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# Effectiveness of Maternal Positions on Materno Foetal Physical and Physiological Parameters during Non-Stress Test among Antenatal Women in Tertiary Care Hospital of Gangtok, Sikkim

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**Abstract:** ***Introduction**: A healthy newborn with a healthy mother is the fundamental objective of foetal surveillance. One of the important tests that is performed during pregnancy is the non-stress test (NST). The NST remains the main method for monitoring the foetus. In this study, expectant women at Gangtok's Tertiary Care Hospital in Sikkim have undergone non-stress test to determine the impact of different maternal positions on the physical and physiological characteristics of the mother and foetus. **Methods**: The study used an experimental approach with crossover research design. The position strategy was randomly assigned to the antenatal women between 34 and 40 weeks of gestation as sequence I, sequence II, or sequence III. Each position strategy included all three positions, and NST was carried out in accordance with the designated strategy. The study comprised 90 pregnant women who were in a labour room of a tertiary hospital in Gangtok. **Results**: The data showed that maternal pulse rate, respiratory rate, blood pressure and fetal heart rate, movement were statistically significant which means there were a varied difference between the maternal and foetal characteristics. The study also depicts that before the positioning, left lateral position had the highest level of no discomfort (81%) and after the positioning, left lateral had the highest level of no discomfort (17%), semi-Fowler's 38% had the highest level of severe discomfort. The comparison of post-test mean score between the positions and within the pre-test and post-test of mean score of the positions were p = 0.001 (p > 0.05) and 0.000 (p>0.05) respectively. Hence, the degree of comfort in the semi-Fowler's, supine, left lateral positions were statistically significant at the p0.05 level. **Conclusion**: The study revealed that both the mother and foetal parameters and the degree of discomfort of mother during Non-Stress Tests varied significantly depending on positions. The study comes to the conclusion that throughout the non-stress test, the left lateral posture was the most comfortable.*

**Keywords:** Maternal position, Non-Stress Test, Result, Antenatal mothers, Comfort, supine, left lateral, semi-fowlers.

## 1. Introduction

Pregnancy is a beautiful event for women; it is a magnificent trip during which she goes through various physical changes that may be beneficial or harmful. Pregnancy connects the mother and foetus and serves as the foundation for generational renewal. A healthy newborn with a healthy mother is the fundamental objective of foetal surveillance.[5]

Through the use of technology, medical professionals can now diagnose and treat disorders that affect foetuses. Prenatal mortality has dramatically decreased as a result of improvements in prenatal treatment over the past 30 years.[1] Doctors now have easier access to the intrauterine environment thanks to non-invasive diagnostic tools.[6]

Non-stress testing is essentially done to evaluate the well-being of the baby in the womb.[1] The non-stress test (NST) is a straightforward, non-invasive technique that is frequently used to identify foetal concerns.[8] Numerous writers noticed the connection between a healthy foetus and heart rate increases in response to foetus movement in the middle of the 1970s. Since that time, antepartum FHR testing (AFHRT), along with non-stress tests (NST) and CST, has served as the major method of determining the health of the foetus.[6]

It's critical to avoid test-related mistakes and false-positive findings. False-positive findings and longer test times can come from a variety of circumstances. Maternal position is one among them; it undoubtedly affects blood circulation of the mother and baby.[2]

Non-Stress Test is the most accurate way to measure foetal wellbeing. It is a screening tool, which is been found to be way more effective at differentiating between healthy and unwell foetuses. Thus, a typical reactive non-stress test can detect the health of the foetus while it is still inside the mother.[13] Nurse practitioners and midwives can use it most effectively. It is fairly simple to perform as well as interpret. The non-stress test provides crucial information about the developing child's health. The midwife or nurse practitioner can use this information to guide their decisions about high-risk pregnancies.[9]

## 2. Methodology

It was a Non blinded clinical trial with Cross over with repeated measure research design conducted in the Labour room of Central Referral Hospital of Sikkim, Gangtok from November 2022 to December 2022, among 100 antenatal mothers of age range between 18-40 years, who were in 34-40 weeks of gestation. Letter of approval was obtained from the Medical Superintendent (MS) of Central Referral Hospital (CRH). Ethical permission was sought from institutional ethics committee. Self-introduction and rapport were established with the participants in order to gain their co-operation. Informed written consent was obtained.

The study was implemented according to the following steps:

- In order to acquire written consent for the study, each antenatal woman who fulfilled the inclusion criteria and has an abdominal ultrasound report ware informed about the purpose of the study.
- In the labour room, Tool 1 was used to conduct individual interviews with each pregnant lady getting three positions to gather socio-demographic information and obstetric history.
- Sequence I, II, or III position strategies were randomly assigned to pregnant women between 34 and 40 weeks of gestation.
- The decision to assign a position strategy (Group-A, Group-B, or Group C) was made using a random technique. An opaque envelope was written with every potential sequence, and the subject picked it up before being allocated Group-A, B, or C. The process was carried out until the appropriate sample size was reached.
- Using tool 2, antenatal women's levels of discomfort were measured twice: at the beginning and the end of the test.
- The researcher followed the steps for non-stress test procedure for each woman. The test lasted for 15 minutes, and at the end of each position, the maternal and foetal physiological parameters were evaluated, recorded, and interpreted in accordance with the categorization of the NST utilising tool 3.
- Comparisons of women's degree of discomfort and foetal cardio-tocographic patterns were done amongst the three group to identify whether position was effective (greater maternal comfort and foetal NST responsiveness) during the test.
- Statistical Package for Social Sciences (SPSS) version 20 was used by the researcher to conduct statistical analysis following data collection.

## 3. Results and Discussion

**Findings related to baseline characteristics of antenatal mothers**

Findings show that among 90 samples, 59% of the samples belong to Hindu religion, 18% of the samples were Christian, 1% were Muslim and 22% were Buddhist. 2% had no formal education, 9% had primary and secondary education. 36% had higher secondary education and 44% had graduation and above educational qualification. 100% of the samples were married. Majority of the sample i.e., 79% had their LMP on February 2022 and 21% of the sample had their LMP on March 2022. 100% of the samples had the NST done as routine check-up. The age of the samples ranged from 19- 39 years. 22% of the samples were in the age group of 19-25 years, 62% of the samples were in the age group of 26- 32 years. 16% of the samples were in the age group of 33-39 years. Among 90 samples, 43% were homemaker, 21% were self-employed, 10% were casual wage labourer and 26% were regular salaried employee. The majority of the samples earned more than 10,001 rupees per month that is 51%, 33% of the samples earned less than 5000, 16% of the samples earned 5001- 10,000. The majority of the samples 54% lived in joint family and 26% of the sample lived in nuclear family and 20% of the sample lived in extended family.

**Findings related to obstetrics characteristics of antenatal mothers**

The study depicts that the range of the height varied from 139 – 181 cms. Majority of the samples belonged to the group between 141 – 160 i.e.,79%. 1% of sample belonged to less than 140 cm and 17% belonged to 161- 180 cm. 3% were more than 180 cm. The majority of samples had to 61 to 80 kg i.e., 61%, 33% of the samples had 41-60 kg, 6% of the samples had more than 80 Kgs. Majority i.e., 77% of the samples were primigravida and 23% were multi gravida with no history of complications. Majority of the samples i.e., 79% had 0 parity, 19% of the samples had parity 1, and 2% of the samples had parity 2. 100% of the samples had no complicated previous obstetrics history. Whereas, 99% of the samples had no complication during antenatal period. 60% of the samples had expected date of delivery on December 2022 and 40% on November 2022. 7% of the samples have done 1-5 ANC visits, 13% of the samples have done 6-10 ANC visits and 80% come for antenatal check-up for more than 10 visits. Out of 90 samples 27% were in the gestational age between 33-36 weeks, 66% were in 37-38 weeks, 8% were in 39-40 weeks. Majority of the estimated fetal weight belonged to the range from 2001-2500 i.e., 41%. 26% belonged to the range 2501-3000 gm. 33% were less than 2000gm.

**Findings related to assessment and comparison of maternal physical parameters between different maternal positions**

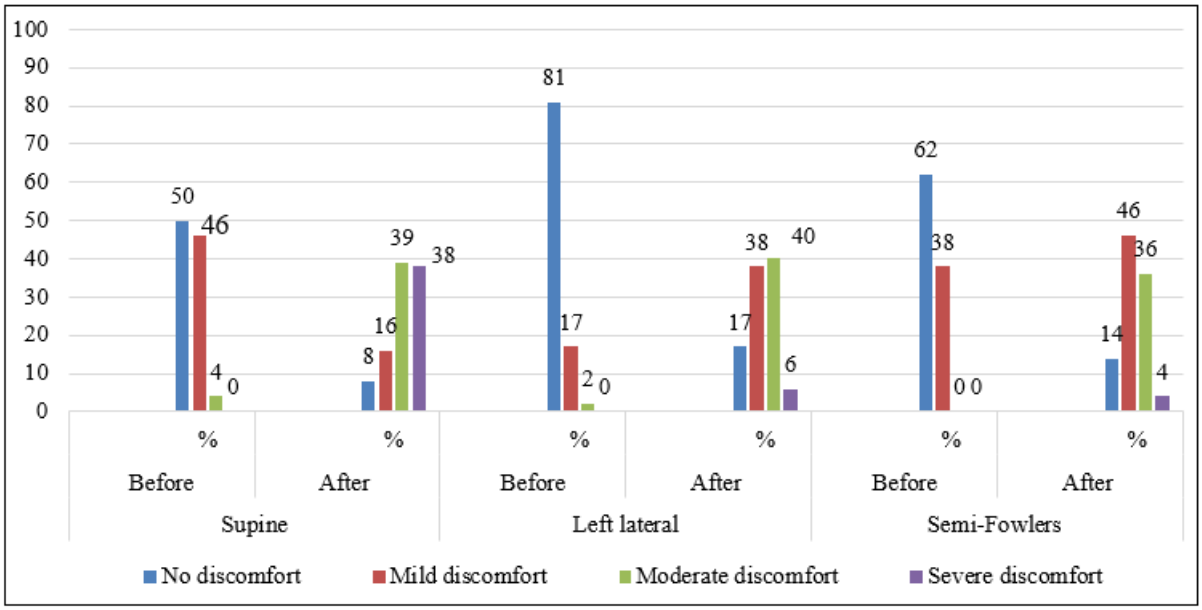


**Figure 1:** Distribution of antenatal mothers in terms of level of discomfort in different maternal positions during non-stress test

In the **supine position,** 50% of the samples reported no pain before and 8% had no pain after the position, 46% had mild pain before and 16% had mild pain after the position, and 4% had moderate pain before and 39% had moderate pain after the position. 38% had severe discomfort after the position as pre

In the **left lateral position,** 81% of the samples had no pain before and no pain after the position, 17% had mild pain before and 38% had mild pain after the position, 2% had moderate pain before and 40% had moderate pain after the position. 6% had severe discomfort after the position.

In **Semi Fowler's position**, 62% samples had no discomfort before and 14% had no discomfort after the position, 38% had mild discomfort before and 46% had mild discomfort after the position, 36% had moderate discomfort after the position. 4% had severe discomfort after the position.

**Findings related to assessment of maternal physiological parameters between different maternal positions**

**Table 1:** Distribution of participants in terms of maternal physiological parameters between different maternal positions, N=90

| Parameters | Test | F value | P value |
|---|---|---|---|
| **Pulse rate** | **Pre-test** | 0.433 | $0.649^{NS}$ |
| | **Post-test** | 0.475 | $0.622^{NS}$ |
| **Respiratory rate** | **Pre-test** | 0.137 | $0.872^{NS}$ |
| | **Post-test** | 0.921 | $0.399^{NS}$ |
| **Systolic BP** | **Pre-test** | 0.362 | $0.697^{NS}$ |
| | **Post-test** | 3.113 | **0.042*** |
| **Diastolic BP** | **Pre-test** | 0.112 | $0.894^{NS}$ |
| | **Post-test** | 2.997 | **0.048*** |

Table 1 shows the comparison within the pre-test and post-test of mean score of the supine, left lateral and semi-Fowler's positions were 0.492, 0.266, 0.060 ($p<0.05$), which depicts that maternal pulse rate is statistically significant during non-stress test.

It is also depicted from the above table that the comparison within the pre-test and post-test of mean score of the supine, left lateral and semi-Fowler's positions were 0.009, 0.180, 0.547 ($p<0.05$), which depicts that maternal respiratory rate is statistically significant during non-stress test.

The comparison of post-test mean score between the positions (supine, left lateral, semi-Fowler's) were p = 0.042 (systolic), 0.048 (diastolic) which is $p > 0.05$, depicts that maternal blood pressure is statistically significant in post-test during the nonstress test as reflected in table 1.

The comparison within the pre-test and post-test of mean score of the supine position was p= 0.000 (systolic) and 0.003 (diastolic), which is which is $p > 0.05$, depicts that maternal blood pressure is statistically significant in pre-test during the nonstress test.

The comparison within the pre-test and post-test of mean score of the left lateral position was p=0.008 ($p > 0.05$), depicts that maternal systolic blood pressure is statistically not significant 0.004 ($p > 0.05$), depicts that maternal systolic blood pressure is statistically significant during the nonstress test.

**Findings related to assessment of fetal physiological parameters between different maternal positions**

**Table 2:** Distribution of participants in terms of fetal physiological parameters between different maternal positions, **N=90**

| Parameters | Test | F value | P value |
|---|---|---|---|
| Fetal Heart Rate | Pre-test | 1.271 | $0.282^{NS}$ |
| | Post-test | 3.999 | 0.019* |
| Fetal movements | Pre-test | 0.313 | $0.731^{NS}$ |
| | Post-test | 11.01 | 0.001* |
| Fetal acceleration | Pre-test | 0.178 | $0.837^{NS}$ |
| | Post-test | 9.124 | 0.001* |

Table 2 shows the comparison within the pre-test and post-test of mean score of the supine and left lateral positions

were p=0.003, 0.000 respectively (p>0.05), which depicts that **fetal heart** rate is statistically significant during non-stress test.The comparison within the pre-test and post-test of mean score of the supine, left lateral and semi-Fowler's positions were 0.000 (p<0.05), which depicts that **fetal movement** is statistically significant during non-stress test. The comparison within the pre-test and post-test of mean score of the supine, left lateral and semi-Fowler's positions were 0.000 (p<0.05), which depicts that **fetal acceleration** is statistically significant during non-stress test.

**Findings related to association between the maternal physical and physiological parameters with selected baseline variables**

There was significant association between maternal physical parameters (level of discomfort) and gestational age in supine position (p < 0.05 i.e., 0.018) and left lateral position (p < 0.05 i.e., 0.043).There was a significant association between maternal physical parameter (level of discomfort) and demographic variable gravida in supine position (p < 0.05 i.e., 0.034), Left Lateral Position (p < 0.05 i.e., 0.047) and semi fowler's position (p < 0.025 i.e., 0.022).There was a significant association between fetal physiological parameters (fetal heart rate) and demographic variable age in supine position (p < 0.05 i.e., 0.025), left lateral position (p < 0.05 i.e., 0.028) and semi fowler's position (p < 0.05 i.e., 0.032). There was a significant association between fetal physiological parameters (fetal movement) and demographic variable Estimated fetal weight (p < 0.05 i.e., 0.007) in left lateral position.

## 4. Discussion

More than half of the mothers 62% belonged to age group of 26-32 years. 59% of the samples belonged to Hindu religion. 44 % had graduation and above educational qualification.100% of the samples were married. 100% of the samples had the NST done as routine checkup. 26% were regular salaried employee. Majority of the samples, 54% lived in joint family.

Similar study was conducted by **Heba A. Ibrahim**, et al[10] on the "effect of different positions during non-stress test on maternal hemodynamic parameters, satisfaction, and fetal cardiotocographic patterns". According to the demographic information about the study's participants, 39.8% of them could read and write, although just 3.4% had a university degree. 86.4 percent of the participants in the research were housewives. The participants in the research had a mean age of 31.05 12.20 and a mean BMI of 31.83 6.51. The mean gravidity, parity, abortion, and gestational period in the obstetrics history were 5.25, 3.16, 3.63, 2.86, 0.61, and 35.14, 2.27, respectively.

In present study majority of the samples belonged to the weight range between 141 – 160 cm i.e., 79%. The majority of samples had to 61 to 80 kg i.e., 61%. Majority i.e., 77% of the samples were primigravida. 100% of the samples had no complication during previous obstetrics history. 99% of the samples had no complication. 80% come for antenatal check-up for more than 10 visits. 66% were in 37-38 weeks. 60% of the samples had EDD on December 22. Majority of the estimated fetal weight belonged to the range from 2001-2500 i.e., 41%.

**Didem Kiratli** et al.'s[11] investigation on the "effect of different maternal positions on reactivity of the non stress test, maternal blood pressure and heart rate". According to the results, nulliparas were 54.3% (n=132) and primigravida were 42.8% (n=104) of the study population. 56.0% of the 136 pregnant women were in the 34–37 weeks gestational period (Group 1), whereas 44.0% were in the 38–40 weeks gestational period.

In the present findings it shows mean score of discomfort level of mothers were highest in supine position (5.23 $\pm$ 2.56) followed by Semi Fowler's (3.13 $\pm$ 2.06) and then left lateral (3.08 $\pm$ 2.18) in post-test, which infers that ante natal mothers experienced least discomfort in left lateral position followed by Semi Fowler's and then in supine position during NST.

Similar research was done in 2021 by **Salime Mucuk**, et al.[12] to "Effects of position on non-stress test results and maternal satisfaction". According to the study, 71.7% women reported discomfort in supine position, 7.8% of participants reported discomfort in the left lateral position and 12.8% in the semi-Fowler position (p < 0.001).

Present study shows that maternal parameters i.e., respiration and pulse are not significant in three different positions whereas maternal blood pressure (systolic p= 0.042 and diastolic p= 0.048) in three different positions was significant at 0.05 level of significance.

According to study done by **Heba A. et al**.[10] on the "effect of different positions during non-stress test on maternal hemodynamic parameters, satisfaction and fetal cardiotocographic pattern". The study findings determined that the maternal parameters blood pressure (systolic p= 0.000 and diastolic p= 0.000), pulse (p=0.001), and respiration (p=0.588) significantly varied in each of the three positions.

Present study shows that fetal parameters i.e., fetal heart rate (p=0.019), fetal movement (p=0.001) and acceleration (p=0.001) in three different positions are statistically significant difference at 0.05 level of significance.

A study was conducted by **Heba A. Ibrahim et al**.[10] on the "effect of different positions during non-stress test on maternal hemodynamic parameters, satisfaction and fetal cardiotocographic pattern". The study's findings showed that foetal heart rate (p=0.019), accelerations (p=0.000), and foetal movement (p=0.012) in three different positions are statistically significant difference at 0.05 level of significance.

Present study depicts that there is association between level of maternal discomfort and gestational age in supine and left lateral position. There is association between maternal systolic blood pressure and gravida of mother in supine, semi-Fowler's and left lateral position during non-stress test. There is association between fetal heart rate and age of mother in left lateral and supine position during non-stress

test. There is association between fetal movement and estimated fetal weight on left lateral position during non-stress test.

## 5. Conclusion

According to the study's findings, the baseline position (supine), when changed to a left lateral or semi-Fowler's position, influences the physical and physiological characteristics of the mother and foetus and, as a result, lessens maternal discomfort. Therefore, the semi-Fowler's and left lateral positions needs to be used instead of the supine position in the current OBG scenario where NST is routinely performed to increase the comfort level of antenatal mothers.

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**Conflicts of Interest**: None

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