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Ameliorative Potential of Relaxing Back Massage on Postpartum Women's Hormones and Infant Weight

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Abstract:

Hormones transported through lactation from mother plasma to milk are crucial for both the start and continuation of breastfeeding. The purpose of this study was to prove the impact of back massage on lactating women's serum levels of leptin, prolactin and growth hormone.Thirty women started breastfeeding in the first postpartum hour and continued breastfeeding for at least 2 times in a 4-h period were randomly assigned to either the study group (SG; n = 15) which had massage or the control group (CG; n = 15)which was treated by routine postnatal care as the study group . Leptin, prolactin, and growth hormone levels were measured before and after intervention at the laboratory of kafr elshiekh University Hospital.Within group analysis , there were statistical significant differences ($p<0.05$) in SG leptin , prolactin ,growth hormone levels , growth hormone levels in CG and baby weight in both groups pre and post intervention , leptin and prolactin levels were not statistically significant increased ($p>0.5$) in CG pre and post intervention. Between group analysis, there was statistical significant difference of prolactin and growth hormone pre intervention and all hormones levels post intervention ($p<0.05$) with no statistical significant differences ($p>0.05$) of leptin levels pre intervention and baby weight pre and post intervention.Benefits of back massage have been related to increased production and growth factor levels in breast milk.

Keywords: Massage; Breast feeding; Leptin; Growth hormone

Introduction

This intricate process is triggered by a decline in placental estrogen and progesterone levels, while the release of prolactin and oxytocin marks the commencement of postnatal lactation [1]. The initiation of lactation is influenced by numerous factors, demanding a specific hormonal pattern for seamless progression. However, the body's hormonal cycle undergoes considerable changes due to the array of physical and psychological variables experienced by women during childbirth[2].

Among the many methods that are effective for initiating and maintaining breastfeeding, massage is particularly noteworthy. Manual massage uses kneading and friction techniques and is a type of supportive therapy that lasts 5 to 30 minutes [3]. Since results might differ greatly depending on the techniques and locations targeted, the effectiveness of massage therapy depends on how well it is tailored to each client's demands. According to

research, postpartum back massages significantly improve a postpartum woman's physical and mental well [4]. Additionally, backaches have been reported to be relieved by these massages [5].

The pituitary, mammary gland, placenta, gastric epithelium, skeletal muscle, and adipose tissue are among the body's sources of leptin, a hormone essential for milk production [6]. There is a strong link between plasma and milk leptin levels, as studies show that leptin is transferred from a mother's blood to her milk [7].

Childhood obesity is a result of the transfer of hormones, particularly leptin, caused by maternal obesity [8]. In obese children, studies by ElSaeed et al. found a favorable correlation between blood leptin levels and BMI [9]. One important development factor affecting babies is the interplay of prolactin, leptin, and growth hormone [10].

The hormone that causes lactation, prolactin, emphasizes how crucial it is to choose massages that increase its release. Notably, Prolactin (PRL) is essential for milk secretion in addition to helping with breastfeeding. According to traditional human research, PRL secretion during labor follows a pattern that decreases during active labor and then increases following placenta delivery and subsequent nursing [11].

The pituitary produces the majority of growth hormone (GH), which is essential for controlling the body's growth and development. In addition to supporting linear bone growth, it influences the development of reproductive organs and promotes the growth of internal organs, adipose tissue, connective tissue, muscles, and endocrine glands [12].

The development of the infant is greatly influenced by the hormones that are transferred from the mother's plasma into the milk during lactation. Growth factors that are essential for both long-term health and neonatal development are included in these hormones [13].

Studies on the effects of soothing massage on mother hormone levels and their correlation with infant weight (IW) have not yet been conducted, though. Therefore, the current study's goal is to evaluate how postpartum back massage affects levels of growth hormone, prolactin, and leptin.

Methods

The present study employed a randomized controlled trial design conducted at the outpatient clinic of the Faculty of Physical Therapy, Kafrelsheik University, Egypt, spanning from February 2023 to September 2023. This study was conducted in accordance with the CONSORT guidelines.

To determine the appropriate sample size, pilot testing involved three cases per group. Growth hormone served as the primary outcome measure, with an effect size of 0.5, a significance level set at ($p=0.05$), and a desired statistical power of 80%. This assessment indicated that a total of 15 participants were required for each group.

The randomization technique employed the creation of a random number table using Microsoft Excel 2010 software. Each number on the table corresponded to either the Study Group (SG, n=15) or Control Group (CG, n=15). Allocation of participants was based on the assigned number generated by their allocation code. The drawing procedure was conducted by a researcher without disclosure to the participants, ensuring unbiased allocation. Moreover, both the assessor and statistician remained blinded throughout the assessment period, unaware of the group assignments.

Forty-five women (n=45) between the ages of 20 and 30 were initially assessed to ensure conformity with the study's selection criteria. All participating mothers initiated breastfeeding within the first postpartum hour and continued to breastfeed at least twice within a 4-hour period. They were primiparous, free from chronic illnesses, and reported no breast-related issues. Each female participant was provided with a detailed explanation of the evaluation procedures. Before baseline assessments, 10 women were excluded due to failure to meet eligibility standards. Subsequently, 35 women were enrolled for blood investigations and measurement of their babies' weight. Notably, three participants from the CG and two from the SG chose to discontinue their involvement in the study. The data collection phase spanned from March to September 2023.

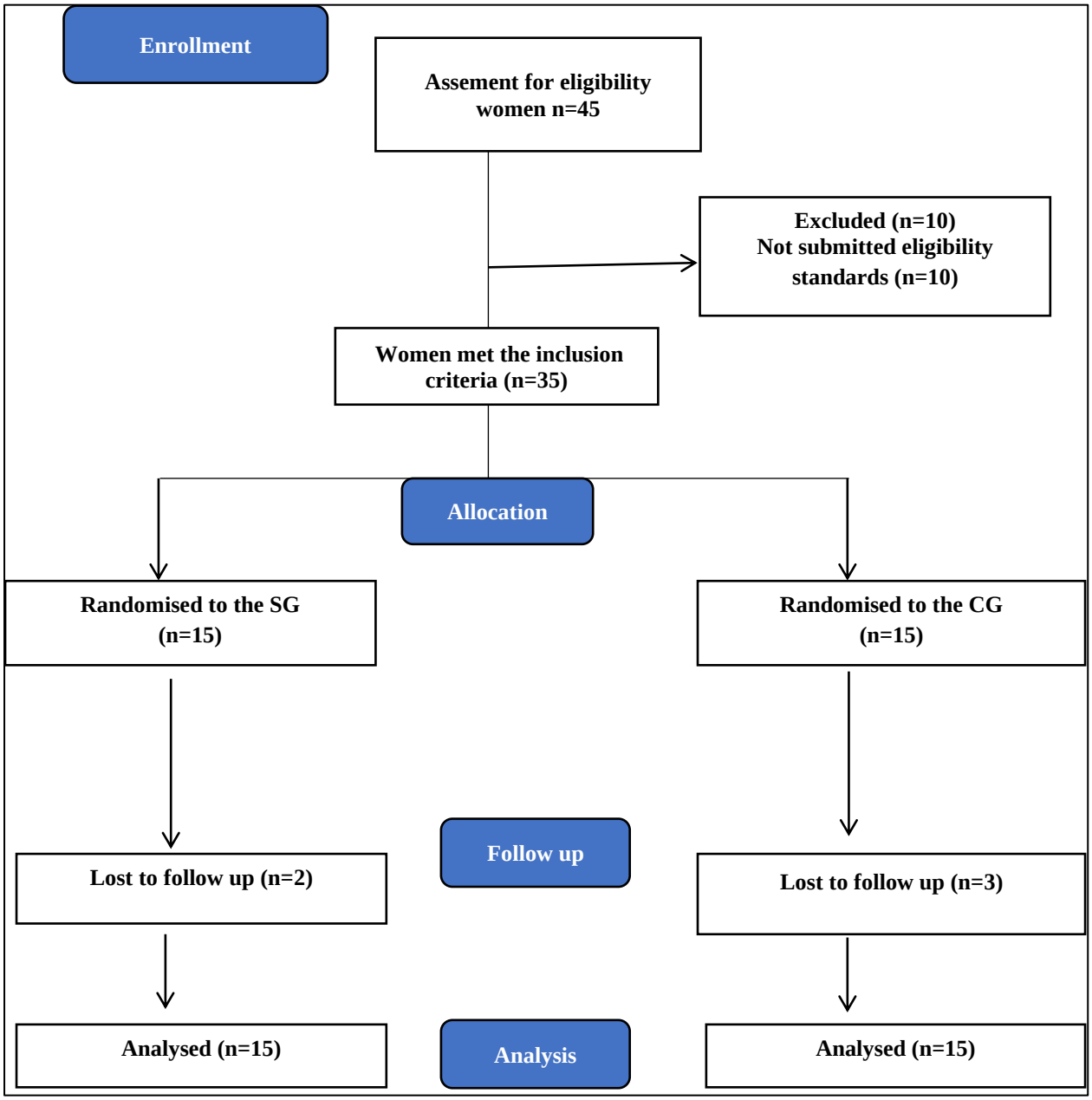

Fig.1. Flow chart of the participants

The study enrolled subjects meeting specific inclusion criteria and randomly allocated them to either the study group (SG) or the control group (CG). The SG comprised 15 women who underwent back massages within four hours of delivery, attending three sessions per week for four weeks. Additionally, they received a brochure outlining standard care guidelines encompassing nutrition, diet, physical activity, pelvic floor exercises, and instructions for maintaining proper posture. Conversely, the CG consisted of 15 women who solely received a brochure detailing standard postnatal care.

All participants were required to read and sign an informed consent form, in compliance with the institutional Review Board and the ethical committee report of physical therapy at Kafrelsheikh University (No. P.T/WH/2/2023/35).

Objectives

The assessment procedures involved a comprehensive evaluation conducted at two crucial points: (1) baseline and (2) after a 4-week intervention period. In line with standard postpartum care in maternity settings, mothers typically undergo hemogram checks within 4 hours post-delivery. For our research, we collected 5 cc of blood during this initial assessment and an additional 5 cc following 12 intervention sessions. Each blood sample underwent centrifugation for 10 minutes at 3000 r.p.m. to isolate serum, which was subsequently stored at temperatures between 2 to 8 degrees Celsius until analysis. Infant weight (IW) was measured using the seca 354 baby weight scale immediately after delivery and at the conclusion of the 4-week intervention period.

Methods

The treatment commenced after both the mother and child had received necessary initial medical attention and had a period of relaxation in their room for the first 4 hours following birth. Specifically, only the intervention group (SG) received a massage therapy program as outlined in the study by Goker A [10], which included effleurage. The massage therapy administered to the intervention group was carried out by a certified physiotherapist who had completed a comprehensive back massage certification program, specialized in women's health issues, and possessed expertise in prenatal care. Prior to the commencement of the intervention, participants were provided with a leaflet detailing and explaining the massage therapy protocol alongside standard postnatal care procedures.

The procedure involved elevating the mother's hands above her head while positioning her back towards the massager. For comfort and privacy, postpartum mothers were comfortably placed on a massage table, draped with a sheet or towel. Employing effleurage strokes with the therapist's palms and fingers, the technique conformed to the body's contours, starting from the shoulders and descending to the lower back, aiding venous return and promoting circulation and relaxation towards the heart. The therapist maintained a smooth, continuous, and rhythmic motion for a 10-minute session, applying light to moderate pressure to accommodate the sensitivity and potential soreness of postpartum mothers. The utmost priority was placed on ensuring comfort, avoiding any pain or discomfort caused by the pressure applied.

The brochure provided to both groups in the study encompassed comprehensive information on standard postnatal care practices. It began with an introductory section emphasizing the importance of postnatal care. The Nutrition and Diet section covered maintaining a healthy and balanced diet, emphasizing essential nutrients like calcium, iron, and protein necessary for postpartum recovery and breastfeeding. It also offered guidance on meal planning, healthy eating habits, and the importance of staying hydrated.

In the Physical Activity section, guidance was provided for gradually resuming physical activity post-childbirth. It recommended specific postnatal exercises focusing on core strength, pelvic floor health, and overall fitness while advising consultation with a healthcare provider before starting any exercise regimen.

The Pelvic Floor Exercises section highlighted the significance of pelvic floor health after childbirth, providing instructions for performing Kegel exercises to strengthen these muscles, along with information on their frequency and timing.

The Breastfeeding and Infant Care segment offered tips on breastfeeding techniques, addressing common challenges, and covered newborn care essentials such as feeding schedules, diapering, and soothing techniques.

Under Proper Posture and Body Mechanics, the brochure explained the importance of maintaining correct posture during daily activities and baby care. It provided practical tips for posture maintenance, lifting techniques, and ways to prevent strain.

Overall, the brochure provided a comprehensive guide to postnatal care, addressing various crucial aspects for the well-being of postpartum mothers and their infants.

Statistical analysis

The statistical analysis was conducted utilizing SPSS for Windows, version 25 (SPSS, Inc., Chicago, IL). Prior to the final analysis, the data underwent screening to ensure adherence to the normality assumption and to identify any extreme scores. This preliminary step was crucial to facilitate the subsequent parametric calculations required for the analysis of differences.

To assess the normal distribution of the numeric variables tested (specifically IW, leptin, GH, and PRL), descriptive analysis techniques were employed, including histograms accompanied by the normal distribution curve. Additionally, the Shapiro-Wilk test was performed to evaluate the normality of the data. The results from these analyses indicated that all tested variables were normally distributed, affirming compliance with the parametric assumption.

For comparisons within groups, a dependent sample t-test was employed, while an independent sample t-test was utilized to compare normally distributed variables between groups before and after treatment. The significance level (alpha) was set at 0.05 throughout the analysis.

Results

30 participants were randomly assigned to either SG or CG (Figure 1). As shown in table (1). There were no statistically significant differences between the two groups (SG and CG) in basic demographics like age and BMI ($p>0.05$).

The mean use of massage sessions in the study group were 11 ± 0.5 out of 12 conceivable sessions. A total of 13 out of the 15 participants (86.7%) in the study group performed no less than 11(91.7%) of week-by-week sessions. No risks were reported by the participants.

Table 1 represent Baseline features of the participants regarding age and BMI between and within groups, also table 2 show effect of hormones within and between both groups at pre and post intervention while table 3 represent IW within and between both groups at pre and post intervention

Table 1 Baseline features of the participants.

	Age (years)		**BMI(kg/m^2)**	
	SG	**CG**	**SG**	**CG**
Mean ± S D	22.40±2.59	23.80±3.39	26.60±2.87	27.07±3.17
Median	22.00	22.00	27.00	28.00
Mann-Whitney U	98		99	
p- value	0.53		0.57	

Table 2 Alloting of hormones within and between both groups at pre and post intervention

Variables	**SG (n=15)** (mean± SD)	**CG (n=15)** (mean± SD)	**p[a]**
Leptin			
Pre intervention.	12.15 ±3.61	.11.36±4.58	0.6
Post intervention.	6.92± 2.42	9.58 ±2.88	0.011
p[b]	0.0001	0.074	
Prolactin			
Pre intervention.	96.47± 32.09	143.6 ±53.79	0.007

Post intervention.	189.27±64.97	141.27±52.24	0.034
p^b.	0.0001	0.091	
Growth hormone			
Pre intervention.	0.085 ± 0.28	1.49±0.84.	0.009
Post intervention.	2.21± 0.59	1.31±0.81.	0.002
p^b	0.0001	0.002	

p^b Probability value within groups, p^a Probability value between groups

Table 3 Alloting of IW within and between both groups at pre and post intervention

Variables	**SG (n=15)** (mean± SD)	**CG (n=15)** (mean± SD)	**p^a**
Baby weight			
Pre intervention	3.23 ±0.3	3.27+0.34	0.755
Post intervention	4.2 +0.32	4.03+0.35	0.167
p^b	0.0001	0.0001	

p^b Probability value within groups, p^a Probability value between groups

Discussion

The within-group analysis of SG revealed statistically significant differences in leptin levels before and after the intervention ($P<0.05$), and the between-group analysis after the intervention revealed a similar pattern ($P<0.05$).

The potential of massage therapy to reduce tension levels is one potential explanation for the observed effect. Chronic stress is linked to alterations in hormone levels, including leptin. Elevated stress levels often result in increased leptin resistance, diminishing the body's responsiveness to this hormone. Through stress reduction, massage therapy might aid in the regulation of leptin levels, enhancing its sensitivity [14].

Moreover, massage can facilitate the efficient distribution of hormones such as leptin throughout the body by promoting enhanced blood circulation.
Enhanced circulation potentially facilitates the transportation of leptin to the brain, where it plays a role in signaling satiety and regulating appetite [15].

The lymphatic system can be stimulated by specific massage techniques, such as lymphatic drainage massage, which can aid in the elimination of debris and the maintenance of immune function. Researchers suggest that such massage modalities might aid in the movement of leptin and other metabolic molecules [16].

Furthermore, the positive impact of massage on mood and overall well-being could motivate individuals to adopt healthier behaviors such as regular exercise and a balanced diet. This lifestyle change, influenced by post-massage feelings of wellness, may indirectly impact leptin levels [17].

Leptin levels in transition milk are lower than those in colostrum and diminish over the initial 180 days post-birth, as evidenced by numerous studies that have investigated and verified this phenomenon. This suggests a weak

correlation between the duration of breastfeeding and Leptin levels. Evidence from Dadres et al.'s 2019 study suggests a decline in leptin levels in breast milk during the first three months postpartum [18].

Aktaç S's research, which supports the findings of the current study, revealed that leptin, ghrelin, and appetite-regulating elements present in breast milk could potentially interfere with the development of appetite-controlling brain regions, notably the hypothalamus, thereby impacting the hunger-regulating system [19].

Leptin hormone levels in cord blood obtained at delivery were found to correlate with the infant's anthropometric measurements in another study [13].

Significantly, children appear to be protected against excessive weight gain by the small levels of leptin that are passed through the breast milk of moms who are of a normal weight. In age, this protective effect might be more noticeable [20].

The research revealed a number of statistically significant results on hormone levels before and after the intervention in the SG within group analysis ($P<0.05$) and between-group analysis after the intervention ($P<0.05$).

The parasympathetic nervous system may be stimulated by massage and hypnobreastfeeding, which would cause the anterior pituitary to release endorphins and calm the posterior pituitary. Mothers feel more at ease, happier, and more confident as a result. Breastfeeding frequency is associated with increased milk production because of the physiologic increase in prolactin [21].

Additionally, massage is linked to the restoration of normal neuroendocrine hormones that are prone to changes brought on by stress, such as growth hormone, prolactin, and cortisol. Through the activation of certain surface receptors by immune cells, massage therapy has demonstrated effectiveness in returning these hormone levels to their baseline [22].

Additional research demonstrates how massage helps postpartum primiparous women feel less stressed and have higher levels of prolactin. Given the relaxing effects of massage on the neurological, cardiovascular, and motor systems, it is recommended that these women receive loving massage and aromatherapy. This process may account for the effectiveness of effleurage massage by reducing stress hormones, anxiety, and pain perception [23].

Notably, the ODC (ornithine decarboxylase) enzyme, which is linked to cell growth and development, is impacted by tactile stimulation during massage. This impact is consistent with the idea that massage and touch activate vagal afferent fibers, which travel to the limbic system and affect the control of prolactin production, cortisol, and the autonomic nervous system [20, 23].

The effects of mechanical stimulation, like back massages, in reducing postpartum pain and stress in mothers have been repeatedly demonstrated by research [23, 24]. According to these research, back massages have a beneficial effect on serum growth factors. In particular, following a four-week intervention, post-intervention data in the SG showed a drop in leptin levels along with rises in prolactin and growth hormone levels, which is in line with earlier findings[10].

Additionally, a study that combined Woolwich massage techniques with endorphin massage showed promise in raising prolactin hormone levels and consequently milk production [25].

The investigation produced a number of noteworthy conclusions. First, within the SG (study group) analysis, there were significant statistical differences between the levels of growth hormone (GH) before and after the intervention ($P<0.05$). Significant differences ($P<0.05$) were also found in the between-group analysis conducted after the intervention.

Numerous effects of massage therapy may be responsible for the benefits that were seen. Notably, Beachy [26] suggests that massage influences the sympathetic nervous system, causes insulin release, and promotes increased

growth hormone secretion. Additionally, Procianoy et al. [27] pointed out that tactile stimulation has been linked to growth promotion.

Tactile-responsive baroreceptors contribute to the release of hormones that improve insulin levels and aid in the absorption of food. According to Diego et al. [28, 29], this process raises vagal activity, which is linked to higher baby weight gain.

Siti Noorbaya's research shown a noteworthy improvement in baby sleep duration by an average of 1.29 hours per day post-massage (from 12.42 hours per day to 13.77 hours per day), further substantiating the advantages of massage. This is important since almost 75% of growth hormone production takes place when you sleep [30].

Notwithstanding these encouraging results, a systematic review encountered difficulties because of insufficient uniformity in the basic and methodological features of the many investigations. As a result, this review was unable to make any comparable judgments regarding the efficacy of massage on breastfeeding [31].

Within each group, there were statistically significant variations in newborn weight before and after the intervention ($P<0.05$). The two groups did not, however, differ statistically significantly. These results can be explained by a number of reasonable theories:

First off, it's possible that the massage intervention's primary target was mothers rather than the babies. Massage tends to produce noticeable gains in weight, length, and the circumferences of the midarm and midleg in newborns, according to studies like the one done by Agarwal KN in 2000. Therefore, the lack of variations in body weight across the groups may be explained by the massage's focus on moms rather than the babies themselves [32].

Second, as noted by Mazzocchi A in 2019, despite progress in understanding the bioactive, non-nutritional components of breast milk and their dynamic changes over time, the complexity of its composition is still not fully understood. This incomplete knowledge casts doubt on whether growth factors are present in breast milk, which could affect how much weight a newborn gains [33].

Additionally, it's possible that the massage sessions didn't last long enough to cause the baby's weight to noticeably grow. This implies that the length of the intervention may not have been ideal for noticing noticeable changes in the weight of the infant.

Finally, a baby's weight increase during nursing is influenced by a wide range of factors, including social and cultural factors, environmental factors, parenting styles, parental behavior, and nutrition. According to research by Pem D. in 2015 [34], it is possible that these factors could have affected the observed outcomes on newborn weight because they were not taken into account in this study.

A few limitations of this study include its limited sample size: Only 30 women participated in the trial after a significant dropout rate affected the original assessment of 41 women. Although the study lasted only four weeks, a bigger sample size might yield more reliable and broadly applicable results. The long-term effects of back massage on hormone levels, breastfeeding outcomes, and other metrics may be better understood with a longer intervention period: The study may benefit from integrating other pertinent variables such maternal stress levels, infant feeding behavior, and maternal satisfaction with the intervention, even though it concentrated on hormone levels and breastfeeding results.

Conclusion

Postpartum back massage can effectively increase prolactin, growth hormone levels, which in turn can make the baby's growth healthier and decrease leptin levels, which can protect the child from future obesity and so, clinicians should advise postpartum women to have massage after delivery. Further studies are needed to to be done on long duration more than 4 weeks, larger sample sizes and additional measurements of maternal stress and infant feeding behaviour should be done.

Declarations

Ethics approval

The study was approved by the institutional Review Board and the ethical committee report of physical therapy at Kafrelsheikh University (No. P.T/WH/2/2023/35).

Consent to participate

Informed consent was obtained from all individual participants included in the study. Participants were informed about the purpose of the study, procedures, potential risks, and benefits. They were assured of the confidentiality of their data and that participation was voluntary, with the option to withdraw at any time without penalty.

Consent for publication

Not applicable.

Availability of data and materials

Additional data that support the findings of this study are available from the corresponding author upon reasonable request.

Competing Interests

The authors declare that they have no competing interests.

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Authors' contributions

Research concept and design: FE, SE, AT, EE

Collection and/or assembly of data: HS, SE, EE

Data analysis and interpretation: FE, HS, AT

Writing the article: FE, HS, SE, AT, EE

Critical revision of the article: FE, AT

Final approval of the article: FE, HS, SE, AT, EE

Statistical analysis: FE, HS, AT, EE

Obtaining funds: FE, AT

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