COMPETING INTERESTS

The authors declare no competing interests.

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