Effect of Different Positions of Pregnant Women on their Comfort and Fetal Cardiotocographic Patterns during Non Stress Test

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Abstract

Background: Non-stress test (NST) is part of a routine monitoring of pregnant women before delivery and it is often used early in pregnancy. A variety of positions can be used during non - stress test, such as semi fowler's, lateral tilts, lateral recumbence, supine and semi fowler's with tilts. Many researches are needed to confirm which position is the best to be used during NST. The current study aims to determine the effect of different maternal positions on pregnant women's comfort and fetal cardiotocographic patterns during Non -Stress Test .. **Methods**: Quasi-experimental design was utilized. A convenience sample of 90 pregnant women who attended the antenatal clinic at Elshatby Maternity University Hospital in Alexandria governorate. Subjects were non randomly equally divided into three groups:-***Group I (study 1):*** left lateral position group (30) participants. ***Group II (study 2):*** semi-fowler's position group (30) participants. ***Group III (control):*** supine position group (30) participants. 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):-Study **results** revealed that there was a statistically significant differences in the results of non- stress test reactivity among groups using supine , left lateral and semi -fowler positions. Where, the left lateral position was associated with more non stress test reactivity than semi –fowler and supine positions. The study **concluded** Pregnant women who are placed in left lateral position during non- stress test exhibit more comfort and more fetal non stress test reactivity than those placed in supine and semi-fowler's positions. The study **recommended** A simple protocol for NST application need to be developed to be followed during the test and, Integrating non – stress test into nursing student's curriculum.

Key Words: maternal position, non – stress- test , discomfort

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Introduction

The ante natal care is a systemic examination of the woman and growing fetus from the time that conception is confirmed until the beginning of labour. During antepartum period, several tests are performed routinely to monitor fetal well-being and to detect possible problems .The electronic evaluation of antenatal fetal heart rate pattern is a widely accepted screening test of fetal well-being, non-stress test is often used as a first choice for fetal health and survival assessment [1,2].

The non-stress test (NST) still continue to be a valuable procedure for the assessment of fetal well-being. NST is a simple and noninvasive method of assessing fetal wellbeing by observing the fetal heart rate(FHR) and it's acceleration in response to fetal movement ,the test is based on the knowledge that the fetus is normally active throughout pregnancy and that fetal activity will result in acceleration of the FHR when the normal fetus moves[3]. It can be done at 28 weeks of gestation or later and takes from 10-45 min [4]. The advantages of NST are relatively quick, non-expensive, easy to interpret, it can be done in outpatient setting and there are no known side effects [5].

The fetal heart rate monitoring by cardiotocography (CTG) is a tool of non stress test and a widely accepted as the primary method of antenatal fetal monitoring to assess the state of fetal oxygenation especially in high-risk pregnancies. CTG is important to understand how the development of the sympathetic and parasympathetic nervous systems of the fetus occurs in the intrauterine period. The sympathetic and parasympathetic controls of blood flow are matured at different times during fetal development, so that the sympathetic becomes active before the parasympathetic [6]. It is a simple test performed by trained midwives . Antenatal CTG is commonly used in conjunction with ultrasound assessment of fetal and placental Doppler in high risk pregnancy [7] .

Components of cardiotocograph patterns of NST including *the baseline fetal heart rate* (FHR) which is the mean level of the FHR when it is stable, excluding accelerations and decelerations. It is determined over a time period of 5-10 minutes, expressed as beats per minute (b/m) and normal range is 120 -160 b/m [6].

The baseline variability is the minor fluctuation in baseline FHR. It is assessed by estimating the difference in b/m between the highest peak and lowest trough of fluctuation in one minute segments of the trace. *Accelerations* are transient increases in FHR of 15bpm or more above the baseline and lasting 15 seconds and finally *Decelerations* are transient episodes of decrease of FHR below the baseline of more than 15 b/m lasting at least 15 seconds [8,9].

The non- stress test is described as reactive (normal) if there are at least two fetal movements in 20 min with acceleration of the FHR by at least 15 beats/min, with long term variability of at least 10 beats/min and a baseline rate within the normal range .It is described as nonreactive if there are no fetal movement or acceleration of the FHR with movement, poor to

no long-term variability, baseline FHR may be within or outside the normal range . And it can be uncertain reactivity if there are fewer than two fetal movements in 20 minutes or acceleration of less than 15 beats/min, long term variability amplitude less than 10 beats/min and baseline heart rate outside of normal limits [10].

Comfort is a state of physical and psychological wellbeing . Discomfort is operationally defined as the presence of behaviors considered to express a negative emotional and/or physical state that is capable of being observed by a trained rater unfamiliar with the usual behavior pattern of the patient.. The main role of the nurse is ensuring women's comfort during NST because it takes 10-20 minutes. Position is one method to provide comfort and decrease pain. So the woman should be placed in position which provide comfort to her and not effect on physiological parameters which can effect on NST result[11,12].

Several factors can contribute to false-positive results and increase the time spent performing tests. One of them is the maternal position, maternal position surely influences the hemodynamics of the maternal and feto-placental circulation. A Varity of positions can be used during non -stress test, such as semi fowler's, lateral tilts, lateral recumbence, supine and semi fowler's with tilts, it has been suggested that these positions optimize uterine perfusion and fetal heart rate patterns and prevent maternal hypotension [13].

Supine recumbent position is the common position used during NST although few researches showed that maternal supine recumbent position during NST can result in aorto-caval compression by the pregnant uterus, affecting placental perfusion and fetal oxygenation. Prolonged monitoring in this position should therefore be avoided and the lateral recumbent, half-sitting, and upright positions are preferable alternatives [14] .

Nurses play an important role in non-stress test; prior to the NST, explain the testing procedure and asked women to empty bladder. Place the women in the appropriate position and apply the two external monitor belts. Document the date and time of test, the reason for testing, and maternal vital signs. In addition she obtain a baseline fetal monitor strip over 10-45 min. During the test , observe for signs of fetal activity with a concurrent acceleration of fetal heart rate. Interpret the NST as reactive or nonreactive. After NST procedure, assist the woman off the table. Discuss the results with the woman . Provide teaching about warning signs and symptoms. If serial NST are being done, schedule the next testing sessions [15].

Significance of the problem:

Position is one of the main factors to be considered during non-stress test where the proper maternal position eliminates procedure related errors and prevent false interpretation. During NST the pregnant women are generally positioned in supine position , because this position allows easy application of the test. However, supine position cause aorto-caval compression which decrease blood supply to the fetus and lead to non -reactive results. Thus, the current study is undertaken to determine the appropriate position can be used during the test.

Aim of the study

The aim of the study is to determine the effect of different positions of pregnant women on their comfort and fetal cardio-tocographic patterns during non -stress test .

Hypothesis

Pregnant women who are placed in left lateral position during non-stress test exhibit more comfort and more fetal non stress test reactivity than those placed in supine and semi-fowler's positions.

Pregnant women who are placed in semi-fowler's position during non-stress test exhibit more comfort and more fetal non stress test reactivity than those placed in left lateral and supine positions.

Operational definition

- **Maternal positions**: In this study refers to placing the pregnant woman in left lateral , supine and or semi-fowler's positions.

MATERIALS AND METHOD

MATERIALS

Study design, setting and subjects

A quasi experimental research design was conducted on a convenient sample of 90 pregnant women who attended the antenatal clinic at Elshatby Maternity University Hospital in Alexandria governorate. All subjects were selected according to specified inclusion criteria which included ≥32 weeks of gestation and before onset of labor; normal course of pregnancy; free from any medical disease and willing to participate in the study. Epi -Info program was used to estimate the sample size when the target population was 300 per 3 months with expected frequency = 50%; acceptable error=10% and confidence coefficient=95%.

Tools:

Three tools were used for data collection.

Tool one*:* Socio-demographic data and reproductive history structure interview schedule:-

This tool was developed by the researcher to collect the basic data about the study subjects. It entailed the socio-demographic data such as: age and level of education; reproductive history such as gravidity, parity, number of abortion, number type and place of last delivery; and medical history such as history of diabetes mellitus, hypertension, heart disease and others.

Tool two*:* Non stress test recording sheet

This sheet was developed by the researcher based on the review of current literature and included two parts:-

Part I: Components of Non stress test: - It included base line fetal heart rate, acceleration, deceleration, variability and fetal movement.

Part II: Interpretation of Non stress test:-

Reactive (normal) when:-At least two fetal movements in 20 min; acceleration of the FHR by at least 15 beats/min; with long term variability of at least 10 beats/min and a baseline rate within the normal range.

Nonreactive when:-No fetal movement or acceleration of the FHR with movement; poor to no long-term variability and baseline FHR may be within or outside the normal range.

Uncertain reactivity when :- Fewer than two fetal movements in 20 minutes; acceleration of less than 15 beats/min; long term variability amplitude less than 10 beats/min and baseline heart rate outside of normal limits.

Tool three: Visual Analog Discomfort Scale (VADS):-

It was modified from visual analog scale which was originally developed by Melzack and Katz (1994). It is a self-report scale used to report subjective data concerning different health problems as pain, nausea, discomfort and others. It was adopted and translated to an Arabic version by the researcher to be used in the current study. It comprised 10 point numerical scale, corresponding to the level of discomfort. Zero representing no discomfort, 1 to less than 4 representing mild discomfort, 4 to less than 7 representing moderate discomfort , 7 to less than 10 representing severe discomfort and finally 10 representing unbearable discomfort . Pregnant

woman was asked to select from that 10 points numerical continuum the number that corresponds to her perceived level of discomfort.

METHOD

The study was executed according to the following steps:

- Official letters from the faculty of nursing university of Alexandria was directed to the responsible authorities in Elshatby Maternity University Hospital to obtain their permission to conduct the study after explaining its purpose.
- Tools one & two & were developed by the researcher after extensive review of recent and relevant literature. Tool three was adopted and translated into Arabic.
- Content validity of the tools was tested by a jury of 5 experts in the obstetric field. Tools reliability was checked by Cronbach's Alpha test. Its result was 0.89 which indicates an accepted reliability of the tool.
- Each pregnant woman who met the inclusion criteria and had free abdominal ultrasound was individually informed about the aim of the study in order to obtain her oral informed consent.
- A pilot study was carried out on 9 pregnant women (excluded from the study subjects) to test the feasibility of the tools as well as to ascertain their clarity and applicability. In addition, the time needed to complete the tools was also estimated. Based on the results of pilot study tools were revised, reconstructed and made ready for use.
- Each pregnant woman in the three groups was individually interviewed in the ante natal clinic to collect socio-demographic data and reproductive history using tool one.
- Subjects were non randomly equally divided into three groups:-
    - The control group (supine 30 women) which completed before starting the study groups to avoid contamination of the sample.
    - The study groups were non randomly assigned to one of the two groups as follows:

Study 1 comprised 30 women upon whom left lateral position was applied.

Study 2 comprised 30 women upon whom semi-fowler's position was applied.

- Steps of non-stress test procedure were followed by the researcher for each woman. Non stress test was taken for duration of 10 min and fetal cardiotocography which include

base line fetal heart rate, acceleration, deceleration, variability and fetal movement was assessed and recorded and interpreted according to classification of NST using tool two.

- Women's level of discomfort was assessed twice at the beginning of the test and at the end using tools three.
- Comparison of women's level of discomfort and the fetal cardiotocographic patterns between the three groups were made to determine which position is more effective(more maternal comfort and more fetal NST reactivity) during Non stress test.
- Statistical analysis was done by the researcher after collection of data by using Statistical Package for Social Sciences (SPSS) version 20 program. A descriptive and analytical statistics were utilized such as frequency distribution table, percentages, means, standard deviations and comparison between study and control groups were done. Chi-square-test and fisher exact test with significant at ≤ 0.05 level were used to find out the statistical significant difference of the results.
- Securing subject's oral informed consent, keeping the subject's privacy, assuring the subjects data confidentiality, and the right to withdraw at any time was considered for each recruited subject in the study.

Results :

Results indicated that more than two- fifths (44.4%) of total subjects were aging from 15 to less than 25yrs while less than one – quarter (22.2%) were aging from ≥35 years, slightly less than two- fifths (38.9%) of them were illiterate or read &write . Reproductive history reveled that less than one- half (46.7%) of total subjects had 2-4 pregnancies, 33.3% and 20.0% were multipara and primipara respectively and more than three- quarters (77.8%) of them had no history of abortion. Also, more than one- half (56.3%) of total subjects had normal vaginal delivery while more than two – fifths (43.8%) had cesarean section. The majority (87.8%) of total subjects were currently 32 to 35 weeks of gestation compared to 12.2% were 36 to 39 weeks of gestation Table (I).

Table (II) explains distribution of the study subjects according to components of non- stress test, it was observed that all (100%) of the study groups (semi fowler and left lateral position) had normal basal line fetal heart rate compared to 83.3% of control group (supine position), where fetal bradyc-ardia was recorded among 16.7% of control group compared to completely absent among study groups. However, these differences between control and study groups were statistically significant P (0.005). It

was found that more than one- third (36.7%) of control group (supine position) had lack of fetal variability compared to one – fifth (20.0%) of study group (2) (semi fowler position) and only 6.7% of study group (1) (left lateral position) , two–fifths(40.0%) of study group (1) had minimal fetal variability compared to 33.3%of control and 20.0%of study groups (2). Less than one - half (46.7%) of study group (2) had moderate fetal variability compared to 43.3% of study group (1) and 30.0% of control groups. Regarding marked fetal variability, less than one –fifth (13.3%) of study group(2) had marked variability compared to only 10.0% of study group (1) and completely absent among control group, the differences between control and study groups were statistically significant P (0.038).

It was observed that the mean number of acceleration among control group (supine position) was (1.5 ±1.5) compared to (3.1 ±1.4 & 2.4 ±1.9) among study (1) (left lateral position) and study (2) (semi fowler position) groups respectively, these differences between control and study groups were statistically significant P (0.001).The mean number of fetal movement among control group (supine position) was (3.4 ±3.0) compared to (5.9 ±4.4 & 4.3 ±3.4) among study (1 & 2) (left lateral and semi fowler position) groups respectively , However, these differences were not statistically significant P (0.058) Table (II).

Considering results of non-stress test reactivity, figure (I) illustrates that the majority(93.3%) of study group (1) (left lateral position) had reactive non stress test result compared 80.0% among study (2) (semi fowler position) and 60.0% among control group (supine position). Nonreactive non stress test result was observed among less than one - fifth (16.7% & 13.3%) of control and study (2) groups respectively compared to completely absent among study group (1) (left lateral position). Less than one – quarter (23.3%) of control group (supine position) had uncertain non stress test result, while only 6.7% in both study (1 & 2) groups had uncertain non stress test. There was a statistically significant difference between study and control groups P (0.023).

During the non -stress test, table (III) shows that no physical complain was reported by 83.3% of study group (1) (left lateral position) and 56.7% among study group (2) (semi fowler position) compared to only 3.3% among control group. Dyspnea was the most common complains reported by 60.0% of pregnant women in control group (supine position) during non stress test compared to more than one-quarter (26.6%) of the study group (2) (semi-fowler position) and 13.3% of the women in study group (1) (left lateral position). Fainting was a complain of 10% of the women in control group (supine position) compared to 6.7 of those in the semi-fowler position and not observed at all among women in group (1) (left lateral position). Feeling drowsy during the test was only complained by 16.7 % of

women in supine position. Headache was reported by 10% of those in semi fowler position compared with 6.7% of those in supine position and only 3.3% in left lateral position. This difference was statistically highly significant between study and control groups P (0.001).

On studying subjects' discomfort level at the beginning & the end of the NST test,

it was found that that more than three-quarters (76.7%) of study group (2) (semi fowler position) had no discomfort at the beginning of non- stress test compared to that noticed among less than two-thirds (63.3%) of the study group (1) in left lateral position and more than one-half (56.7%) of control group (supine position) . By the end of the test, the percentage of subjects who reported no discomfort was increased among those positioned in left lateral position (56.6%) and semi fowler position (46.7%) and decreased among subjects in supine position (6.7%)Table (IV). Moderate discomfort was reported by (10%) of both groups in control group (supine position) and study group (1) in left lateral position at the beginning of non -stress test and increased among one-third (33.3%) of those in supine position at the end of the test while completely relieved among subjects in left lateral positions(0%). No severe discomfort was observed among supine and semi-fowler groups at the beginning of the test and become evident among less than one-half (46.7%) of those in control group (supine position) at the end of the test compared to 10% of the study group (2) (semi fowler position). Also, unbearable discomfort was observed only at the end of the test among both study group (1) in left lateral position and control group (supine position) (6.7%) and (3.3%) respectively. However, the differences between the three groups was statistically highly significant at the end of the non- stress test P(0.001) Table (IV).

Table (V) shows significant statistical differences between reactivity of non- stress test and level of discomfort. A one- half (50.0%) of total subjects with no discomfort had reactive non stress test, more than two– fifths (44.5%) of total subjects with mild discomfort had non reactive non stress test, and more than one- third (36.4%) of total subjects with moderate discomfort had uncertain non stress test.

Table (I): Distribution of the study subjects' general characteristics

Socio-demographic data	Control group		Study groups				Total (n=90)	
	Supine (n=30)		Study (1) Left Lateral (n=30)		Study (2) Semi Fowler (n=30)			
	No	%	No	%	No	%	No	%

Age in years								
▪ 15 to less than 25	11	36.7%	17	56.7%	12	40.0%	40	44.4%
▪ 25 to less than 35	10	33.3%	10	33.3%	10	33.3%	30	33.3%
▪ ≥35	9	30.0%	3	10.0%	8	26.7%	20	22.2%
Level of education								
▪ Illiterate / Read &write	9	30.0%	14	46.7%	12	40.0%	35	38.9%
▪ Primary /preparatory	8	26.7%	6	20.0%	9	30.0%	23	25.6%
▪ Secondary	10	33.3%	9	30.0%	8	26.7%	27	30.0%
▪ University	3	10.0%	1	3.3%	1	3.3%	5	5.5%
Gravity								
• Primigravida	13	43.3%	13	43.3%	8	26.7%	34	37.8%
• 2-4	11	36.7%	14	46.7%	17	56.7%	42	46.7%
• 5+	6	20.0%	3	10.0%	5	16.6%	14	15.5%
Parity								
• Nullipara	15	50.0%	16	53.4%	11	36.7%	42	6.7%
• Primipara	6	20.0%	7	23.3%	5	16.6%	18	20.0%
• Multipara	9	30.0%	7	23.3%	14	46.7%	30	33.3%
Abortion								
• No	24	80.0%	24	80.0%	22	73.3%	70	77.8%
• Yes	6	20.0%	6	20.0%	8	26.7%	20	22.2%
Mode of previous delivery								
• Normal vaginal delivery	8	53.3%	9	64.3%	10	52.6%	27	56.2%
• Cesarean section	7	46.7%	5	35.7%	9	47.4%	21	43.8%
Current weeks of gestation								
▪ 32-35	28	93.3%	28	93.3%	23	76.7%	79	87.8%
▪ 36-39	2	6.7%	2	6.7%	7	23.3%	11	12.2%

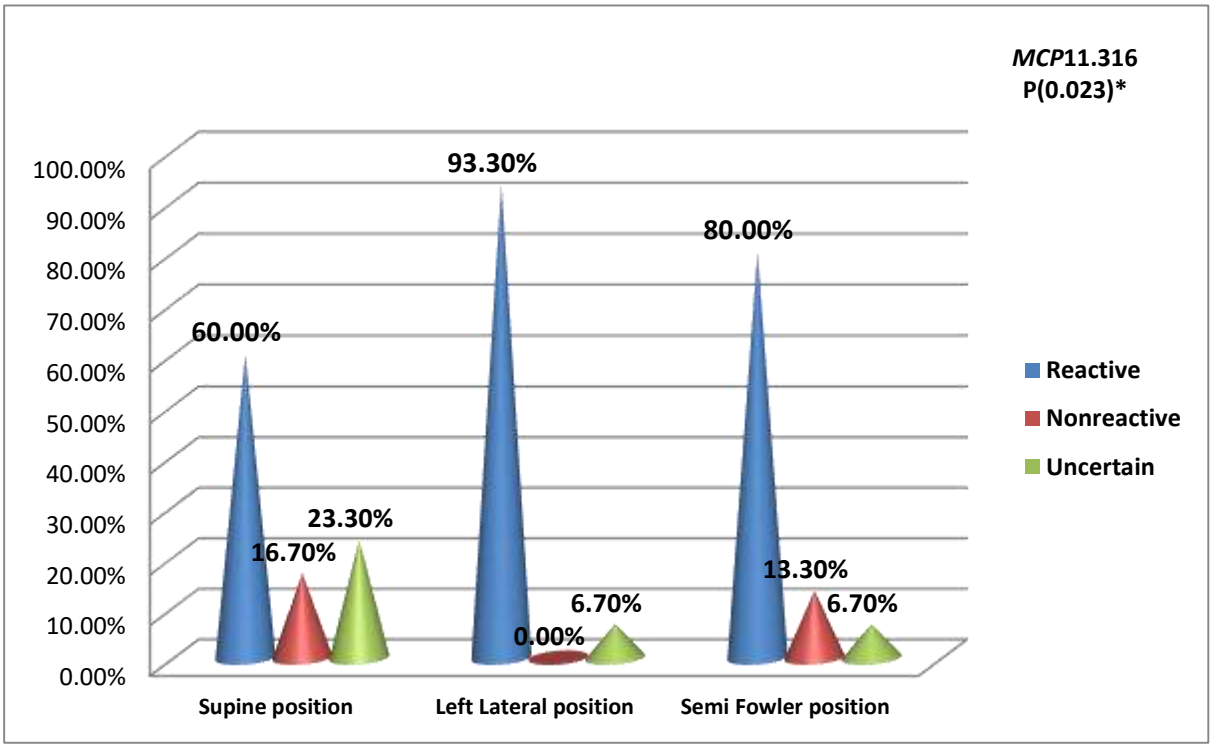
MCP: Mont Carlo exact probability

Table (II): Distribution of the study subjects according to components of non -stress test

Components of non -stress -test	Control group		Study groups				Total (n=90)		*Significant Test MCP* (P-value)
	Supine (n=30)		Study (1) Left Lateral (n=30)		Study (2) Semi Fowler (n=30)				
	No	%	No	%	No	%	No	%	
Basal line of fetal heart rate									
• Normal (120-160 b/m)	25	83.3%	30	100.0%	30	100.0%	85	94.4%	7.978 P(0.005)*
• Bradycardia (<120 b/m)	5	16.7%	0	0.0%	0	0.0%	5	5.6%	
Fetal variability									
• lack of variability	11	36.7%	2	6.7%	6	20.0%	19	21.1%	13.576 P(0.038)*
• Minimal variability (<5b/m)	10	33.3%	12	40.0%	6	20.0%	28	31.1%	
• Moderate variability (6-25b/m)	9	30.0%	13	43.3%	14	46.7%	36	40.0%	
• Marked variability (>25b/m)	0	0.0%	3	10.0%	4	13.3%	7	7.8%	
Mean number of Accelerations									
▪ Range	0-5		1-6		0-6		0-6		U=13.7 (0.001)*
▪ Mean ±SD	1.5 ±1.5		3.1 ±1.4		2.4 ±1.9		2.3 ±1.7		
▪ Median	1.0		3.0		2.0		2.0		
Mean number of fetal movements									
▪ Range	0-11		2-20		0-10		0-20		U=5.6 (0.058)
▪ Mean ±SD	3.4 ±3.0		5.9 ±4.4		4.3 ±3.4		4.5 ±3.8		
▪ Median	3.0		3.0		3.0		3.0		

MCP: Mont Carlo exact probability * P < 0.05 (significant)

Figure (I): Distribution of the study subjects according to results of non-stress test reactivity



MCP: Mont Carlo exact probability * P < 0.05 (significant

Table (III):Number and percent distribution of the study subjects according to their complains during non -stress test.

Women's complains	Control group		Study groups				Total (n=90)		*Significant Test MCP* (P-value)
	Supine (n=30)		Study (1) Left Lateral (n=30)		Study (2) Semi Fowler (n=30)				
	No	%	No	%	No	%	No	%	
None	1	3.3%	25	83.4%	17	56.7%	43	47.8%	49.307 P(0.001)*
Dyspnea	18	60.0%	4	13.3%	8	26.6%	30	33.3%	
Fainting	3	10.0%	0	0.0%	2	6.7%	5	5.6%	
Drowsy	5	16.7%	0	0.0%	0	0.0%	5	5.6%	
Headache	2	6.7%	1	3.3%	3	10.0%	6	6.6%	
Nausea & vomiting	1	3.3%	0	0.0%	0	0.0%	1	1.1%	

MCP: Mont Carlo exact probability * P < 0.05 (significant)

Table (IV): Distribution of the study subjects' discomfort level at the beginning & at the end of the NST test according to visual analog discomfort scale (VADS).

Groups	Level of discomfort	Discomfort at the beginning of the NST test		Discomfort at the end of the NST test		*Significant Test* (P-value)
		No	%	No	%	
Supine (Control) (n=30)	No discomfort	17	56.7%	2	6.7%	X^2=26.507 0.028*
	Mild	10	33.3%	3	10.0%	
	Moderate	3	10.0%	10	33.3%	
	Severe	0	0.0%	14	46.7%	
	Unbearable	0	0.0%	1	3.3%	
Left Lateral (Study (1)) (n=30)	No discomfort	19	63.3%	17	56.6%	X^2=56.58 0.086
	Mild	6	20.0%	9	30.0%	
	Moderate	3	10.0%	0	0.0%	
	Severe	2	6.7%	2	6.7%	
	Unbearable	0	0.0%	2	6.7%	
Semi Fowler (Study (2)) (n=30)	No discomfort	23	76.7%	14	46.7%	X^2=33.45 0.048*
	Mild	2	6.7%	7	23.3%	
	Moderate	5	16.6%	6	20.0%	
	Severe	0	0.0%	3	10.0%	
		MCP =9.634 P(0.088)		MCP =42.049 P(0.001)*		

X^2: Friedman test MCP: Mont Carlo exact probability * P < 0.05 (significant)

Table (V): Relationship between reactivity of non -stress test and subject's level of discomfort

Discomfort after position	Reactivity of non stress test								X^2(P)
	Reactive		Nonreactive		Uncertain		Total		
	Count	%	Count	%	Count	%	Count	%	
1) No discomfort	35	50.0	2	22.2	3	27.2	40	44.4	16.889 (.031*)
2) Mild	21	30.0	4	44.5	2	18.2	27	30.0	
3) Moderate	6	8.6	3	33.3	4	36.4	13	14.5	
4) Severe	8	11.4	0	0.0	2	18.2	10	11.1	
5) Unbearable	0	0.0	0	0.0	0	0.0	0	0.0	

X^2(P): Chi-Square Test &P for X2 Test * P < 0.05 (significant)

DISCUSSION

Non stress test (NST) is the most common and significant test performed for assessment of fetal well-being. NST is a simple and noninvasive method of assessing fetal wellbeing by observing the fetal heart rate (FHR) and it's acceleration in response to fetal movement. [(5)].

A Varity of positions can be used during non-stress test, such as semi fowler's, lateral tilts, lateral recumbency, supine and semi fowler's with tilts. It has been suggested that these positions optimize uterine perfusion and fetal heart rate patterns and prevent maternal hypotension [(13)].The present study aimed at determining the effect of different positions of pregnant women on their comfort and fetal cardiotocographic patterns during non-stress test

The present study revealed a statistically significant differences in the results of non-stress test reactivity among groups using supine , left lateral and semi -fowler positions. Where , the left lateral position was associated with more non stress test reactivity than semi –fowler and supine positions.

These findings are in congruent with the findings of other numerous researches. ***Elsayed and Mohamady(2016),*** who stated that the left lateral position gave significantly non stress test reactivity compared to semi –fowler and supine positions (p=0.000) [16]. ***Sekhavat and Tabatabaei (2014)*** , pointed out that supine position showed less fetal reactivity than left lateral position, the average time required to demonstrate a reactive NST was 10.62 minutes in left lateral and 15.48 minutes in the supine position [17]. ***Alus and Okum (2007),*** assessed the effect s of supine, left lateral , semi- fowler and sitting position on non -stress test and reported that there is statistically significant difference among the four groups in terms of reactivity where the supine position showed the least fetal reactivity [18]. ***Abitbol et al(2010)***, compared the supine and lateral decubitus positions for NST reactivity for both low and high-risk patients and found that preference of lateral decubitus position during the test reduced the percentage of false nonreactive NST results [19]. In agreement with the previous findings ***Nathan et al (2000)***, conducted a randomized-clinical trial to determine positional effect on the NST reactivity. They found that, in the semi-fowler position 34.6% showed no reactive NST compared to 45.7% in supine position [20]. Moreover, ***Khatib et al (2014)*** examined the effect of maternal supine position on umbilical and cerebral blood flow indices . They concluded that the supine position in late pregnancy, causing aortic and vena cava compression, leads to brain auto-regulation that activates the brain sparing effect in the fetus [21]. Such similarities among the results of the above mentioned studies could be attributed to what is elicited in the relevant literature which states that the supine position causes aortocaval compressions that affect maternal hemodynamic indices that cause redistribution of blood flow and non-reactive fetal heart rate. Meanwhile , left lateral and semi –fowler positions optimize uteroplacental perfusion and fetal heart rate patterns [13].

On the contrary with the present study results, ***Varsha and Pardip (2015)***, conducted a comparative study to assess the effect of different maternal positions on reactivity and time consumption for non -stress test and reported that there was no statistically significant difference between left lateral and sitting position [22]. ***Samuel and Karkada (2015)*** , concluded that the sitting position adopted for NST by antenatal women during their third trimester demonstrated a favorable materno-fetal physiological parameters than lateral position [23]. Moreover, ***Moffatt and Van (1997),*** found no difference between semi-Fowler's left or right lateral positions in

terms of NST reactivity rate and time to achieve a reactive NST [24]. Furthermore, the present results are in contrast with the results reported by ***Moghadam and Mirsaeed (2009)*** , who had studied the non -stress test results on both the left-side and half-sitting position in high-risk pregnant women and concluded that in semi-sitting position the NST was reactive and the uncertain and false abnormal results were less than left lateral position[25].

This discrepancy between the present study results and the results of mentioned studies may be attributed to the difference of maternal 'positions used in each research and the nature of the study subject. While in ***Varsha and Pardip (2015)and Samuel and Karkada (2015)*** , examined sitting and left lateral position. ***Moffatt and Van (1997***) and ***Moghadam and Mirsaeed (2009)*** ,conducted the study on high risk pregnant women with hypertension , diabetes mellitus and others but in the current study these subjects were excluded [22-25]***.***

Also, this finding is not in agreement with ***Lorzadeh and Kazemirad (2011),*** who found that there was a relation between maternal position and non-stress test results and there were more reactive results in semi fowler position ***[26]***.This contraindication may be attributed to the method of data collection. ***Lorzadeh and Kazemirad (2011),*** collected data by putting the women in semi fowler position for 10 minutes and then in left lateral position for 10 minutes but in the current study each position was used separately .

Concerning, components of non-stress test, ***basal line fetal heart rate*** which is considered an important index of fetal well-being especially during the third trimester of pregnancy.

The results of the current study revealed that there was a significant difference in basal line fetal heart rate between supine , semi- fowler and left lateral positions. Where, all women in study groups (left lateral and semi – fowler) had normal basal line fetal heart rate (120-160 b/m) compared to 16.7% of women in supine position had fetal bradycardia (<120 b/m) . These can be explained by the fact that pressure of inferior vena cava and pelvic veins of enlarged uterus during the supine position cause a decrease in venous return and leading to less placental perfusion and lower fetal heart rate [22].

The current finding is similar to the study conducted by ***Stone and Burgess (2016)***, about the effect of maternal position on fetal behavioral state and heart rate variability in healthy late gestation pregnancy. They found that there was a significant association between maternal position and the mean of fetal heart rate. The measures of heart rate were reduced in both semi-

recumbent and supine positions. [27].The present findings are also in agreement with ***DiPietro et al (2007)***, where they assessed fetal responses to induced maternal relaxation during pregnancy . The study indicated that the initial decline in FHR is the result of maternal recumbence position[28].

However , these findings are partially in accordance with the findings of , ***Elsayed and Mohamady(2016),*** who reported a significant difference in basal line fetal heart rate between supine , semi- fowler and left lateral positions during non stress test. However , the basal line fetal heart rate varied between the three groups ,where all studied women had normal basal line fetal heart rate[16].

Also, the present findings are partially in accordance with ***Varsha and Pardip (2015)***,who revealed that there was a significant difference in basal line fetal heart rate between left lateral and sitting positions where, it ranged from 131 to 145 b/m among two groups[22] and ***Pandy and Magon (2015) ,*** mentioned that the basal line fetal heart rate should be within normal range 110 to 160 b/m [29] .

Concerning ***the mean number of acceleration,*** the present study reported a highly significant difference between supine , semi- fowler and left lateral positions. The mean number of acceleration was higher(3.1 ±1.4) among the study group assumed left lateral position followed by semi – fowler (2.4 ±1.9) and finally supine position (1.5 ±1.5). These findings are supported by ***Elsayed and Mohamady(2016),*** who found that the number of acceleration was significantly higher in left lateral position than semi-fowler and supine positions[16] .

On the other hand, ***Samuel and Karkada (2015)*** , no significant difference was found between left lateral and sitting position in relation to the mean of acceleration[23 . This contraindication may be explained by the fact to the difference of maternal positions used , ***Samuel and Karkada (2015)*** , examined sitting and left lateral positions but in the current study examined left lateral, supine and semi-fowler positions.

The present study also revealed that ***the mean number of fetal movements*** perceived by the women in left lateral position was higher than supine and semi-fowler positions with no statistically significant difference. these results are in line with that reported by ***Elsayed and Mohamady(2016),*** where they denoted that the higher number of fetal movements was

perceived by the women in left lateral position than supine and semi-fowler position[16] . In accordance with this result is ***Cito (2005)***, they had studied the effect of maternal position during non- stress test and fetal heart rate patterns. Their result indicated that the number of fetal movements perceived by the mother was greater in left lateral position than walking and sitting position [30].

Regarding ***fetal variability*** , the present study revealed that there was statistically significant difference between three positions, left lateral provided more fetal variability followed by semi fowler position in comparison with supine position. This finding is similar to ***Elsayed and Mohamady(2016)***,who found that all (100%) the women in left lateral position had average variability followed by semi fowler(98.6%) and finally supine(97.2%) positions[16] .

Specifically speaking about maternal discomfort, more than two – fifths of women used supine position felt severe discomfort followed by semi-fowler position while, left lateral position provided the least discomfort for the women. These results are supported by ***Elsayed and Mohamady(2016),*** who reported that about two –thirds of the studied women felt severe discomfort in supine position compared to left lateral and semi-fowler positions[16] .

These findings are consistent with ***Sekhavat and Tabatabaei (2014)*** , who found that 16.43% of women were uncomfortable in left lateral position during NST compared to 67.86% in supine position[17]. As well, ***Kaur and Saha(2015)***, reported that 65% of pregnant women reported to be comfortable in left lateral position ,whereas only one –fourth of them supported sitting position[31].

Also, this finding is in agreement with ***Alus and Okum (2007),***who had studied the effects of different maternal positions on non -stress test results and the preference of mothers for different positions, they elaborated that the supine position was the least comfortable position for the pregnant women during non -stress test[18], and ***Cabanies and Ross (2010***), reported the same results [32] .

Moreover, ***Varsha and Pardip (2015) ,*** who conducted a comparative study to assess the effect of different maternal positions on reactivity and time consumption for non -stress test, they found that in terms of comfort, pregnant mothers reported to be more comfortable in left lateral position. Hence it is recommended that left lateral position should be incorporated during non -

stress test which could decrease need for prolonged monitoring thus lead to time effective evaluation [22].

Simultaneously, this result contradict with the findings of ***Moghadam and Mirsaeed (2009)***, they had evaluated the effect of non- stress test results on both left side and half- sitting position in high risk pregnant women. They found that 55.2% of pregnant women felt more comfortable in semi sitting position rather than the left side (44.8%)[25].

CONCLUSION& RECOMMENDATIONS

CONCLUSION

It can be concluded from the present study that the hypothesis

(1) is accepted and hypothesis (2) is rejected because:-

Left lateral position adopted for non-stress test by the pregnant women during their third trimester demonstrate favorable maternal comfort than semi fowler and supine positions. Left lateral and semi fowler positions provided more non stress test reactivity than supine position. There was a significant differences in components of non-stress test (basal line fetal heart rate, fetal variability and mean number of acceleration) and supine , semi- fowler and left lateral positions, where the left lateral position provided normal and effective component of non-stress test followed by semi fowler and supine positions. Higher number of fetal movements was perceived by the women in left lateral position than semi fowler and supine positions. Pregnant women were comfortable in left lateral position than in semi fowler and supine positions, and pregnant women placed in supine position during NST reported physical complains as dyspnea and drowsiness.

RECOMMENDATION

Based on the findings of the present study, the following are recommended:-

Integrating non – stress test into nursing student's curriculum.

Non- stress test applications should be standardized to eliminate variations in practice among healthcare providers.

A simple protocol for NST application need to be developed to be followed during the test which should include the following:-

-The preference of the pregnant women's position should be determined before non- stress test to minimize discomfort.

- Left lateral position and semi-fowler positions should be encouraged as alternative positions during non- stress test.

- Workshops about interpretation of non – stress test for nursing staff should be considered.

Future researches

- Effect of the training programs regarding protocol for non-stress test on knowledge of health care providers especially staff nurses.
- Replication of the study on a large sample, using different maternal positions and different settings for generalizing the findings.

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