

## The Effect of Different Maternal Position on Nonstress Test (NST)

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**Abstract:** Objective: Nonstress testing (NST) is most widely used primary testing method for assessment of fetal well-being. The aim of this study is to assess if maternal position (lateral vs supine) has any effect on NST. Methods: This prospective study evaluated 140 singletons and term pregnant women who were admitted for delivery to ShahidSadoughi Hospital, Yazd, Iran. NST was done at supine and lateral position interval one hour. Twenty minutes of fetal heart rate was monitored in each position and was continued 40 minutes if it was nonreactive. Main outcome measures were percentage of reactive NST and number of minutes for reactivity in each position. Results analyzed with SPSS 11.5 software and  $P < 0.05$  was significantly difference. Result that: Supine position showed less fetal reactivity than lateral position ( $p = 0.01$ ) and required more time to achieve reactivity ( $p = 0.02$ ). Pregnant women were least comfortable in supine position reporting back pain and shortening of breath. Conclusion: The results showed that supine position yields the lowest non-reactivity. By using this position fetal reactivity is more quickly observed and could decrease the need for prolonged monitoring, thus leading to a more time-effective evaluation of patients at risk.

**Key words:** Nonstress Test • Supine Position • Lateral Position • Reactive NST

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### INTRODUCTION

The evaluation of the antenatal fetal heart rate (FHR) pattern with electronic fetal monitoring is a widely accepted screening test of fetal well-being. The non-stress test (NST) is a part of routine monitoring of pregnant women before delivery [1]. NST records the FHR and the interaction between the fetal movements. Thereby, provides information on the health of the fetus [2]. NST is used in an attempt to reduce the incidence of fetal compromise at birth that is the result of placental insufficiency [3]. The NST lasts between 20 and 40 minutes, long enough to bring about changes in blood pressure and respirations [2]. The customary NST requires two fetal heart rate accelerations during a 20-minute window for a favorable result [3].

Several factors can contribute to false-positive results and increase the time spent performing tests. One of them is maternal position. Maternal position during NST surely influences the hemodynamics of maternal and feto-placental circulation [4]. Unfortunately, in Iran, there are no standard, evidence-based guidelines

for NST application. However, the maternal position during the testing is important element that should be part of practice guidelines. Physicians generally position the pregnant women in the supine position because this position allows easy administration of the test. As NST takes between 20 and 40 minutes, comfort of the mothers during the test becomes an important variable in determining the accuracy of results [5]. The large number of NSTs performed in many testing centers, the 20-minute requirement can result in increased waiting time or an increased need for machine or technician time. So, the tests could be done in the shorter term (e.g, 10 minutes), it would have benefits [6].

Because the possibility of correlations between maternal position and fetal heart rate patterns is controversial. The primary purpose of this study is to explore the effects of different maternal positions (supine and lateral position) on NST (reactivity and reactivity time) and to identify alternative maternal positions during the test to provide optimum comfort for the mothers. Other aims of the study are standardization of NST applications and cost-containment by reducing the rate of unnecessary interventions.

## MATERIALS AND METHODS

In an experimental study, the effects of maternal positions (supine and lateral) on fetal reactivity and reactivity time in NST was investigated on 140 term low risk singleton pregnancy, in ShahidSedoughi hospital, Yazd, Iran. Exclusion criteria were maternal systemic disease like diabetes, maternal drug using (e.g. antihypertensive or antidepressant drugs) or drug abusing, PROM, known fetal anomalies, poly or oligohydramnios, abnormal baseline fetal heart and decelerations.

The protocol was approved by the hospital ethic review board. Participants were informed of the reasons why NST was needed and the methods and aims of the research. Those participants who accepted to participate in the study were assisted by the researchers to complete the Pregnancy Information Form. All tests were performed in the morning. Before NST obstetric ultrasound was done for determining health status of the fetus and placenta and amniotic fluid. All women underwent NST after eating a small snack. Then NST was administered once on supine and lateral position within an hour. Patients received 20 minutes of monitoring in each position and was continued 40 minutes if it was nonreactive.

A computerized analysis was performed on each NST with an electronic Sonicaid Antepartum Monitor (Oxford Instruments Medical Systems Division, Largo). Results were categorized as either reactive or nonreactive. For a reactive result, a test had to show at least two accelerations of =15 beats/min lasting =15 seconds within the 20-minute interval. Reactivity and the time in minutes of minimum length of NST defined as reactive were assessed (Reactivity time) at the end of the 20 minutes.

Data were analyzed, using SPSS 11.0. The chi-square test was used to assess fetal reactivity differences and analysis of variance (ANOVA) was used to assess differences in reactivity periods.  $P < .05$  considered statistically significant.

## RESULTS

A total of 280 were performed on 140 patients. Table 1 shows the demographic characteristics of the study population. The mean age of the participants was 26 and the mean gestation period was 38 weeks. The percentages of the nullipars were 38.58% and 46.43% of women were worker.

Table 1: Demographic characteristics of the study groups

Maternal age in year (Mean $\pm$ SD)	4/7 $\pm$ 26
Gestational age in week (Mean $\pm$ SD)	9/0 $\pm$ 38
Mother employment [N (%)]	
Yes	65 (46.43)
No	75 (53.57)
Parous [N (%)]	
Nullipar	54 (38.58)
multipar	86 (61.42)
Presentation [N (%)]	
Cephalic	131 (93.58)
Breech	7 (5)
other	2 (1.42)
Neonatal sex [N (%)]	
Girl	67 (47.9)
boy	73 (52.1)

Table 2: Comparisons of NST Outcomes in two positions of the study groups

NST	Left lateral position	Supine position	<i>P</i> value
Reactivity [N (%)]			
Reactive	128 (91.43)	88(62.86)	
nonreactive	12 (8.57)	52 (37.14)	0.001
Time to reactivity in minutes (Mean $\pm$ SD)	10.62 $\pm$ 2.98	15.48 $\pm$ 5.55	0.01
Satisfaction [N (%)]			
Comfortable	117 (83.57)	45 (32.14)	
Un comfortable	23 (16.43)	95 (67.86)	0.001

NST results in relationship to gestational age and maternal position are shown in Table 2. Of the examinations 128 (91.43%) had reactive and 12 (8.57%) had nonreactive results in lateral position. While the results were 88(62.86%) reactive and 52 (37.14%) nonreactive in supine position ( $P= 0.001$ ).

AVOVA test was used to determine the differences among the two positions according to time to detect reactivity. The range of time required for fetal heart rate records to demonstrate reactivity was between 8and 16 minutes, with a mean of 10.62minutes in lateral and between 10 and 28 minutes, with a mean of 15.48 minutes in supine position ( $P = 0.001$ ).

NST was reported to be uncomfortable by 23 (16.43%) women in lateral and 95 (67.86%) in supine position. The most frequent complaints reported while taking the test in this position were dyspnea and backache.

## DISCUSSION

This study was undertaken to determine the effects of two different maternal positions (lateral and supine) on NST (reactivity and achieve reactive time) and the

satisfaction of mothers for those positions during the test. Our findings showed that there were significant differences in fetal reactivity during the NST among the maternal position.

NST was most non-reactive when the test was applied on supine position. This could be confirming the theory of vascular compression in the supine position. In supine position the pressure on the inferior vena cava and pelvic veins from an enlarged uterus cause a decrease in venous return and leading to less placental Perfusion and lower fetal heart rate [7,8]. Our results corroborate the findings reported by Nathan *et al.*, who conducted a randomized-clinical trial to determine positional effect on the NST reactivity and found that in the semi-fowler position 34•6% and in supine position 45•7% of the NST showed no reaction [6]. Altus *et al.*, also reported similar result in 2007 [4].

The average time required to demonstrate a reactive NST in the current study was 10.62 minutes in lateral and 15.48 minutes in supine position. This is similar to the average time taken to meet reactivity in Moffatts report [9]. This is contrary to Altus *et al.*, study that reported there were no statistically significant differences among the four maternal positions (Sitting up, Semi-fowler, Supine left and supine) [4].

Our findings showed that women feel extreme discomfort in supine position with the experience of dyspnea and back pains. This result corroborate previous studies on this topic that reported during the third trimester of the pregnancy, the level of diaphragm, under pressure from an enlarged uterus, was elevated by 4 cm, which decreased lung capacity causing shortness of breath. It is, therefore, suggested that pregnant women, even when they are resting, should lie down in the semi-fowler position [10, 11]. Considering that NST lasts for at least 20 minutes and that it is applied at the third trimester of the pregnancy, it is physiologically consistent that pregnant women would experience dyspnea in a supine position. Moreover, enlarged uterus will also increase the lumbosacral vertebral curve giving rise to prolonged back pain, especially when the patient is standing up or is in a supine position.

We recommend that NST applications should be standardized to eliminate variations in practice among healthcare providers. We also recommend that more research related to the impact of positioning during NST is undertaken and findings are disseminated to healthcare professionals to minimize inaccurate NST results. It is suggested that further studies be conducted with larger sample sizes and longer follow up periods.

## CONCLUSION

The results showed that lateral position yields the highest reactive results while also being more comfortable position for the pregnant women. By using this position fetal reactivity is more quickly observed and could decrease the need for prolonged monitoring, thus leading to a more time-effective evaluation of patients at risk. Our data indicate that the lateral position is a superior position for conducting an NST in a short period.

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