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### Effectiveness of tendoachilles and hamstring stretching on nocturnal leg cramps among antenatal women

**Anandhi D<sup>1\*</sup>, Thameem Ansari<sup>2</sup> and Sivakumar VPR<sup>3</sup>**

<sup>1</sup>Associate Professor, SRM College of Physiotherapy, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu, India

<sup>2</sup>Student, SRM College of Physiotherapy, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu, India

<sup>3</sup>Former Dean, Department of Physiotherapy, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu, India

**\*Corresponding Author:** Anandhi D, Associate Professor, SRM College of Physiotherapy, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu, India, Tel: 9884299924; Email: anand2979@yahoo.co.in

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## Introduction

Pregnancy also known as gravidity, is the duration which one or more offspring develops inside a woman. A multiple pregnancy involves more than one offspring, such as with twins. Pregnancy can occur by sexual intercourse or assisted reproductive technology. In the pregnancy which lasts about 40 weeks, is grouped into three trimesters. Maternal physiologic adaptations are attributed to the hormones of pregnancy and to mechanical pressures arising from the enlarging uterus and other tissues. These adaptations protect the woman's normal physiologic functioning, meet the metabolic demands pregnancy imposes on her body, and provide a nurturing environment for foetal development and growth. Although pregnancy is a normal phenomenon, problems can occur. The hormonal and physical changes

of pregnancy result in enormous changes in a woman's body. Enormous amount of estrogen is produced which leads to the discomforts during pregnancy. Common musculoskeletal discomforts are back pain, sacroiliac joint dysfunction, leg cramps, nerve compression syndromes like carpal tunnel syndrome, brachial plexus pain, meralgia paraesthetica, posterior tibial nerve compression, circulatory disorder such as varicose vein in the legs, vulval varicose vein, haemorrhoids, cramp, thrombosis and thrombo embolism, thoracic outlet syndrome, thoracic spine pain, postural back ache, osteoporosis of pregnancy, fatigue, insomnia and nightmares.

Discomforts during Pregnancy are quite common in second trimester when the musculoskeletal changes commences but do not significantly interfere with activities of daily living or pose any significant threat to the health

of the mother or baby, in contrast to pregnancy complications. So many studies prevail on assessing and treating various discomforts of pregnancy like sciatica, sacroiliac joint dysfunction, low back pain and so on [1-5], but only a very few studies have been done on leg cramps. In Pregnancy, cramps are the major discomforts experienced most commonly during second and third trimesters. It often occurs in night time. A muscle cramp is a sudden, involuntary, painful contraction of a muscle or part of it, self-extinguishing within seconds to minutes and is often accompanied by a palpable knotting of the muscle. The cramp contractions are associated with repetitive firing of motor unit action potentials. This myoelectric activity has been referred to as "cramp discharge". Nocturnal leg cramps are suddenly occurring, episodic, painful, sustained involuntary muscle contractions of the calf and hamstrings muscles. Many women suffer from cramp during pregnancy because the possible mechanism which have been suggested are slowed venous return resulting from raised intra-abdominal pressure with progesterone reducing the tone in venous musculature and nutritional deficiencies brought by the demands of the growing fetus [6]. The most common site is calf and hamstrings, this painful problem can also occur in the feet and thighs. During this cramp, muscles are tender and hard to palpate. The pain that occurs with these contractions are sharp and intense. In pregnancy, nocturnal leg cramps may occur due to increased blood volume, fluid retention, nerve root pressure, mineral imbalance, calcium deficiency, ischemia and certain foods may make cramps worse, including nutrient poor fried or processed foods high in salt such as chips and caffeine which may cause dehydration. Earlier studies reveal that about 30% of pregnant women suffer from leg cramps and is more common in last three months or third trimester of Pregnancy. Though cramp causes no lasting damage to muscles, it can be very painful and unfortunately is very much more common at night in bed [7].

Management of the nocturnal leg cramps has centered mainly on prophylactic pharmacological treatment particularly quinine, but it has potential serious side effects. In the US, the food and drug administration has prohibited the over counter sale of quinine because of safety concerns [8]. Therefore, cessation of drugs should be taken and one of the best advices that a pregnant women can follow would be stretching. The nocturnal leg cramps may also cause sleep disturbances that may indirectly cause depression during pregnancy which may have an impact on the psychological well being of the pregnant women [9]. Stretching mainly helps to reduce calf and hamstrings muscles stiffness. It also can make them feel relaxed. Regular stretching exercises can also give more movement freedom despite being pregnant, help in lubricating of joints so that the women will be able to move without much pain. A good and regular stretching exercise can prepare them well for the birth of their baby. Very less studies and so far no study in Indian Population prevails on the effect of stretching exercises over cramps in pregnant women. So, this study aims to find the effectiveness of Tendoachilles and Hamstring stretching on nocturnal leg cramps among antenatal women. Nocturnal cramps is one of the major discomforts which a women experiences during pregnancy. Cramps although may sound simple can be extremely painful and whilst they usually last only a few seconds, they can also last for minutes [10,11]. "Pregnancy cramps" are particularly distressing. No management as such is available medically due to the side effects of the appropriate drugs. Stretching helps to reduce such cramps but due to the lack of evidence most of the time doctors and patients are unaware about it and fail to understand the importance of it. So, to create evidence, as no studies prevail with Indian Population to prove the effect of stretching for cramps during pregnancy. So to create awareness among the Health Professionals and Community about the importance of Physiotherapy in managing cramps during pregnancy, this study was done.

Moreover, very few studies have been conducted in India to find the effectiveness of stretching during pregnancy. Hence this current study was undertaken. Thus, the main objective of the study was to find the Effectiveness of Tendoachillies and Hamstring stretching on nocturnal leg cramps among antenatal women.

## **Materials and Methods**

### **Study Design and Sample**

This is a Quasi experimental, pre-test and post-test type study done in Department of Obstetrics and Gynaecology, SRM medical college Hospital and Research centre, Kattankulathur, Kancheepuram District, India. Subjects with age Between 20 to 40 years, Second and third trimester, primi and multigravida women were included in the study. Subjects who were in high risk pregnancy like cervical incompetence, pregnancy induced hypertension, subclinical hypothyroidism [12] etc, were excluded from the study. In this study 60 women were selected according to inclusion and exclusion criteria. The procedure was explained to subjects and written consent form was taken. And among the participants only 43 pregnant women responded and were willing to participate in the study. The remaining 17 pregnant women were unwilling to participate. 43 pregnant women participants who were willing to participate were assessed prior to the study for the details of parity, age, type of birth. Before providing the Questionnaire, they were explained in detail about the study and the questionnaire. Pre-test for the subjects was done with VAS and Muscle and Joint Measurement Questionnaire which was given to the subjects and explained and were asked to fill. Then the study population was divided in to two groups conveniently, Group A: 21 participants, Group B: 22 participants. Group A subjects were scheduled with free exercises and stretching and Group B subjects were advised only with free exercises.

### **Procedure**

21 participants of Experimental Group A were scheduled with free exercises for ankle (Dorsiflexion and plantarflexion) and stretching exercises for calf and hamstring muscles which was first explained to the participants and then those exercises were passively done and taught by the Physiotherapist. Following the confirmation that the participants learnt the procedure correctly, they were advised to follow those exercises actively at home for a period of 4weeks. 22 participants of Control Group B were advised only with free exercises for ankle (Dorsiflexion and plantarflexion), it was first trained by physiotherapist and then the participants were advised to practice those exercises actively at home for a period of 4weeks. Both groups performed the exercise programs as 3 sessions per day for 4 weeks at participants home.

#### **Group A (Stretching exercises)**

Prior to free exercise and stretching exercise training, Pre-test scores of Visual Analogue Scale (VAS) and Muscle and Joint Measurement Questionnaire (MJM) were taken.

Free exercises: Ankle Dorsiflexion

Ankle plantarflexion

Repetition: 10times

Session: 3times per day

Duration: 4weeks.

Stretching exercises: Hamstring Muscles-Participants were advised to sit with one leg bent and they were instructed to touch the foot of the extended leg until they feel a stretch in the hamstring muscles of the extended leg. They were asked to breath normally.

Tendoachilles muscles-Participants were advised to stand with dorsiflexed ankle of one

leg against a wall and other leg neutral and bend forward until they feel a stretch in that Tendoachilles muscle of the dorsiflexed leg. They were asked to breath normally.

Holding time: 10 seconds

Resting time: 10 seconds

Repetition: 3 times

Session: 3 times per day

Duration: 4weeks.

Group B (Free exercises)

Prior to free exercise training, Pre-test scores of Visual Analogue Scale(VAS) and Muscle and Joint Measurement Questionnaire(MJM) were taken.

Free exercises: Ankle dorsiflexion

Ankle plantarflexion

Repetition: 10times

Resting time: 10 seconds

Session: 3times per day

Duration: 4weeks.

After completion of 4weeks of duration of exercises, both experimental and control groups participants came to hospital to consult physiotherapist to check the post-test values of Visual Analogue Scale (VAS) and Muscle and Joint Measurement Questionnaire (MJM) for nocturnal leg cramping of pregnant women.

## Results

The collected data were tabulated and analyzed using descriptive and inferential statistics. Mean and standard deviation were used to assess all the parameters of the data using statistical package for social science (SPSS)

version 17. Paired t- test was adopted to find out the effect of calf and hamstring stretching within the groups and independent t-test was done to compare the effect of calf and hamstring stretching between the two groups. From the 60 subjects gathered, only 43 accepted to be the part of study and all 43 subjects were taken with post test assessment. The pretest of both the groups were statistically analysed using independent t test and was found to be similar ( $p < 0.05$ ). The pre test and post test of pain and Muscle and Joint measurement questionnaire among Group A subjects were tabulated in [table 1](#). There was a statistically significant difference between pre and post test values of visual analogue scale readings in group A subjects treated with free exercises and stretching,  $p < 0.05$ , mean of visual analogue scale score before treatment was 5.890 which was reduced significantly to mean of 2.005 and there was a statistically significant difference between pre test and post test values of muscle and joint measurement questionnaire readings among group A subjects treated with free exercises and stretching  $p < 0.05$ , mean of muscle and joint measurement questionnaire score before the treatment was 29.81 which was reduced significantly to mean of 13.33. Pre test and post test of pain and muscle and joint measurement questionnaire among Group B subjects were tabulated in [table 2](#). There was a statistically significant difference between pre test and post test values of visual analogue scale readings in group B subjects treated with only free exercises,  $p < 0.05$ , mean of visual analogue scale score before treatment was 5.586 which was reduced significantly to mean 4.127 and there was a statistical difference between pre test and post test values of muscle and joint measurement questionnaire readings among group B subjects treated with free exercises alone,  $p < 0.05$ , mean of muscle and joint measurement questionnaire score before treatment was 27.59 which was reduced significantly to mean 19.27 after treatment for four weeks. Post test values of VAS and muscle and joint measurement questionnaire were compared between both the groups in [table 3](#),

which shows the post test mean value of VAS in group A (2.005) and in group B is (4.127) which shows that there was a statistically significant difference between both the groups ( $p < 0.05$ ). This table also shows the post test mean value of muscle and joint measurement

questionnaire in group A (3.217) and in group B is (2.995) which infers again that there was a statistically significant difference between both the groups ( $p < 0.05$ ).

**Table 1:** Pre and Post-test values of Visual Analogue Scale and muscle and joint measurement questionnaire among Group A subjects treated with free exercises and stretching (n=21).

Group A		Mean	Standard deviation	t value	p value
Pair 1	Pre VAS	5.890	0.7489	21.621	0.001
	Post VAS	2.005	0.8261		
Pair 2	Pre QUESTIONNAIRE	29.81	3.172	28.412	0.001
	Post QUESTIONNAIRE	13.33	3.624		

**Table 2:** Pre and Post-test values of Visual Analogue Scale and muscle and joint measurement questionnaire among Group B subjects treated with free exercises (n=22).

Control Group		Mean	Standard deviation	t value	p value
Pair 1	Pre VAS	5.586	0.953	13.736	0.001
	Post VAS	4.127	0.886		
Pair 2	Pre QUESTIONNAIRE	27.59	3.217	19.652	0.001
	Post QUESTIONNAIRE	19.27	2.995		

**Table 3:** Comparison of Post test measures of Visual Analogue Scale scores and muscle and joint measurement questionnaire scores between Group A subjects treated with free exercises and stretching and Group B subjects treated with free exercises.

OUTCOMES	GROUPS	MEAN	STANDARD DEVIATION	T VALUE	p VALUE
POST VAS	GROUP A	2.005	0.826	8.113	0.001
	GROUP B	4.127	0.886		
POST QUESTIONNAIRE	GROUP A	13.33	3.624	5.870	0.001
	GROUP B	19.27	2.995		



### Discussion

This study was focused to find the effect of stretching over leg cramps among pregnant women. Pregnancy is often a stressful period with great biochemical, physiological, and anatomical changes in the body. Sometimes, these physiological changes cause pathological conditions, and problems and diseases for the pregnant mother. Nocturnal leg cramps are suddenly occurring, episodic, painful, sustained involuntary muscle contractions of the calf and hamstrings muscle. It's often occurs at night. Many women suffer from cramp during pregnancy because these possible mechanism which have been suggested that calcium deficiency, ischemia, and nerve root pressure may and towards term increased fluid retention together with reduced activity particularly in the evening may be additional factor to the cause of the cramp. The most common site is calf and hamstrings, this painful problem can also occur in the feet and thighs [13,14]. In past, the pregnant women had to suffer from cramps. Now due to recent advancement in the field of women's health in physiotherapy, different concepts of training are evolving to enhance the quality of life in pregnant women. This may highly be useful for the pregnant women to overcome cramps related to pregnancy. Various studies and compilation in Cochrane database say that physical activity and taking part in exercise program have been proven to have positive effect on symptoms related to pregnancy. This was supported by the result of this study, which showed that regular exercise has positive effect on cramps among both stretching with free exercises group and free exercises group among pregnant women [15-17]. The statistical results of this study showed that there was a statistically significant difference in leg cramps among Group A participants who underwent stretching and free exercises ( $p < 0.05$ ) for a period of four weeks. The results goes in hand with Dr Gordon Lim (2015), who concluded that stretching is a good exercise for mothers to be [8]. The statistical results of this study showed that there was a

statistically significant difference in leg cramps among Group B participants who underwent free exercises ( $p < 0.05$ ) training for a period of 4 weeks.

The muscle spindle and Golgi tendon organ are receptors sensitive to changes in muscle length and tension and are activated during stretching. An elevation in body temperature produces an increase in the dissociation of oxygen from haemoglobin and myoglobin, a lowering of the activation energy rates of metabolic chemical reactions, an increase in muscle blood flow, a reduction in muscle viscosity, an increase in the sensitivity of nerve receptors, and an increase in the speed of nervous impulses Stretching also increases blood flow, relax the muscles, increase range of motion and flexibility, and can prevent injury or muscle cramps [18]. During pregnancy, performing stretching exercises regularly can aid in relieving stiff and painful muscles. It can also relieve the pain issues that is associated and linked with pregnancy. Furthermore, stretching during this period can aid in bringing oxygenated blood into the muscles. This will provide mothers more energy while also aiding them in flushing out the lactic acid and toxins in the body, thereby lessening any muscle soreness. If done properly, along with deep breathing, stretching can also deliver oxygen to the fetus, helping to grow better [19]. Stretching can also aid in keeping relaxed. It can make muscle flexible and even allows to experience the feeling of calmness. Various muscle groups can be stretched at least 3 to 5 times every week [20]. Exercise relieves cramps because it helps release beta-endorphins, which are internal opioids "human morphine," Thus free exercises accounts for the relief of pain and cramps post training for four weeks [21]. It has been widely assumed that stretching exercises would reduce the number, severity and pain of cramps, possibly because of the common experience that stretching a muscle aborts an actual attack. When both the groups are compared there was a significant difference reduction in pain and muscle and joint questionnaire between the

groups and this shows that stretching has a beneficial effect without any side effects in the management of nocturnal cramps among pregnant women. This can be explained by that typical muscle cramp is actually neural in origin and is initiated when a muscle already in its most shortened position involuntarily contracts. Muscle cramps cease when involved muscle group is stretched regularly, because stretching disrupts the muscle electrical activity and allow it to relax in lengthened state. This goes in hand with Joannes M Hallegraef, Cees P van der Schans, Renee de Ruiter and Mathieu HG de Greef (2012) who stated that stretching before going to sleep reduces the frequency and severity of nocturnal leg cramps in older adults [22]. Daniell (1979) treated 44 patients with a passive calf muscle stretching regimen. After 24-72 hours, 21 patients reported disappearance of their symptoms and all reported cure within a week [8]. Thus from this study, stretching tendoachilles and hamstrings muscles regularly is quite effective in reducing nocturnal leg cramps among antenatal women.

## Conclusion

This study focused on the comparison of stretching along with free exercises and free exercises alone in antenatal women. The result of this study shows statistically significant effect of stretching over muscle cramps as assessed by visual analogue scale and muscle joint questionnaire among pregnant women. This study concludes that 4 weeks of stretching of Tendo achilles and Hamstring muscle effectively reduces the intensity of muscle cramps among antenatal women and there by recommends stretching to be taught to all antenatal women as a preventive measure and can also be used for treating muscle cramps in antenatal women.

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