

A COMPARATIVE STUDY TO ASSESS THE EFFECT OF DIFFERENT MATERNAL POSITIONS DURING NON STRESS TEST (NST) ON MATERNAL AND FOETAL BIOPHYSIOLOGICAL PARAMETERS AMONG ANTENATAL MOTHERS IN ANTENATAL OPD, SPMCW, TIRUPATI

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ABSTRACT: Introduction: NST is a non invasive method used to evaluate foetal well-being. This test is a part of cardiotocography(CTG) used within at least 20 minutes after admission of patient, if it is the only screening test, for evaluation of foetal well being during delivery. Important component of NST are baseline foetal heart rate (FHR), baseline variability. **Objectives:** To measure and compare maternal and fetal biophysiological parameters among antenatal mothers in different positions before and during non-stress test [NST] at 0 min, 8th min, and 16th min. To find the association between antenatal mothers demographic variables and fetomaternal biophysiological parameters. **Methodology:** Descriptive research was adapted to carry out the study. 30 antenatal mothers who were selected using convenient sampling technique who admitted for delivery, as well as the mothers come for regular check up at OPD, SPMCW hospital, Tirupati. The observational schedule was prepared for assessing maternal and fetal physiological parameters under the three positions supine, left lateral and semi-fowler's, were provided to assess the parameters before and during non stress test for 0 min, 8th min, 16th min. **Results:** the study findings revealed that There was no much difference in physiological changes (pulse, respiration, systolic and diastolic blood pressure) in maternal while changing the mothers in different positions (supine, left lateral and semi-fowler's) but normal in left lateral position. The significant findings for pulse at 0 min $f = 4.189$ with $p < 0.05$, at 8th min $f = 14.122$ with $p < 0.01$ and at 16th min $f = 8.567$ with $p < 0.01$. The association between demographic variables vs systolic blood pressure in position wise $f = 16.864$ at $p < 0.01$ and for diastolic blood pressure in position wise $f = 13.032$ at $p < 0.05$. There was no association between demographic variables vs pulse, respiration. In all the three positions (supine, left lateral and semi-fowler's) the mother had normal fetal heart rate ranging from 120-160. And fetal movements were more in supine and left lateral position. The significant findings for fetal heart rate $f = 6.229$ at $p < 0.01$, $f = 3.613$ at $p < 0.05$, $f = 3.815$ at $p < 0.05$. For acceleration at 8th min $f = 8.713$ at $p < 0.01$, at 16th min $f = 13.109$ at $p < 0.01$. The association between demographic variables vs fetal heart rate in position wise $f = 19.114$ at $p < 0.01$ and fetal movements with educational status of the mother $f = 13.520$ at $p < 0.05$, in position wise $f = 14.119$ at $p < 0.01$. And acceleration in position wise $f = 28.654$ at $p < 0.01$. **Conclusion:** The findings of the study shows that left lateral position seems to be most comfortable position to the mothers during non stress test. Similarly semi-fowler's position seemed to be mild discomfort and acceleration shown. Supine position during NST reported physical complaints as dyspnea and drowsiness. **Recommendation:** A descriptive study can be conducted on knowledge of non stress test among pregnant mothers.

Key Words: supine position, left lateral and semi-fowlers position, Non Stress Test, Bio-Physiological parameters.

INTRODUCTION:

Antenatal care is one of the important element to ensure normal pregnant with delivery of healthy baby. There are many ways to evaluate the health and well-being of a developing baby (fetus) throughout pregnancy. Fetal heart rate is an integral part of fetal surveillance. Auscultation of fetal heart rate has been a standard component of each prenatal visit. Monitoring fetal heart rate pattern is called non stress test¹. Non stress test is a continuous electronic monitoring of foetal heart rate along with recording of foetal movements (cardiotocography). The non stress test (NST) is a primary foetal surveillance tool. The foetal NST is a simple, non invasive test performed in pregnancy over 28 weeks of gestation. Before 28 weeks, the fetus is not developed enough to respond to the test protocol. The test is named "non stress" because no stress is placed on the foetus during the test.²

NST is a non invasive method used to evaluate foetal well-being. This test is a part of cardiotocography(CTG) used within at least 20 minutes after admission of patient, if it is the only screening test, for evaluation of foetal well being during delivery. Important component of NST are baseline foetal heart rate (FHR), baseline variability. The baseline FHR is the heart rate during a 10 minute increment excluding periods of marked FHR variability, periodic (or) episode changes, and segments of baseline that differ by more than 25 beats per minute. The minimum baseline duration must be at least 2 minutes. Acceleration is a visually abrupt increase in the fetal heart rate (FHR) above the baseline with onset to peak of the acceleration less than 30 seconds. Episodic accelerations occur independent of uterine contractions. Periodic accelerations are associated with uterine contractions and deceleration. NST records the FHR and the interaction between the foetal movements. Thereby, provides information on the health of the foetus. NST is used in an attempt to reduce the incidence of the foetal compromise at birth i.e the result of placental insufficiency².

However, the maternal position during the testing is an important element that should be part of practice guidelines. pregnant women are generally positioned in the supine position because it allows easy administration of the test. But supine position causes aortocaval compression which decreases blood supply to the fetus hence shows non reactive results. Hence position is one of the main factor which should be considered during non stress test. Proper positioning of the mother during the test can eliminate procedure related errors and will prevent false interpretation. Literature recommends either supine, left lateral and semi-Fowler's positions for antenatal mothers during non stress test. A study done in New York, to determine whether maternal posture (left lateral recumbent vs semi-Fowler position) had effect on non stress test

results. As per findings, it was recommended that semi-Fowler's position is a superior position for conducting a non stress test in a short period. Studies shows that, left lateral and sitting position are preferable but it is still an open question regarding the best position during non stress test in terms of reactivity and time consumption¹.

MATERIALS AND METHODS:

Quasi experimental cross over design with one group were observed the feto-maternal parameters in three different positions for the different groups of mothers at three different time 0 min, 8th min and 16th min in one day among antenatal mothers in SPMCW Hospital, Tirupati. The data collection tool was validated and reliability was determined by using test retest method with the score of $r = 0.7963$ and pilot study was conducted. 30 antenatal mothers were selected using convenient sampling technique who were undergone antenatal checkups at OPD, SPMCW hospital, Tirupati. Written consent was taken. Observation checklist were used to assess the feto-maternal parameters in three different positions for the different groups of mothers at three different time 0 min, 8th min, 16th min in one day.

RESULTS:

Frequency and percentage distribution of demographic variables among antenatal mothers.

(40%) of antenatal mothers were aged between 20-22 years, (40%) were aged between 23-26 years. Mostly two third of (83.30%) subjects belongs to Hindu religion. (36.70%) respondents were studied up to higher education and (43.30%) subjects Husbands were graduates. Majority of mothers (80%) were home makers and Spouse occupation remaining (46.70%) were government employees. Majority of respondents belongs to nuclear family (86.70%). In relation to the income of the family per month (53.30%) were having above 12,000, Majority of the sample (70%) were multi gravida and remaining sample (56.70%) had 29-32 weeks of gestation. Most of the respondents got information from health personnel (43.30%). Majority of the mothers (70%) body mass index were in between 18.5-26.

Mean and standard deviation for maternal and foetal biophysiological parameters among antenatal mothers.

Table- 1 position wise pulse in minutes mean difference

		N	Mean	Standard Deviation
Pulse 0 min	Supine	10	98.70	12.49
	Left lateral	10	87.20	6.27
	Semi fowler's	10	97.20	9.20
	Total	30	94.37	10.67
Pulse 8th Min	Supine	10	102.60	8.75
	Left lateral	10	84.40	3.24
	Semi fowler's	10	94.20	9.45
	Total	30	93.73	10.58
Pulse 16th Min	Supine	10	99.00	10.42
	Left lateral	10	84.60	2.99
	Semi fowler's	10	94.40	8.48
	Total	30	92.67	9.80

Table- 1 Maternal biophysiological parameters of Pulse among antenatal mothers at 0 min supine position, left lateral position and semi-fowler's position $f = 4.189$ at $P < 0.05$. At 8th min in Supine position, left lateral position and in semi-fowler's position. $f = 14.122$ at $P < 0.01$. At 16th min in Supine position, left lateral position and in semi-fowler's position $f = 8.567$ at $p < 0.01$

Table-2 position wise respiration in minutes mean difference

		N	Mean	Standard deviation
Respiration 0 Min	Supine	10	21.40	4.01
	Left lateral	10	20.60	1.65
	Semi fowler's	10	21.20	2.86
	Total	30	21.07	2.91
Respiration 8th Min	Supine	10	22.10	3.84
	Left lateral	10	19.40	1.90
	Semi fowler's	10	21.60	2.46
	Total	30	21.03	3.00
Respiration 16th Min	Supine	10	21.40	4.12
	Left lateral	10	19.60	1.58
	Semi fowler's	10	20.40	3.10
	Total	30	20.47	3.09

Table-2 There is no significant difference in position wise respiration in minutes mean difference

Table-3 position wise systolic blood pressure in minutes mean difference

		N	Mean	Standard deviation
Systolic blood pressure at 0 minute	Supine	10	112.10	41.31
	Left lateral	10	115.00	7.07
	Semi fowler's	10	117.00	20.58
	Total	30	114.70	26.09
Systolic blood pressure at 8 th minute	Supine	10	117.00	20.03
	Left lateral	10	111.00	7.38
	Semi fowler's	10	118.00	24.40
	Total	30	115.33	18.33
Systolic blood pressure at 16 th minute	Supine	10	114.00	23.19
	Left lateral	10	115.00	8.50
	Semi fowler's	10	116.00	19.55
	Total	30	115.00	17.57

Table-3 There is no significant difference in position wise systolic blood pressure in minutes mean difference

Table-4 position wise diastolic blood pressure in minutes mean difference

		N	Mean	Standard deviation
Diastolic blood pressure at 0 minute	Supine	10	80.00	10.54
	Left lateral	10	76.00	5.16
	Semi fowler's	10	78.00	11.35
	Total	30	78.00	9.25
Diastolic blood pressure at 8 th minute	Supine	10	80.00	10.54
	Left lateral	10	76.00	5.16
	Semi fowler's	10	79.00	15.24
	Total	30	78.33	10.85
Diastolic blood pressure at 16 th minute	Supine	10	81.00	11.97
	Left lateral	10	78.00	4.22
	Semi fowler's	10	80.00	16.33
	Total	30	79.67	11.59

Table-4 There is no significant difference in position wise diastolic blood pressure in minutes mean difference

Table-5 position wise fetal heart rate in minutes mean difference

		N	Mean	Standard deviation
Fetal Heart Rate at 0 minute	Supine	10	139.40	8.00
	Left lateral	10	143.60	5.46
	Semi fowler's	10	125.80	17.97
	Total	30	136.27	13.75
Fetal Heart Rate at 8 th minute	Supine	10	139.70	9.17
	Left lateral	10	141.70	4.32
	Semi fowler's	10	128.00	18.76
	Total	30	136.47	13.38
Fetal Heart Rate at 16 th minute	Supine	10	141.60	12.55
	Left lateral	10	141.50	4.40
	Semi fowler's	10	125.90	21.56
	Total	30	136.33	15.99

Table-5 Foetal heart rate at 0 min in supine position, left lateral position and semi-fowler's position $f = 6.229$ at $P < 0.01$. At 8th min in Supine position, left lateral position and in semi-fowler's position $f = 3.613$ at $P < 0.05$. At 16th min Supine position, left lateral position and in semi-fowler's position $f = 3.815$ at $P < 0.05$

Table-6 position wise fetal movements in minutes mean difference

		N	Mean	Standard deviation
Fetal Movements at 0 minute	Supine	10	1.10	1.85
	Left lateral	10	1.50	1.43
	Semi fowler's	10	0.70	1.25
	Total	30	1.10	1.52
Fetal Movements at 8 th minute	Supine	10	2.30	2.79
	Left lateral	10	3.80	1.93
	Semi fowler's	10	2.20	1.87
	Total	30	2.77	2.29
Fetal Movements at 16 th minute	Supine	10	2.90	2.60
	Left lateral	10	3.90	2.51
	Semi fowler's	10	1.80	1.03
	Total	30	2.87	2.27

Table-6 There is no significant difference in position wise fetal movements in minutes mean difference

Table-7 position wise fetal acceleration in minutes mean difference

		N	Mean	Standard deviation
Fetal acceleration at 0 minute	Supine	10	0.00	0.00
	Left lateral	10	0.10	0.32
	Semi fowler's	10	0.10	0.32
	Total	30	0.07	0.25
Fetal acceleration at 8 th minute	Supine	10	1.50	0.71
	Left lateral	10	1.00	0.00
	Semi fowler's	10	2.10	0.74
	Total	30	1.53	0.73
Fetal acceleration at 16 th minute	Supine	10	1.40	0.70
	Left lateral	10	0.90	0.32
	Semi fowler's	10	2.50	0.97
	Total	30	1.60	0.97

Table-7 Fetal acceleration at 8th min in Supine position, left lateral position and in semi fowler's position $f = 8.713$ in $P < 0.01$. At 16th min in Supine position, left lateral position and in semi-fowler's $f = 13.109$ in $p < 0.01$ and there was no significance of fetal acceleration at 0 minute in supine position, left lateral and semi-fowler's position.

Association between demographic variables VS maternal and foetal Biophysiological parameters

Association between demographic variables (age, religion, educational status of the respondent, educational status of the husband, occupation of the respondent, occupation of the spouse, type of family, income of the family per month in rupees, gravida, period of gestation in weeks, source of information, body mass index) as systolic blood pressure with different positions $f = 16.864$ at $p < 0.01$ level and diastolic blood pressure with different positions $f = 13.032$ at $p < 0.05$ level.

Association between demographic variables (age, religion, educational status of the respondent, educational status of the husband, occupation of the respondent, occupation of the spouse, type of family, income of the family per month in rupees, gravida, period of gestation in weeks, source of information, body mass index) with fetal heart rate $f = 19.114$ at $p < 0.001$.

Association between demographic variable (educational status of the respondent with the fetal movements $f = 13.520$ $p < 0.005$ and with different positions of antenatal mother $f = 14.119$ at $p < 0.01$ and association between acceleration at different positions of antenatal mothers $f = 28.654$ at $p < 0.001$ level.

DISCUSSION

1) To measure and compare maternal and fetal biophysiological parameters among antenatal mothers in different positions before and during non-stress test [NST] at 0 min, 8th min and 16th min.

Maternal biophysiological parameters of Pulse among antenatal mothers at 0 min supine position, left lateral position and semi-fowler's position $f = 4.189$ at $P < 0.05$. At 8th min in Supine position, left lateral position and in semi-fowler's position. $f = 14.122$ at $P < 0.01$. At 16th min in Supine position, left lateral position and in semi fowler's position $f = 8.567$ at $p < 0.01$ and no significance of Respiration, systolic blood pressure and diastolic blood pressure.

Foetal heart rate at 0 min in supine position, left lateral position and semi-fowler's position $f = 6.229$ at $P < 0.01$. At 8th min in Supine position, left lateral position and in semi-fowler's position $f = 3.613$ at $P < 0.05$. At 16th min Supine position, left lateral position and in semi-fowler's position $f = 3.815$ at $p < 0.05$, no significance of fetal movements.

Foetal acceleration at 8th min in Supine position, left lateral position and in semi fowler's position $f = 8.713$ in $P < 0.01$. At 16th min in Supine position, left lateral position and in semi-fowler's $f = 13.109$ in $p < 0.01$ and there was no significance of fetal acceleration at 0 minute in supine position, left lateral and semi-fowler's position.

The results of the above study was supported by the earlier study carried out by **Rusha Mohammed Essa, Samar k. Hafez (2018)** conducted a Quasi experimental study among 90 women who attended the antenatal clinic at Elshat Maternity University Hospital in

Alexandria governorate. Study title was “Effect of different positions of pregnant women on their comfort and fetal cardiographic patterns during Non Stress Test”. Convenient sampling method was used to select samples, three tools were used for data collection. Tool one: socio demographic data and reproductive history structure interview schedule, Tool two: Non stress test recording sheet, Tool three: Visual Analog Discomfort scale (VADS). Statistical analysis was done by the researcher after collection of data by using Statistical Package for social Sciences (SPSS) version 20 program. A descriptive analytical statistics were utilized such as frequency distribution table, percentage, mean, standard deviation and comparison between study groups were done. Chi- square-test and fisher exact test with significance at ≤ 0.05 level were used to find out the statistical significant difference of the results.

2 To find out the association between antenatal mothers demographic variables and feto-maternal biophysiological parameters

Association between demographic variables (age, religion, educational status of the respondent, educational status of the husband, occupation of the respondent, occupation of the spouse, type of family, income of the family per month in rupees ,gravida, period of gestation in weeks, source of information, body mass index) as systolic blood pressure with different positions $f=16.864$ at $p<0.01$ level and diastolic blood pressure with different positions $f=13.032$ at $p<0.05$ level. Association between demographic variables (age, religion, educational status of the respondent, educational status of the husband, occupation of the respondent, occupation of the spouse, type of family, income of the family per month in rupees, gravida, period of gestation in weeks, source of information, body mass index) with fetal heart rate $f=19.114$ at $p<0.001$. Association between demographic variable educational status of the respondent with fetal movements at $f=13.520$ $p<0.005$ and with different positions of antenatal mother $f=14.119$ at $p<0.01$ and association between the acceleration at different positions of antenatal mothers $f=28.654$ at $p<0.001$ level.

The results of the above study was supported by the earlier a cross sectional study carried by **Rachel Samuel sushmitha karkada at al (2015)** among 44 women between 34 to 40 weeks of gestation attending antenatal clinic for regular check-up in Dr T M Pai Hospital, Udupi. Study title was “Materno foetal physiological parameters in sitting and left lateral position during non – stress test (NST) monitoring in pregnancy : a cross over study.” The tools used for data collection were demographic proforma, materno-foetal physical and physiological parameters monitoring chart and maternal comfort rating scale by observation. In this study descriptive and statistical analysis was used. There were significant changes in maternal physiological parameters like maternal systolic ($p=0.001$), diastolic ($p=0.001$) blood pressure and pulse rate ($p=0.001$) between left lateral and sitting position. There was significant difference in foetal physiological parameters like baseline foetal heart rate ($p=0.034$) and deceleration ($p<0.001$) between sitting and lateral positions.

CONCLUSION

The findings of the study shows that left lateral position seems to be most comfortable position to the mothers during non stress test. Similarly semi-fowler’s position seemed to be mild discomfort and acceleration shown. There was no difference in the physiological parameters like (pulse, respiration, systolic and diastolic blood pressure). Left lateral and supine positions provided more non stress test reactivity than semi-fowler’s positions. There was a significant difference in components of non stress test (baseline fetal heart rate, fetal variability and mean number of acceleration) and supine, semi-fowler’s and left lateral positions. The left lateral position provided normal and effective component of non stress test followed by semi-fowler’s and supine positions. Higher number of fetal movements were perceived by the women in left lateral position than semi-fowler’s and supine positions. Pregnant women were comfortable in left lateral position than in semi-fowler’s and supine positions, and pregnant women placed in supine position during NST reported physical complaints as dyspnea and drowsiness.

RECOMMENDATIONS

The findings of the study can be further developed as follows:

1. This study can be replicated on a larger sample for generalization of the findings.
2. A comparative study can be conducted between sitting position and standing of the mothers subjected to non stress test.
3. A descriptive study can be conducted on knowledge of non stress test among pregnant mothers.

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