

Effect of Low-Level Laser Therapy on Acupoints of Emesis Gravidarum

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ABSTRACT

Background: Emesis gravidarum is one of the popular health issues affecting gravid women and results in maternal and newborn adverse effects.

Purpose: The goal of the study was to determine how low-level laser therapy affected emesis gravidarum acupoints.

Patients and Methods: Forty pregnant women with emesis gravidarum were chosen in this prospective, randomized, controlled trial study; they were chosen from the Al-Asmarat Medical Center's gynecology outpatient clinic. They were equally distributed into two groups (A and B) at random (20 women per group). For group A (Study group), the women received low-level laser therapy (LLLT) on the ST36 acupoint for three minutes on each side, 3 days weekly for two weeks, and anti-emetic medications. While Group B (Control group), was treated with anti-emetic drugs only (meclizine hydrochloride, 25 mg, and pyridoxine hydrochloride, 50 mg, once per day for 2 weeks). The Pregnancy Unique Quantification of Emesis (PUQE) questionnaire was utilized to evaluate emesis gravidarum in both groups before and following the therapy.

Results: Statistical analysis showed a highly significant reduction of nausea, vomiting, and retching without vomiting ($p = 0.0001$) in both groups (A and B), but when comparing between the two groups' results, Group A showed a statistically significant decrease in the PUQE total score more than Group B ($p = 0.0001$).

Conclusion: LLLT applied to certain acupoints is a helpful adjunctive therapy for reducing nausea and vomiting in pregnant women with emesis gravidarum.

Keywords: Acupuncture, Emesis gravidarum, Laser, Nausea, Pregnancy, Vomiting.

INTRODUCTION

Eighty percent of gravid women experience hard symptoms of nausea and vomiting between the 4th and 7th weeks of their pregnancy, which usually subside by the twentieth week of gestation ⁽¹⁾. In about 35 percent of the affected women, the symptoms are clinically significant and have physical and psychosocial consequences ⁽²⁾.

Certain causes of emesis and hyperemesis gravidarum are unidentified. However, observational data suggests that such conditions are correlated with the human chorionic gonadotropin (HCG) level as well as the placenta mass size, which raises the possibility that placental products may be correlated to the occurrence and extent of nausea and vomiting ⁽³⁾.

It is usually assumed that pregnant women who have extreme nausea and vomiting are turning their emotional discomfort into physical symptoms ⁽⁴⁾. The incidence of mild to moderately severe nausea and vomiting in both early and late pregnancy was linked to depression in the early pregnancy ⁽⁵⁾. Severe vomiting, especially in the early pregnancy, frequently results in hypovolemia and loss of weight ⁽⁶⁾.

Uncontrolled hyperemesis throughout gestation is linked to raised likelihood of negative consequences for the mother and fetus, such as bleeding diathesis, Wernicke's encephalopathy (vitamin B1 deficiency), oesophageal rupture, and acute kidney injury in addition

to several negative effects on psychological and emotional wellness. Additionally, it may lead to placental dysfunction with an increased probability of preeclampsia, premature placental separation, preterm labor, as well as infants with low birth weights ⁽⁷⁾. The Pregnancy-Unique Quantification of Emesis and Nausea (PUQE) scale may be of assistance to physicians, healthcare professionals, and investigators due to its effectiveness and simplicity in the evaluative procedures of nausea and vomiting during pregnancy (NVP) ⁽⁸⁾.

Laser acupuncture (LA), which was initially experimentally evaluated in Graz, Austria, is used for treating NVP. It provides an innovative, non-painful, and harmless acupuncture technique whereby specific group of acupoints can be triggered at the same time as in traditional Chinese medicine ⁽⁹⁾.

In recent years, acupuncture practitioners have used non-thermal, low-level laser irradiation more frequently to trigger acupoints. LA has been promoted as a less harmful, painless substitute for traditional acupuncture that also offers greater adaptability. Numerous characteristics of LA make it a desirable alternative as a therapeutic method, including little sensation, only a short time of therapy, and low hazards for infection, trauma, and bleeding problems ⁽¹⁰⁾.

The mitochondria appear to absorb photons, according to the biological and cellular processes

associated with low-level laser treatment (LLLT). They increase ATP synthesis and low levels of reactive oxygen species (ROS), which stimulate transcription factors like nuclear factor kB to produce several gene transcripts that are crucial to the beneficial consequences of LLLT (11).

For thousands of years, Chinese medicine has employed acupuncture to alleviate nausea and vomiting. The three acupoints of Neiguan (PC6), Zusanli (ST36), and Jianshi (PC5) are the most frequently utilized for the management of digestive disorders. It has been shown that acupuncture can successfully decrease nausea and vomiting in a variety of situations, such as in chemotherapy patients. This action may be mediated by the downregulation of serotonin and dopamine (7).

There was only one previous study that investigated the impact of LA on nausea and vomiting in patients after chemotherapy (12).

So, this study was the first to aim to ascertain the efficacy of LLLT on the ST36 acupoint for treating emesis gravidarum.

SUBJECTS AND METHODS

Participants:

Forty pregnant women diagnosed by the gynecologist with emesis gravidarum, with ages ranging from 20 to 35 and a body mass index (BMI) of 25 to 30 kg/m², contributed in the research. They had been chosen from the gynecological outpatient clinic of Al-Asmarat Medical Center and were distributed into two equal groups (A and B) at random by sealed enveloped method (Figure 1). Group (A): comprised 20 women suffering from emesis gravidarum, received low-level laser therapy on ST36 acupoint bilaterally, 3 times weekly for 2 weeks, and antiemetic drugs. Group (B): comprised 20 women with emesis gravidarum who were treated with antiemetic drugs only (Meclizine hydrochloride 25 mg and pyridoxine hydrochloride 50 mg once per day for 2 weeks). The pregnant women were excepted if they had any history of a disease that caused nausea and vomiting, dermatological abnormalities of the skin at the sites of acupoints, internal fixation at the area of application and smokers. The study was done between August 2022 and March 2023.

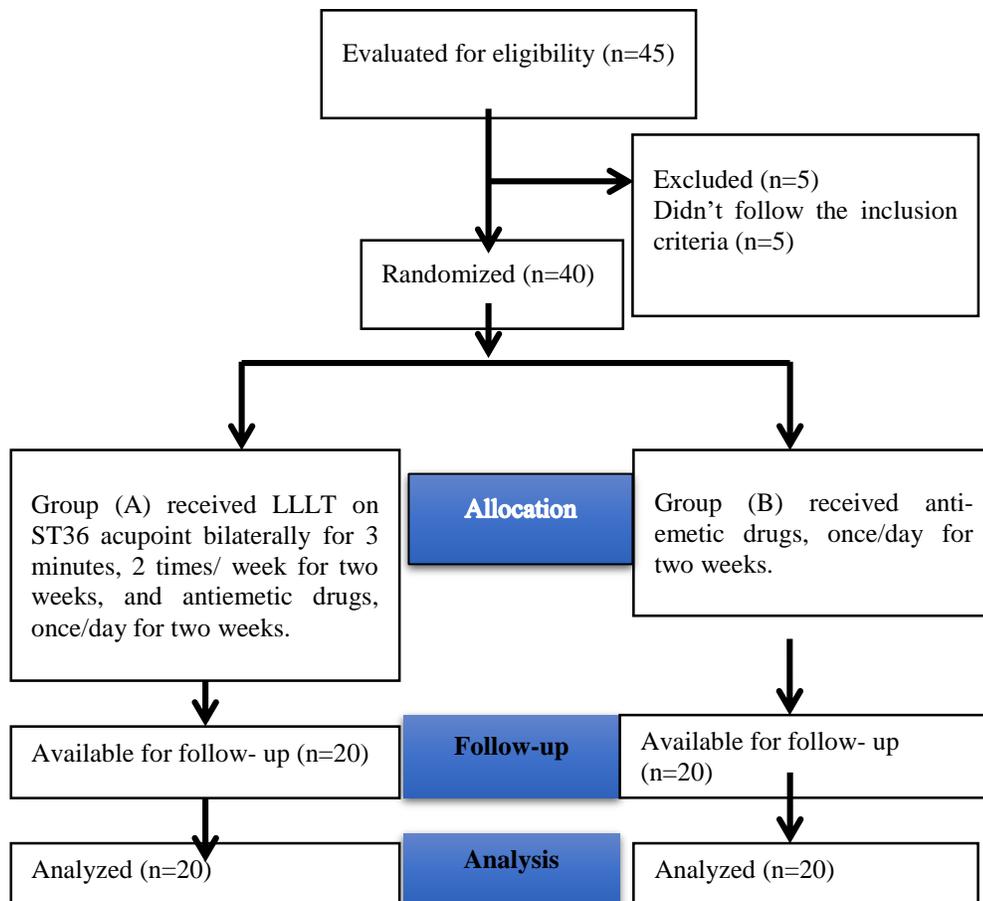


Figure (1): Flow diagram of the study

Procedures:

A- Evaluative procedures:

- Height and Weight scale was used to measure BMI.
- Pregnancy Unique Quantification of Emesis (PUQE) Questionnaire: It was utilized to evaluate the extent and intensity of NVP before starting and after the completion of the therapy (2 weeks) for each pregnant woman in the two groups (A and B) depending on three physical manifestations: nausea, vomiting, and retching. Patients were instructed to answer the questions of the PUQE questionnaire. It contained three NVP-related questions; involving the amount of time the patient experienced nausea, the number of times they vomited, and the number of times they retched without vomiting. Following that, responses were divided into five categories and given a score between one and five depending on how severe each symptom felt. According to the composite summation of the PUQE categorical scores, the NVP was categorized as "mild" (score of 3-6 points); "moderate" (scoring from 7 to 12 points); and "severe" (score of 13 points or more) ⁽¹³⁾.

B- Treatment procedures:

- All participating women in both groups were given a brief explanation of the treatment procedures to win their trust and cooperation.

LLLT on acupoint application:

- Each woman was asked to lie in a relaxed supine position while wearing loose clothes and breathing deeply during the session, and then the skin of the treated area was sterilized with alcohol.
- The probe of LLLT was applied perpendicular on acupoint (ST36) (which is located laterally to the board of anterior tibia by one finger width) on each leg.

- LLLT was utilized with the following parameters: Wavelength: 660 nM, power density: 30 MW, and energy: 3 joules, 3 min for each point bilaterally, 3 times/week for 2 weeks ⁽¹²⁾.

Sample size:

The prerequisite sample size was determined to be 20 participants in each group using the G*POWER statistical program (version 3.1.9.2; Franz Faul, Universitat Kiel, Germany). Calculation was done with $\alpha=0.05$, power = 80%, and effect size = 0.95 with allocation ratio N2/N1 =1.

Ethical Approval:

The Ethics Board for Clinical Research at the Cairo University of Physical Therapy approved the study protocol (approval date: 2022/5/17; approval number: P.T.REC/012/003735). All women signed an informed consent form prior to beginning the study. The Helsinki Declaration, for studies involving humans, was followed throughout the study's conduct.

Statistical analysis

The Statistical Package for the Social Sciences (SPSS) version 25 for Windows (IBM SPSS, Chicago, IL, USA) was used for overall statistical tests. The subject characteristics of both groups were contrasted using an unpaired t-test. The comparison of PUQE between groups was done using the Mann-Whitney U test, and the pre- and post-treatments in each group were compared using the Wilcoxon signed-rank test. All statistical analyses had a probability level of $p < 0.05$.

RESULTS

- Subject characteristics:

The subject characteristics for groups A and B are listed in table 1. Age, weight, height, BMI, and pregnancy period weren't significantly changed across groups.

Table (1): Comparison of subject characteristics between group A and B

	Group A (n=20)	Group B (n=20)	MD	t- value	p-value
	Mean±SD	Mean±SD			
Age (years)	24.95 ± 3.05	26.10 ± 3.74	-1.15	-1.06	0.29
Weight (kg)	72.90 ± 7.52	71.40 ± 5.61	1.5	0.71	0.47
Height (cm)	163.35 ± 7.74	161.55 ± 6.09	1.8	0.81	0.41
BMI (kg/m ²)	27.50 ± 1.73	27.62 ± 1.37	-0.12	-0.24	0.81
Pregnancy period (weeks)	7.90 ± 2.43	6.75 ± 2.84	1.15	1.37	0.17

SD, Standard deviation; MD, Mean difference.

Efficacy of treatment on PUQE:

Within group comparison

In comparison to pre-treatment, group A and group B had a significant improvement in their nausea, vomiting, retching, and PUQE overall score post- treatment (Table 2).

Between group comparison

Before treatment, there was no significant difference between the groups. Following treatment, a comparison between the two groups showed that group A had a significantly lower median value of nausea, vomiting, retching, and the total PUQE score than group B (Table 2).

Table (2): Median values of PUQE pre and post treatment of group A and B:

	Pre-treatment	Post-treatment	Z-value	p value
	Median (IQR)	Median (IQR)		
Nausea				
Group A	3.5 (4.75-3)	1 (1-1)	-3.95	0.001
Group B	3 (4.75-2.25)	3 (3-2)	-3.07	0.002
U- value	182	75.5		
p value	0.61	0.001		
Vomiting				
Group A	3 (3-2)	1 (1-1)	-3.68	0.001
Group B	3 (3.75-2)	2 (3.75-1.25)	-2.71	0.007
U- value	180.5	71.5		
p value	0.58	0.001		
Retching				
Group A	3 (4-1.25)	1 (1.75-1)	-3.47	0.001
Group B	3 (3-2)	2 (3-1.25)	-3.03	0.002
U- value	188	97.5		
p-value	0.73	0.003		
PUQE total score				
Group A	9 (10.75-7.25)	3 (3.75-3)	- 3.93	0.001
Group B	9 (11-7.25)	7 (9.75-5)	- 3.70	0.001
U- value	191	41.5		
p value	0.81	0.001		

IQR, interquartile range; U- value, Mann-Whitney test value; Z- value, Wilcoxon signed ranks test value.

DISCUSSION

The current study examined the use of LLLT on acupoints and utilized controlled and randomized methods to illuminate knowledge regarding the effective treatment of emesis gravidarum.

The observed improvements in group A were confirmed by **Farivar et al.** (11) who found the use of laser acupuncture (LA) during pregnancy might be relatively safe and innocuous considering its potential cytogenotoxic, oxi-inflammatory, and proliferative gains that prohibit gastric dysrhythmia theory and also facilitate mitigation of discomfort with no reporting findings of severe adverse effects on either mothers or newborns.

The study's findings were also matched with those of **Dune and Shiao** (14), who concluded that acupressure and acupuncture are helpful therapeutic methods as medications to lessen children's postoperative vomiting.

The result of this study agreed with those of **Ralston-Wilson and Karlik** (15), who found significant improvement in postoperative vomiting and nausea in children from applying acupuncture on P6 (pericardium6) and ST36 acupoints.

This study's findings were consistent with those of **Sari and Sari** (9), who revealed that treating orthodontic patients with gagging reflexes with laser activation of acupuncture point CV 24 was successful.

The current findings were also linked to **Zhang et al.** (16), who recorded similar improvements through ST36 LA to anti-emetic medicines by explaining theories based on its effectiveness in modulating nausea, mainly in the earlier weeks of pregnant women suffering from hyperemesis gravidarum (HG), by activating intensive neurophysiological benefits yielded by stimulating the ST36 acupoint, which may be mediated via the down-regulation of dopamine and serotonin.

Furthermore, **Einion** (17) explained such antiemetic effects of ST36-LA based on vomiting center inhibition through increased pituitary secretion of beta-endorphins and adrenocorticotrophic hormone response based on a physiological basis that considered earlier clinical trials had built up their reported conclusions based on the fact that LA could regulate gastric peristalsis and reduce gastric acid secretion in morning sickness patients.

Additionally, it continues to have its own advantages; evidence from **Boelig et al.** (18) showed that LA demonstrated a decreased incidence of negative outcomes and pregnancy termination that might occur in HG patients.

In contrast to the present study, **Holmér Pettersson and Wengström** (19) found that the application

of acupuncture did not reduce vomiting when compared to using antiemetic medications.

The current results also disagreed with those of **Yeh *et al.*** (20). They showed no significant impact of auricular acupuncture on reducing nausea and vomiting related to chemotherapy.

CONCLUSION

It can be concluded that LLLT on ST36 acupoint is a beneficial adjunctive therapeutic modality used for relieving emesis gravidarum.

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Conflict of Interest: There are no conflicts of interest.

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