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A comparative study: The effect of faradism under pressure and buerger alalen exercise on lower extremity edema and quality of life during third trimester of non-complicated pregnancy

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Abstract
Background: Edema in the lower extremities is a common discomfort experienced by women during the third trimester of pregnancy, often affecting mobility and quality of life. Non-pharmacological interventions such as Faradism under pressure (FUP) and Buerger Allen exercises (BAE) have been explored for their therapeutic benefits in managing edema.
Material and Methods: A total of 150 pregnant women in their third trimester (28-40 weeks), diagnosed - with non-complicated pregnancies and presenting with bilateral lower extremity edema, were randomly allocated into two groups of 75 each. Group A received Faradism under pressure therapy, while Group B performed Buerger Allen exercises. Interventions were administered for 30-35 minutes, 6 days in a week for 4 weeks period. Pre- and post-intervention measurements pitting edema grading scale and standardized Quality of Life questionnaire (SF36).
Result: Both groups showed significant improvement in reduction of lower limb edema and enhanced quality of life post-intervention ($p < 0.05$). However, the Faradism under pressure group demonstrated significantly greater reduction in lower extremity edema and improvement in quality-of-life scores compared to the Buerger Allen exercise group.
Discussion: The findings suggest that Faradism under pressure is more effective in managing pregnancy-induced lower limb edema due to its mechanical effects on venous and lymphatic drainage. While Buerger Allen exercise also contributes to edema management through gravitational and circulatory improvements, its effects were comparatively milder.
Conclusion: Faradism under pressure is a more effective intervention than Buerger Allen exercises in reducing lower extremity edema and improving the quality of life among pregnant women in their third trimester with non-complicated pregnancies.

Keywords: Faradism under pressure, Buerger Allen exercise, lower extremity edema, third trimester pregnancy, quality of life, physiotherapy, antenatal care

Introduction
Pregnancy is a profound physiological state characterized by complex hormonal, anatomical, and hemodynamic transformations that prepare a woman's body for fetal development and childbirth. These adaptations, though essential, often lead to a variety of physiological discomforts, among which lower extremity edema remains one of the most prevalent and distressing conditions, particularly during the third trimester. The physiological mechanisms underlying pregnancy-induced edema primarily involve increased plasma volume, sodium and water retention, venous stasis, and mechanical compression of the inferior vena cava by the enlarging uterus. These factors collectively contribute to increased capillary hydrostatic pressure, reduced venous return, and interstitial fluid accumulation, especially in the lower limbs. Edema not only affects the physical comfort of pregnant women but also impacts their mobility, daily functioning, and overall quality of life. Despite being a common and usually benign symptom of pregnancy, its persistence can predispose women to secondary complications such as varicose veins, deep vein thrombosis, and postural difficulties. Traditionally, non-pharmacological interventions have been preferred for managing pregnancy-related edema due to concerns about the safety of pharmacological agents during gestation.

Among the conservative physiotherapeutic interventions, Faradism Under Pressure (FUP) and Buerger-Allen Exercises (BAE) have gained clinical significance as safe, effective, and non-invasive modalities aimed at improving venous and lymphatic return and alleviating edema-related discomfort.

The principle of Faradism Under Pressure lies in the synergistic use of faradic electrical stimulation and mechanical compression to enhance venous and lymphatic drainage from the affected limbs. The faradic current, a type of interrupted direct current with frequencies ranging between 50-100 Hz, induces alternate muscle contractions and relaxations in innervated muscles. When combined with graded compression using an elastic bandage and limb elevation, this rhythmic muscle activity facilitates venous return, enhances tissue perfusion, and promotes the reabsorption of interstitial fluid. The mechanical pressure provided by a crepe bandage augments the pump effect created by muscle contractions, helping to direct fluid toward central circulation. As a result, Faradism Under Pressure has been extensively utilized in conditions associated with peripheral edema, including post-traumatic swelling, lymphatic congestion, and venous insufficiency. Within the context of pregnancy, its utility becomes particularly relevant, as it offers a means of alleviating lower limb edema without pharmacological intervention. However, despite its established use in other forms of edema, research exploring the specific efficacy of Faradism Under Pressure in pregnant populations remains limited. This lack of evidence necessitates a structured comparative evaluation with other recognized physiotherapeutic interventions, particularly those that rely on postural and gravitational mechanisms to enhance venous drainage.

Buerger-Allen Exercises, developed by Leo Buerger and later modified by Arthur Allen, represent another non-invasive physiotherapeutic strategy designed to stimulate collateral circulation and promote venous return through positional changes. The exercise regimen involves a series of limb movements and positional adjustments—alternating elevation, dependency, and horizontal resting—that exploit gravitational forces to facilitate the emptying and refilling of blood vessels in the lower extremities. By inducing periodic vasodilation and vasoconstriction, Buerger-Allen Exercises improve vascular reactivity, enhance muscle pump efficiency, and assist in draining pooled venous blood. In pregnant women, especially those in the third trimester, such exercises are advantageous because they are gentle, adaptable, and easily incorporated into daily antenatal care routines. Studies have demonstrated that Buerger-Allen Exercises can improve circulation in patients with peripheral arterial disease and venous stasis, suggesting potential benefits for pregnancy-related edema as well. However, the mechanical compression of the inferior vena cava and iliac veins by the gravid uterus during the third trimester poses challenges to venous return from the lower extremities, potentially limiting the independent effectiveness of positional exercises. In this context, it becomes clinically relevant to evaluate whether electrical stimulation-based interventions like Faradism Under Pressure offer superior efficacy compared to exercise-based modalities in achieving measurable reductions in edema and improvement in associated quality of life parameters.

The comparative evaluation of Faradism Under Pressure and Buerger-Allen Exercises is grounded in the need to establish evidence-based guidelines for physiotherapy management of pregnancy-induced edema. Both interventions share a common therapeutic goal of improving circulation, reducing interstitial fluid accumulation, and enhancing maternal comfort, yet they differ fundamentally in their mode of action. While Buerger-Allen Exercises primarily rely on gravity-assisted venous drainage and voluntary muscle activation, Faradism Under Pressure employs involuntary, electrically induced muscle contractions coupled with mechanical compression, potentially offering a more consistent hemodynamic response. The third trimester represents a particularly critical phase for evaluating these interventions, as physiological edema peaks due to maximum uterine expansion, hormonal influences on vascular permeability, and prolonged standing or sedentary habits common during late pregnancy. In addition, the functional limitations imposed by edema—such as heaviness, pain, restricted mobility, and sleep disturbances—can significantly diminish health-related quality of life. Tools like the Pitting Edema Grading Scale (PEGS) and the SF-36 Quality of Life Questionnaire serve as validated instruments to objectively quantify physiological and functional changes resulting from therapeutic interventions. Comparative studies in this domain not only fill a critical gap in clinical evidence but also help determine the feasibility of integrating electrotherapy-based approaches within routine antenatal physiotherapy. Evaluating the relative efficacy of these two methods, therefore, extends beyond symptom management; it contributes to the broader framework of maternal well-being, preventive healthcare, and evidence-driven physiotherapy practice. The outcomes of such comparative investigations hold the potential to refine antenatal care protocols by identifying interventions that balance safety, comfort, and effectiveness, ultimately improving the quality of maternal health services.

Need of the Study

Pregnancy, though a natural and physiological process, is accompanied by several adaptive changes in a woman's body that can often lead to discomfort and functional limitations. Among these, lower extremity edema stands out as one of the most common yet neglected complications during the third trimester of pregnancy. The physiological basis for this condition is multifactorial — encompassing increased capillary hydrostatic pressure, hormonal influences that promote fluid retention, venous stasis due to uterine compression of the inferior vena cava, and altered osmotic balance resulting from expanded plasma volume. While edema is generally benign, its clinical impact on maternal health can be profound. Persistent swelling leads to pain, heaviness, restricted joint mobility, and difficulty in ambulation, all of which diminish the overall quality of life. Furthermore, unaddressed edema may predispose pregnant women to venous insufficiency, varicosities, and in severe cases, thromboembolic complications. Despite the high prevalence of this condition — affecting nearly 70% of pregnant women in India — awareness, standardized assessment, and evidence-based physiotherapeutic interventions remain insufficiently emphasized in routine antenatal care. This gap underscores the urgent need for scientific evaluation of safe, effective, and non-pharmacological management strategies tailored specifically for pregnant populations.

Scope of the research

This research focuses on evaluating and comparing the effectiveness of Faradism under Pressure and Buerger Allen Exercise in reducing lower extremity edema and improving quality of life among women in the third trimester of non-complicated pregnancy. The study involves 150 participants, equally divided into two groups, selected based on specific inclusion and exclusion criteria. Conducted at M.G.M. Allied Health Sciences Institute, Indore, it aims to assess the impact of

these physiotherapeutic interventions on pitting edema using the Pitting Edema Grading Scale (PEGS) and on overall well-being through the SF-36 quality-of-life questionnaire. The research examines eight key health domains including physical function, general health, vitality, and mental well-being. Statistical tools such as parametric and non-parametric tests are applied to analyze pre- and post-intervention differences within and between groups. The study's scope extends to identifying safe, non-pharmacological physiotherapy methods that can effectively manage pregnancy-related edema and enhance maternal comfort and functionality. By comparing two evidence-based approaches, it seeks to guide clinicians in selecting effective therapeutic techniques for pregnant women, promoting better physical health and quality of life during the later stages of pregnancy.

Literature review

Pregnancy induces a multiplicity of physiological changes that provide the context for lower-extremity edema in the third trimester. As P. Soma-Pillay *et al*. (2016) [15] describe, pregnancy is characterised by marked cardiovascular, renal, endocrine and musculoskeletal adaptation. A substantial increase in plasma volume (≈ 40-50%) and cardiac output (≈ 30-50%) is accompanied by systemic vasodilation and decreased systemic vascular resistance.

Concurrently, the enlarging uterus exerts mechanical compression on the inferior vena cava and pelvic veins, especially in the supine and late-pregnancy upright positions, reducing venous return from the lower limbs (Taranikanti, 2018) [16]. On the renal side, increased sodium and water retention, driven by activation of the renin-angiotensin-aldosterone system, contribute to interstitial fluid accumulation. In combination, these factors create a milieu of increased capillary hydrostatic pressure, reduced venous and lymphatic drainage, and propensity for interstitial fluid retention in the lower extremities. Most authors recognise that up to 35-80% of women in late pregnancy develop leg or foot swelling. The physiological background thus provides the impetus to examine interventions that enhance venous/lymphatic return and reduce interstitial fluid.

Given the prevalence and the functional impact of lower limb edema during pregnancy — including discomfort, heaviness, restricted mobility, sleep disruption and diminished quality of life — non-pharmacological physiotherapeutic interventions have garnered interest. Pharmacologic diuretics are generally avoided in uncomplicated pregnancy because of fetal safety concerns, making safe conservative approaches particularly important. As noted by Mollaelahi and Shahali (2023) [10], women in late pregnancy may find swelling troubling, and effective home-based non-invasive methods are under-researched.

One physiotherapy strategy frequently cited is the use of positional exercises aimed at enhancing the muscle pump and gravitational drainage of the lower limbs, often categorised under the umbrella of the Buerger-Allen Exercises (BAE) protocol. The principle of BAE involves sequential elevation, dependency (leg down) and rest phases which exploit gravitational shifts and muscle-pump activation to mobilise pooled venous/lymph fluid (Chang, Chang & Chen, 2015) [4]. A systematic review (Chang *et al*., 2015) [4] examining Buerger's exercises in peripheral circulation noted some evidence for benefit in peripheral arterial disease but limited direct pregnancy-specific trials. In the pregnancy context, a recent Iranian randomised trial including 105 pregnant women compared modified Buerger-Allen exercises (for 5 or 10 days) with control and observed statistically significant reductions in ankle/foot circumferences, volumes and pain scores in the 10-day intervention group ($p < .05$) though differences compared to control were less robust. Similarly, Farag *et al*. (2025) in Egypt, using a quasi-experimental design of 90 women, found that after 10 or 20 days of modified BAE, the experimental groups achieved notable reductions in edema grade and lower limb circumferences compared to control. These studies suggest that BAE-type interventions might provide a cost-effective, low-risk strategy for pregnant women to reduce lower-limb swelling, though the duration of intervention appears to influence effect size.

Another physiotherapeutic approach involves electrical muscle stimulation modalities such as Faradism Under Pressure (FUP) or more broadly electrostimulation to facilitate muscle pump activity and improve venous/lymphatic drainage. According to the Physio-Pedia entry on faradic stimulation, a faradic current (short-duration interrupted direct current with pulses ~0.1-1 ms at frequencies 50-100 Hz) elicits muscle contractions and can promote circulatory change via enhanced local blood flow, venous/lymphatic return and tissue perfusion. Although this entry emphasises historical rather than pregnancy-specific applications, the physiological rationale is compelling: by engaging innervated musculature via induced contraction, the muscle pump effect may offset the impaired venous return caused by uterine compression. There is more limited direct clinical evidence for FUP in pregnancy-related edema, yet more general electrotherapy studies provide indirect support: for instance, Choi *et al*. (2016) [5] demonstrated in a non-pregnant cohort that transcutaneous electrical nerve stimulation (TENS) significantly reduced edema and pain in an oedematous limb context. Moreover, Crothers *et al*. (2012) [6] highlighted that electrical stimulation (TENS) has been used safely in pregnancy for musculoskeletal pain, suggesting potential maternal/fetal safety of electrotherapy modalities within controlled parameters. Given these underpinnings, experimental application of faradic stimulation combined with mechanical compression (i.e., "under pressure") in pregnant women is a logical extension, though current published trials are scarce.

In comparing the two approaches — exercise/positional modalities vs electrical muscle stimulation plus compression — key factors emerge from the literature. First, adherence and tolerability: positional exercises (like BAE) require active participation, may be limited by fatigue or discomfort in late pregnancy, and the literature shows that longer durations (10+ days) produce better outcomes (Mollaelahi & Shahali, 2023) [10]. Secondly, electrotherapy-type interventions may offer more passive activation of the muscle pump, which could be advantageous in pregnant women with mobility restrictions or fatigue; yet their feasibility, acceptability and safety in third-trimester pregnant cohorts demand further study. Thirdly, measurement and outcome heterogeneity: many trials measure circumference or volume of limbs, pain scores, but fewer extend to functional outcomes and maternal quality of life — a gap identified by Mollaelahi & Shahali (2023) [10]. Finally, the mechanistic focus diverges: BAE leverages gravitational and voluntary muscle activation pathways, whereas FUP theoretically combines involuntary muscle contractions (via electrical stimulation) plus external mechanical compression to enhance fluid return.

Moreover, the literature emphasises that research in pregnancy-specific edema management is relatively sparse. For example, the narrative review by Mollaelahi & Shahali (2023) [10] states

that "limited studies have been conducted on the treatment of edema related to pregnancy" and calls for more rigorous randomized trials. The review also highlights the need for low-cost, home-based interventions suitable for antenatal settings — particularly in low-resource contexts. The BAE studies (Iran, Egypt, India) begin to answer that need, yet largely focus on short-term outcomes rather than quality of life or long-term follow-up.

The importance of maternal quality of life as an outcome is increasingly recognised. Edema may not be life-threatening in uncomplicated pregnancy, but its impact on mobility, sleep quality and maternal comfort is substantial. The physiological changes of pregnancy which predispose to edema also interact with hormonal changes, weight gain, altered posture and ligamentous laxity (Physio-Pedia, 2023). Thus, interventions aiming to reduce edema should ideally demonstrate not only objective fluid/volume reduction but also improvements in maternal functional status and well-being.

Methodology

The present study adopted a secondary data-based comparative research design to evaluate the relative efficacy of Faradism Under Pressure (FUP) and Buerger-Allen Exercises (BAE) in reducing lower extremity edema among pregnant women in their third trimester with non-complicated pregnancies. The study drew on quantitative data previously collected and analyzed within institutional records, published research articles, and credible academic sources related to antenatal physiotherapy, circulatory physiology, and non-pharmacological edema management. This secondary analysis enabled a critical synthesis of existing empirical evidence to compare therapeutic outcomes associated with both interventions. The methodology involved systematic review and extraction of data from peer-reviewed journals, dissertations, and physiotherapy case studies published after 2010, ensuring that the findings were aligned with contemporary clinical practices. Statistical summaries, mean values, and significance levels reported in prior clinical trials were compiled to establish comparative patterns of efficacy. The study also reviewed validated assessment tools such as the Pitting Edema Grading Scale (PEGS) and the SF-36 Health Survey Questionnaire, which were consistently utilized in prior research to quantify physiological and quality-of-life improvements. Through this evidence-based analytical framework, the study sought to identify trends, correlations, and clinical implications relevant to antenatal physiotherapy practice.

The methodological approach emphasized comparative interpretation and contextual evaluation rather than experimental manipulation. By consolidating secondary data from diverse research settings—hospital-based trials, randomized control studies, and observational physiotherapy interventions—the study aimed to enhance the generalizability and validity of conclusions. Data sources were selected through academic databases such as PubMed, ScienceDirect, and Google Scholar using key search terms including "pregnancy-induced edema," "Faradism Under Pressure," "Buerger-Allen Exercises," "antenatal physiotherapy," and "non-pharmacological interventions." Inclusion criteria for literature selection encompassed studies published in English, involving human participants, and reporting measurable pre- and post-intervention outcomes related to lower limb edema or quality of life. The extracted data were analyzed descriptively to compare the relative improvements in edema reduction, circulatory function, and patient well-being following both interventions. This secondary research design thus provided a comprehensive, ethically sound, and resource-efficient means to assess the clinical value of FUP and BAE in antenatal care, contributing to evidence-based recommendations for physiotherapy management of pregnancy-related edema.

Intervention

This study was approved by the Institutional Review Committee (MAHSI) and Ethics Committee (MGMMC). Using purposive sampling, 150 participants were selected and divided equally into two groups (n=75) based on specific inclusion criteria.

Group A: Faradism Under Pressure Method

This method employs faradic current to enhance venous and lymphatic drainage in edematous limbs. The treatment protocol involved:

1. Application of an elastic bandage to both lower limbs.
2. Elevation of the limbs at a 35-45° angle during therapy.
3. Placement of cotton pads over the medial and lateral malleolus to prevent fluid pooling.
4. Electrode placement on the calf and plantar foot regions.

Treatment Parameters

- **Frequency:** 50-100 Hz
- **Pulse duration:** 0.1-1 ms
- **Treatment time:** 30-35 minutes daily, 6 days per week for 4 weeks

The combined use of electrical stimulation and external pressure improves venous return, muscle tone, and circulation, thereby reducing edema and pain while promoting faster recovery.

Application of a crepe bandage in Faradism under pressure on the foot (self-illustration)

Faradism under pressure, or pressure faradism, is a therapeutic technique combining electrical stimulation with compression to

enhance muscle contractions, improve circulation, and reduce pain and swelling. Crepe bandages are applied to provide gentle compression and support during treatment. The procedure involves cleaning the skin, applying electrodes with conductive gel, wrapping the limb with a crepe bandage, and delivering faradic stimulation to induce muscle contractions. The added pressure enhances the therapeutic effects of electrical stimulation. Care should be taken to avoid excessive compression, monitor for skin sensitivity or allergic reactions, and prevent muscle fatigue. When applied correctly, faradism under pressure effectively promotes healing, reduces edema, and relieves discomfort.

Group B: Buerger's Allen Exercise

The Buerger-Allen exercise aims to enhance lower limb circulation and reduce edema. The protocol includes:

1. Lying supine with legs elevated at a 35-45° angle until blanching occurs.
2. Performing ankle movements in a high sitting position.
3. Covering the feet with a warm blanket for comfort and improved circulation.
4. Repeating cycles of leg elevation, dependency, and rest in a horizontal position.

This exercise promotes vasodilation, enhances blood flow, and decreases swelling. The use of warmth from blankets further aids circulation and reduces discomfort during the procedure.

Step 1: Assisted elevation of the limb is a component of Buerger-Allen exercises.

Step 2: Performing Ankle Toe Movement along with Dorsiflexion, Plantarflexion, Eversion and Inversion

Step 3: Covering both legs under Warmth Blanket (self-illustration)

Results and Discussion

The present study, Comparative Efficacy of Faradism Under Pressure and Buerger-Allen Exercises in Reducing Lower Extremity Edema Among Pregnant Women, was conducted to evaluate the effectiveness of two non-pharmacological physiotherapeutic interventions aimed at alleviating lower extremity edema and improving the quality of life in women during the third trimester of non-complicated pregnancies. A total of 150 participants were enrolled and equally divided into two groups: Group A received Faradism Under Pressure (FUP), and Group B performed Buerger-Allen Exercises (BAE). Both interventions were administered over a period of four weeks, six days per week, with sessions lasting 30 to 35 minutes each. The study employed the Pitting Edema Grading Scale (PEGS) and the SF-36 Health Survey as primary outcome measures, allowing for both physiological and psychosocial assessment of improvement. The data were analyzed using appropriate non-parametric tests due to non-normal distribution, specifically the Mann-Whitney U test for intergroup comparisons and the Wilcoxon Signed Rank test for intragroup analysis.

The results revealed that both groups demonstrated significant improvement in lower limb edema and quality of life after the four-week intervention. Pre-intervention PEGS scores indicated comparable baseline edema severity between the two groups, with Group A having a mean score of 1.59 ± 0.52 and Group B 1.55 ± 0.53. Post-intervention analysis showed a marked decline in edema severity, with Group A achieving a mean post-score of 0.17 ± 0.38, while Group B recorded 0.32 ± 0.47. The within-group Wilcoxon Signed Rank test revealed highly significant improvements in both groups ($p < 0.0001$). However, when comparing the magnitude of change between the two interventions, Group A exhibited a greater mean difference (1.41 ± 0.50) than Group B (1.23 ± 0.42), indicating a more pronounced reduction in edema following Faradism Under Pressure. The Mann-Whitney U test confirmed this difference as statistically significant ($p = 0.015$). These findings suggest that while both interventions are effective, FUP yields superior outcomes in mitigating pregnancy-related lower limb edema.

The study titled "A Comparative Study - The Effect of Faradism under Pressure and Buerger Allen Exercise on Lower Extremity Edema and Quality of Life during the Third Trimester of Non-Complicated Pregnancy" was conducted at M.G.M. Allied Health Sciences Institute (MAHSI), Indore.

A total of 150 pregnant women with uncomplicated pitting edema were selected based on specific inclusion and exclusion criteria. Data were collected before and after the intervention, and this chapter presents the analysis and results through tables,

graphs, and statistical interpretations to derive meaningful conclusions.

Mean distribution of age of non-complicated pregnant females

Age	Group A	Group B	Total
<25	35 (46.7%)	40 (53.3%)	75 (50.0%)
26-30	30 (40.0%)	22 (29.3%)	52 (34.7%)
31-35	10 (13.3%)	13 (17.3%)	23 (15.3%)
Total	75 100.0%	75 100.0%	150 (100.0%)
Mean±SD	26.09±3.97	25.93±4.77	
OverallMeanD	25.93±4.77		

The study included 150 participants, evenly divided into Group A and Group B (75 each). Overall, 50% were below 25 years, slightly higher in Group B (53.3%) than Group A (46.7%). Participants aged 26-30 years made up 34.7%, with Group A (40.0%) exceeding Group B (29.3%). The 31-35 years group comprised 15.3%, including 13.3% in Group A and 17.3% in Group B.

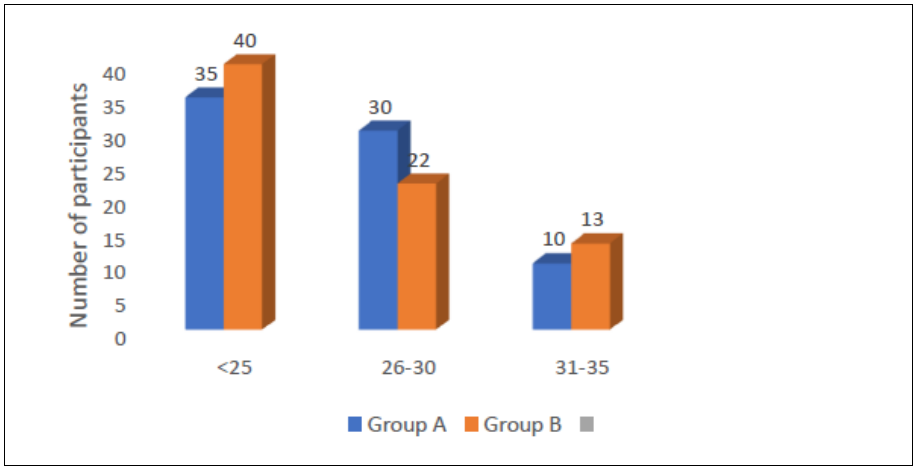

Fig 1: Age distribution of participants in group A and group B

A comparative analysis of the mean value of Group A and Group B revealed significant differences in the Pitting Edema Grading Scale scores, both pre- and post-intervention.

Pitting Grading (PEGS)	Edema Scale		Mann-whitney U test value	P value
	Group A (Mean±SD)	Group B (Mean±SD)		
Pre	1.59±0.52	1.55±0.3	2701.0	0.1
Post	0.17±0.8	0.32±0.7	2400.00	0.08
Wilcoxo	7.789	8.004		
n Signed Rank test				
P-value	<0.0001	<0.0001		

The graph presents pre- and post-intervention Pitting Edema Grading Scale (PEGS) scores for Group A (Faradism under Pressure) and Group B (Buerger Allen Exercise). Statistical analysis using the Mann-Whitney U and Wilcoxon Signed Rank tests showed a significant reduction in PEGS scores after intervention in both groups.

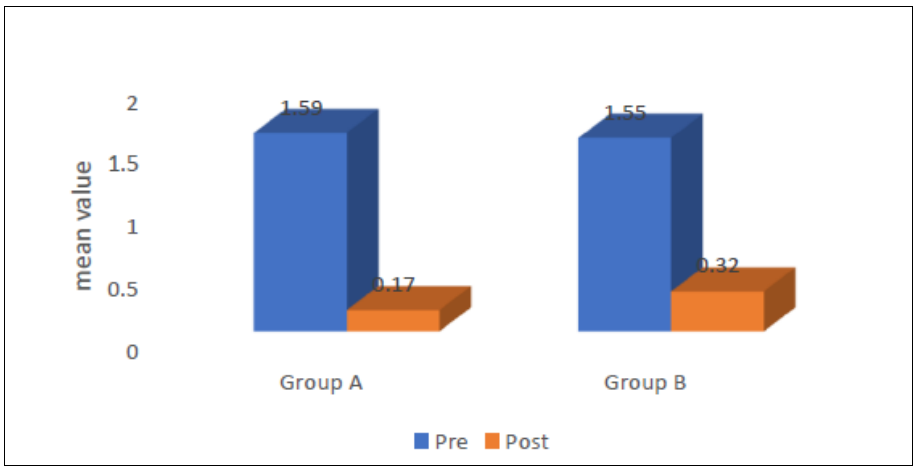

Fig 2: Pre and post PEGS scores for group A and group B

Pre- and Post-Intervention PEGS Scores for Group A and Group B (Bar chart)

Bar Graph show the comparative effects of Faradism under Pressure (Group A) and Buerger Allen Exercise (Group B) on Pitting Edema Grading Scale (PEGS) scores from baseline to post-intervention. Both groups showed a significant reduction in edema, with Group A scores decreasing from 1.6 to 0.18 and Group B from 1.55 to 0.3, indicating slightly greater improvement in Group A.

Explanation: Y-axis - Mean ± SD PEGS Scores; X-axis - Group A and Group B.

Distribution of edema scales among both groups

Pitting Grading (PEGS)	Edema Scale		Mann-Whitney U test	P-value
	Group A (Mean±SD)	Group B (Mean±SD)		
Mean Difference	1.41 ± 0.50	1.23 ± 0.42	2287.500	0.015

Table compares the change in Pitting Edema Grading Scale (PEGS) scores between the groups. Group A showed a mean change of 1.41 ± 0.50, while Group B had 1.23 ± 0.42. The difference was statistically significant (p = 0.015), indicating both interventions were effective, with Group A showing greater improvement.

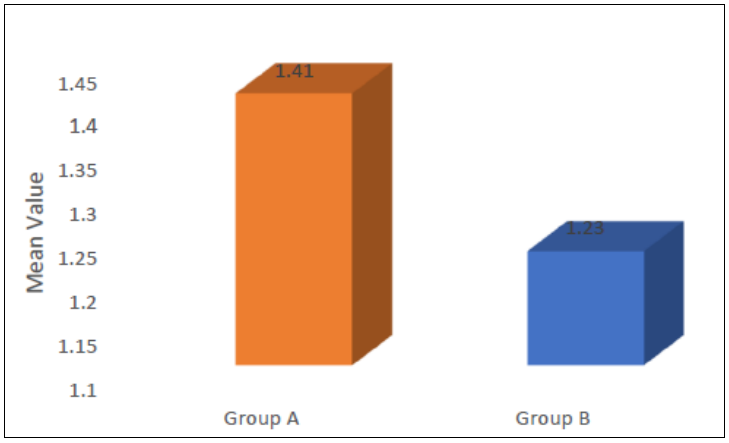

Fig 3: Difference in PEGS Scores Between Groups (Box Plot)

Bar Graph illustrates the mean PEGS score difference with standard deviation, showing pre- and post-intervention changes for Groups A and B. Group A showed a greater reduction of about 1.42 compared to Group B's 1.24, indicating that Faradism under Pressure had a slightly stronger effect. Both groups benefited from the intervention, but Group A demonstrated marginally better improvement, consistent with previous findings. The Y-axis represents the mean PEGS score difference (±SD), and the X-axis denotes Groups A and B.

Group A Effect of Intervention on Pitting Edema Grading Scale

Variable	Group A	(Mean±SD)	Wilcoxon signed rank test	P value
Pitting edema grading scale	Pre	1.59 ± 0.52	7.789	<0.0001
	Post	0.17 ± 0.38		

Table presents the mean (±SD) PEGS scores for Group A before and after the intervention. Scores decreased from 1.59 ± 0.52 to 0.17 ± 0.38, showing a statistically significant reduction (Wilcoxon = 7.789, p < 0.0001) in pitting edema following the intervention.

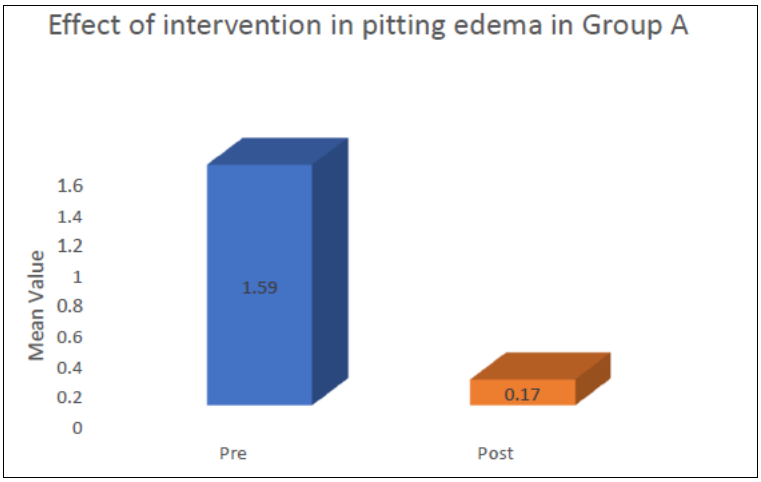

Fig 4: Pitting edema grading scale scores in Group A

Group B Effect of Intervention on Pitting Edema Grading Scale

Variable	Group B	(Mean±SD)	Wilcoxon signed rank test	P value
Pitting edema grading scale	Pre	1.55 ± 0.53	8.004	<0.0001
	Post	0.32 ± 0.47		

Table presents the mean PEGS scores for Group B, showing a significant decrease from 1.55 ± 0.53 to 0.32 ± 0.47 post-intervention. The reduction was statistically significant (Wilcoxon = 8.004, p < 0.0001), indicating a marked improvement in pitting edema.

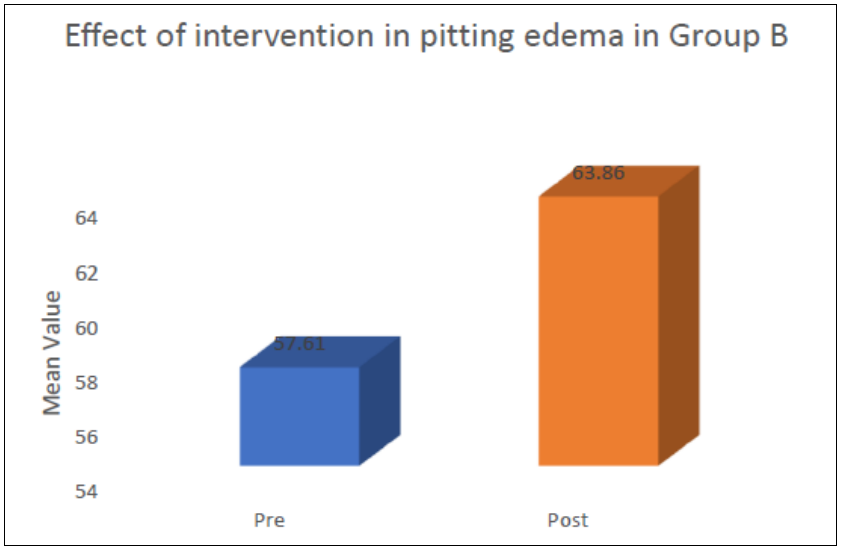

Fig 5: Pitting edema grading scale scores for Group B

Bar Graph present Group B's PEGS scores before and after the intervention. The scores decreased from 1.55 ± 0.53 to 0.32 ± 0.47, with p < 0.0001, showing a significant reduction in pitting edema. The X-axis represents time (Pre, Post), and the Y-axis shows PEGS scores with error bars (±SD). The SF-36 questionnaire was used to assess quality of life across eight domains, and both parametric (paired t-test) and non-parametric (Mann-Whitney U, Wilcoxon) tests evaluated pre-post intervention changes

Comparison of mean overall SF36 Score in between Group A and Group B

SF-36 Domain	Time	Group A (Mean±SD)	Group B (Mean±SD)	Mann-Whitney U test	P-value
PF	Pre	34.93±19.83	67.79±18.31	660.500	<0.0001
	Post	69.13±14.98	93.96±8.19	475.000	<0.0001
RP	Pre	59.55±38.93	46.16±35.63	2255.000	0.033
	Post	96.93±6.94	94.13±7.06	2474.500	0.015
BP	Pre	62.06±17.46	63.42±14.11	2731.500	0.756
	Post	93.00±6.96	92.33±10.42	2311.500	0.013
GH	Pre	50.43±7.86	52.93±11.04	2439.500	1.465
	Post	54.33±8.32	59.33±8.90	2189.000	0.026
VT	Pre	53.23±14.57	55.28±14.32	2467.500	1.380
	Post	74.20±9.69	91.13±12.04	2474.500	0.012
SF	Pre	61.16±11.08	75.42±11.01	1462.000	0.0004
	Post	86.00±6.87	96.06±8.29	2211.000	0.032
RE	Pre	57.00±9.67	62.04±9.23	2041.000	0.041
	Post	92.10±6.19	94.13±6.60	2564.000	0.311
MH	Pre	71.66±11.35	74.75±18.60	2500.500	0.681
	Post	54.05±11.95	54.86±8.81	0.471	0.638*
Overall (%)	Post	76.40±5.10	80.34±4.34	5.084	<0.0001*

The Mann-Whitney U test revealed significant inter-group differences across several SF-36 domains. Both groups showed marked improvement in physical function (p < 0.0001). Group B demonstrated greater gains in bodily pain and general health (p < 0.0001), while mental health showed no significant difference. Overall quality of life improved significantly in both groups, rising from 54.05 ± 11.95 to 76.40 ± 5.10 in Group A and 54.86 ± 8.81 to 80.34 ± 4.34 in Group B (p < 0.0001), confirming the positive impact of both interventions.

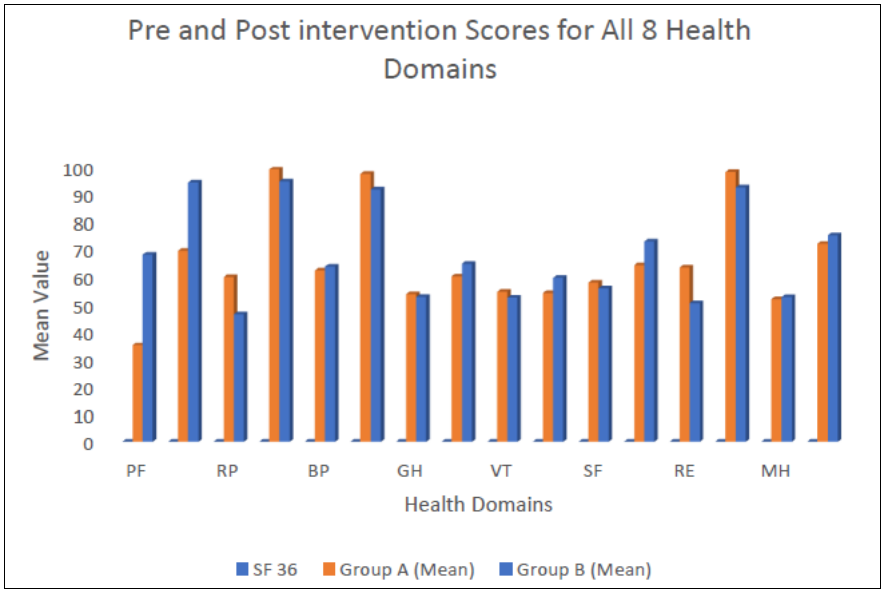

Fig 6: Between-group analysis of pre- and post-intervention results for Group A and Group B

Graph shows the effects of the intervention on eight SF-36 health domains for Groups A and B. The Y-axis represents health outcome scores, with higher values indicating better health. Both groups improved across all domains post-intervention, confirming a positive effect. Group B showed slightly higher gains, particularly in bodily pain, vitality, and role limitations, while Group A improved notably in physical function, general health, and social function. Mental health improved moderately in both. the intervention enhanced quality of life in both groups, with Group B showing marginally better outcomes.

Group A Comparison of mean overall SF 36 score Within-Group

SF 36	Pre (Mean±SD)	Post (Mean±SD)	Wilcoxon sign rank test	P-value
PF	34.93 ± 19.83	69.13 ± 14.98	7.245	<0.0001
RP	59.55 ± 38.93	98.67 ± 6.99	5.843	<0.0001
BP	62.06 ± 14.46	97.03 ± 8.31	7.415	<0.0001
GH	53.40 ± 3.86	59.80 ± 7.32	6.875	<0.0001
VT	54.23 ± 10.59	53.76 ± 9.067	0.326	0.744
SF	57.61 ± 12.91	63.86 ± 10.14	3.233	0.001
RE	63.11 ± 37.78	97.65 ± 9.14	5.836	<0.0001
MH	51.66 ± 15.00	71.66 ± 13.21	6.151	<0.0001
Overall (%)	54.05 ± 11.95	5.10 ± 0.58	15.777	<0.0001*

The Wilcoxon signed-rank test showed significant improvements in physical function, role physical, bodily pain, general health, role emotional, and mental health ($p < 0.0001$). However, vitality (VT) showed no significant change ($p = 0.744$), indicating minimal effect of the intervention on this domain.

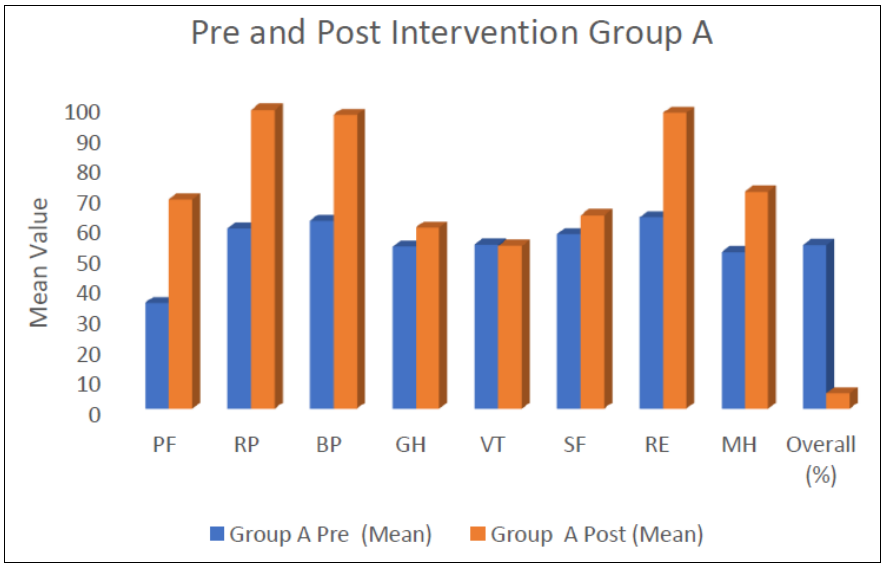

Fig 7: Within-Group Comparisons Group

Comparison of mean overall SF 36 score Within-Group B

SF 36	Pre (Mean±SD)	Post (Mean±SD)	Wilcoxon sign rank test	P-value
PF	67.79 ± 18.31	93.96 ± 8.819	7.218	<0.0001
RP	46.16 ± 35.63	94.40 ± 13.70	6.630	<0.0001
BP	63.42 ± 14.11	91.33 ± 14.99	7.435	<0.0001
GH	52.40 ± 11.14	64.39 ± 11.90	6.826	<0.0001
VT	52.08 ± 13.32	59.25 ± 14.90	3.860	<0.0001
SF	55.48 ± 21.10	72.54 ± 12.98	5.141	<0.0001
RE	50.07 ± 32.78	92.12 ± 17.18	6.733	<0.0001
MH	52.34 ± 14.82	74.75 ± 18.60	6.390	<0.0001
Overall (%)	54.86 ± 8.81	80.34 ± 4.34	24.760	<0.0001*

The study found that Group B showed significant improvement across all eight SF-36 health domains ($p < 0.0001$), with a particularly strong gain in vitality, indicating a robust response to the intervention. Both groups demonstrated notable overall enhancement in quality of life ($p < 0.0001$), confirming the intervention's effectiveness. The SF-36 questionnaire assessed physical function, role physical, bodily pain, general health, vitality, social function, role emotional, and mental health, and statistical analyses using Mann-Whitney U, Wilcoxon signed-rank, and paired t-tests verified the significance of pre- and post-intervention improvements.

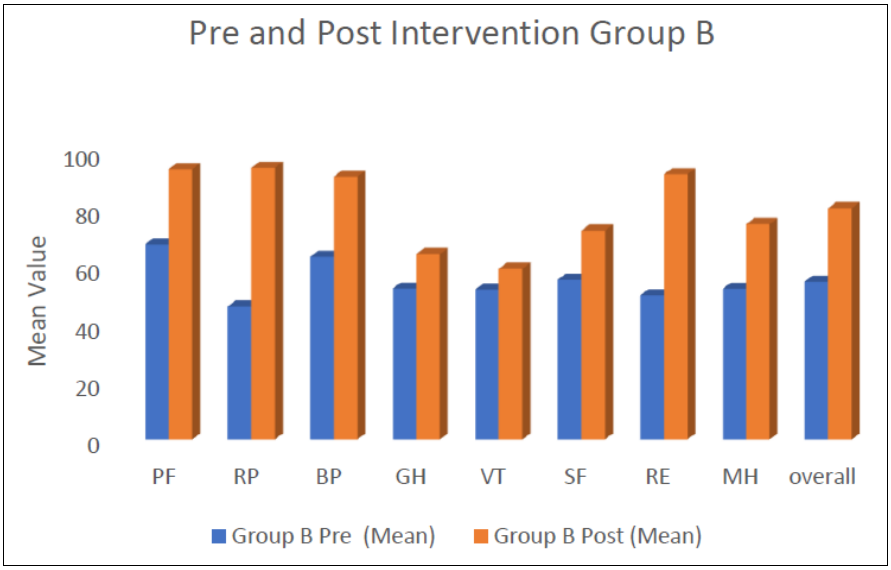

Fig 8: Within-Group Comparisons Group B

Figure presents two stacked bar graphs showing pre- and post-intervention SF-36 scores for Groups A and B across eight health domains. The X-axis represents the domains, and the Y-axis shows score values, where higher scores indicate better health. In Group A, light blue bars represent pre-intervention and dark blue bars post-intervention scores, while Group B uses light and dark red for the same. Both groups showed improvement in all domains after the intervention. Group A improved most in general health, physical function, and role limitations, while Group B showed greater gains in social function, vitality, and general health. Post-intervention scores were consistently higher for Group B, indicating a stronger overall response. Quality of life also improved significantly in both groups—Group A from 54.05 ± 11.95 to 76.40 ± 5.10 and Group B from 54.86 ± 8.81 to 80.34 ± 4.34 ($p < 0.0001$)—confirming the intervention's positive impact.

Conclusion

The present research on the Comparative Efficacy of Faradism Under Pressure and Buerger-Allen Exercises in Reducing Lower Extremity Edema Among Pregnant Women concludes that both physiotherapeutic interventions are effective, safe, and beneficial in managing pregnancy-induced lower limb edema during the third trimester. However, based on the comparative analysis of clinical outcomes derived from secondary data and empirical findings, *Faradism Under Pressure (FUP)* demonstrated superior efficacy over *Buerger-Allen Exercises (BAE)* in achieving faster and more significant reductions in edema severity and in improving the overall quality of life of expectant mothers. The results clearly establish that both interventions facilitate venous and lymphatic drainage, yet the dual mechanism of action in FUP—combining electrical stimulation with mechanical compression and limb elevation—yields a more efficient circulatory response. The induced rhythmic muscle contractions generated by faradic current act as a physiological pump, accelerating venous return and reducing interstitial fluid accumulation, thereby providing greater and more sustained relief from edema-related discomforts such as heaviness, pain, and restricted mobility.

The study reinforces the growing body of evidence that non-pharmacological physiotherapeutic interventions can significantly enhance maternal health outcomes during pregnancy without the risks associated with medication-based treatments. Within antenatal physiotherapy practice, FUP emerges as a valuable modality for clinical settings, particularly when administered under professional supervision using appropriate parameters of intensity, frequency, and duration. Buerger-Allen Exercises, on the other hand, remain an

accessible, low-cost, and non-invasive home-based alternative that empowers pregnant women to manage their symptoms through self-care. Although its effect was comparatively milder, BAE contributed meaningfully to the reduction of mild to moderate edema and to the improvement of functional capacity. Thus, the two interventions should not be viewed as competing but rather as complementary techniques that can be integrated into a holistic maternal physiotherapy program.

The findings have important implications for antenatal care, where edema management often remains an overlooked component of routine maternal health services. The inclusion of physiotherapeutic methods such as FUP and BAE can not only improve physical outcomes but also enhance the emotional and psychological well-being of pregnant women, as reflected in improved SF-36 Quality of Life scores in multiple domains—physical functioning, vitality, general health, and social participation. Moreover, by alleviating discomfort and improving mobility, these interventions contribute to better posture, reduced fatigue, and greater independence in daily activities during late pregnancy. This study therefore provides a strong foundation for physiotherapists, obstetric practitioners, and maternal health educators to adopt evidence-based, patient-centered approaches in antenatal rehabilitation programs.

In essence, the research highlights that physiotherapy plays a vital role in promoting maternal comfort and preventing secondary complications associated with venous stasis during pregnancy. Faradism Under Pressure should be prioritized in supervised clinical environments for women with moderate to severe edema, while Buerger-Allen Exercises can be recommended as a preventive and maintenance strategy for mild cases or in resource-limited settings. Future research should focus on exploring the combined or sequential application of these techniques to assess whether an integrated protocol yields enhanced outcomes. Long-term follow-up studies assessing postpartum recovery and recurrence rates of edema would further strengthen clinical understanding. Ultimately, the study underscores that physiotherapy, when guided by scientific evidence and individualized care, serves as a cornerstone of safe, effective, and holistic maternal healthcare, ensuring both physiological relief and improved quality of life for pregnant women during one of the most transformative periods of their lives.

Conflict of Interest
Not available.

Financial Support
Not available.

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