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Characterization of Fetal Nuchal Translucency Thickness using Ultrasonography

وصف سمك الشفافية القفوية للجنين باستخدام التصوير بالموجات فوق الصوتية

A thesis Submitted for Partial Fulfillment for The Requirement of (M.Sc) Degree in Medical Diagnostic Ultrasound

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الآية

بِسْمِ اللَّهِ الرَّ حمْنِ الرحِيم

قال الله تعالى:

(اقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ (1) خَلَقَ الإِنْسَانَ مِنْ عَلَقٍ(2) اقْرَأْ وَرَبُّكَ الأَكْرَمُ(3) الَّذِي عَلَّمَ بِالْقَلَمِ(4) عَلَّمَ الإِنْسَانَ مَالم يعلم(5)).

صدق اللهالعظيم

سورة العلق الآيات(5-1)

Dedication

To,

My parents...

My sons...

My brothoers and sisters...

My friends and collegues…

Acknowledgment

First of all, I thank Allah the Almighty for helping me complete this project.I thank Dr. Babiker Abdu Alwahab ,my supervisor, for his help and guidance. Iwould like to express my gratitude to the collegues in Ultrasound Unit in Elsaudi hospital and Bashaaier hospital for their great help and support. I am greatly indebted to my parents, my sons ,my brothers and my sisters for bearing with me during the past several months. I would like to express my special and grate thanks to my dear eldest son ,Bashar for his help in designing the research. Finally I would like to thank everybody who helped me prepare and finish this study.

Abstract

This is a crossectional descriptive study which was done during june- 2018 to December -2018 and was carried out in(Elsaudi hospital and Bashaier universal hospital) Khartoum-Sudan.

The study discusses the characterization of fetal nuchal translucency thickness in Khartoum state. Atotal of 60 pregnant women were selected with age range 18-40 year and gestational age fetus range 11-14 weeks.any pregnant women with fetus gestational age less or more than this age were excluded. All of them were subjected to be examined by ultrasound scanning using fukuda denshi and sonoscape scanners with 3.5 megahertz probe. Transabdominal scanning were performed for all 60 pregnant women to measure nuchal translucency thickness and different other variables which were gestational age , crown rump length and amniotic fluid , data was collected using data collection sheet and for data analysis ,statistical package for social sciences (spss) was used. significance tests and correlation between variables was done. The study showed that the age range of women under study was 18-40 years with mean age 28.47 years. The total of them were 1-9 gravida with mean 3.32. crown rump length range 32.6-70.5 millimeter with mean 52.118 millimeter. gestational age took at 11.00 -14.00 week with mean 12.0738 week . nuchal translucency thickness range were 1.1-2.6 millimeter with mean1.795 millimeter. The study found that there was weak linear association between gestational age, crown rump length ,gravida and nuchal translucency, R2= o.02 and no significant correlation was found between them when

P>0.05. The study found that there was weak linear association between nuchal translucency thickness and maternal age when R2=0.12(for every year nuchal translucency increased o.17 millimeter), but there was moderate significant correlation between maternal age and nuchal translucency when $P < 0.01$ and $R = 0.35$.

in addition to that amniotic fluid the study found that, 100 percent have average amniotic fluid ,so no relation between and nuchal translucency. The study recommended that Pregnant women in different ages must do ultrasound scanning routinely and nuchal translucency thickness should be taken as a routine measurement for all pregnant women with pregnancy gestational age 11-14 weeks to exclude any chromosomal abnormalties ,also more care and followup should be done for pregnant women in advance ages above 35 years.

Lastly, the study put recommendation for further studies to be carried out in this field on many aspects such as increasing the sample volume or by taking big sample that concentrate on pregnant women in advance age above 35 years.

المستخلص

هذه الدراسة وصفية اجريت في الفترة من يونيو 2018 الى ديسمبر 2018 في كل من المستشفى السعودي و مستشفى بشائر الجامعي بولاية الخرطوم جمهورية السودان.

ناقشت الدراسه وصف سمك الشفافية القفوية للجنين في ولاية الخرطوم.

هناك 60 امرأه حامل تم اختيارهن تراوحت اعمارهن بين 18 و 40 سنه في الفترة من الاسبوع الحادي عشر الى الاسبوع الرابع عشر من عمر الحمل .تم استبعاد اي امراه حامل في عمر انغراس اقل او اكثر من هذا العمر.كل العينه المختاره تم فحصها بالموجات فوق الصوتيه باستخدام ماسحات فوكودا دينشي وسونوسكيب بطاقه مقدارها 3.5 ميقاهرتز. تم المسح عن طريق البطن وتم اخذ قياسات دقيقه لسمك الشفافية القفوية للاجنه بالاضافه الي قياسات اخرى تتمثل في طول تاج الردف و عمر الحمل والسائل الأمنيوني.تم جمع البيانات بواسطة ورقة تجميع البيانات وتم تحليلها بواسطة برنامج الحزم الاحصائيه للعلوم الاجتماعيه

باجراء اختبارات الأهميه والعلاقات بين المتغيرات. اوضحت الدراسه ان عمر النساء الحوامل اللائي تم اختيارهن تتراوح بين 18-40 سنه بمتوسط عمر 28.47 سنه و قد سبق لهن الحمل 1-9 مرات بمتوسط 3.32. طول تاج الردف تراوح بين 32.6-70.5 مم بمتوسط طول 52.118 مم وكان عمر الانغراس بين 11-14 اسبوع بمتوسط 12.0738 اسبوع. تراوح سمك الشفافيه القفويه بين 1.1-2.6 مم بمتوسط 1.795 مم . وجدت الدراسه ان هناك علاقه خطيه ضعيفه بين كل من عمر الانغراس,طول تاج الردف وعدد مرات الحمل و بين سمك الشفافيه القفويه وليس هناك علاقه هامه بينهم عندما . $R = 0.02,\ P > 0.05$، ايضا الدراسة وجدت ان هناك علاقه خطيه ضعيفه بين سمك الشفافيه القفويه و عمر المرأه الحامل عندما. (لكل سنه يزيد السمك بمقدار 0.1 7مم)$R2 = 0.12$ لكن وجدت الدراسه ان هناك علاقه هامه و معتدله بينهما عندما كان $R = 0.35$. و$P < 0.01$

بالاضافه لذلك وجدت الدراسه ان كل العينه لديها قياس متوسط من السائل الامنيوني لذلك فانه ليس هناك علاقه بينه وبين سمك الشفافيه القفويه.

اوصت الدراسه بان جميع النساء الحوامل في مختلف الأعمار يجب ان يتم لهن عمل مسح بالموجات فوق الصوتيه دوريا و ان سمك الشفافيه القفويه يجب ان يؤخذ كقياس روتيني لجميع الحوامل خلال فترة عمر الحمل 11-14 اسبوع و ذلك لاستبعاد اي اختلالات كروموزوميه مع اعطاء المزيد من المتابعه والاهتمام بالنساء الحوامل في سن متقدمه فوق سن 35 سنه.

اخيرا اوصت الدراسه بعمل المزيد من الدراسات في هذا الحقل من عدة جوانب اخرى كزيادة حجم العينة او باخذ عينه يتم التركيز فيها على الحوامل في سن متقدمه فوق سن 35 سنه.

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Abbreviations

Abbreviation	Meaning
NT	Nuchal Translucency
HCG	Human Chorionic Gonadotrophin
PAPP-A	Pregnancy Associated Plasma Protein-A
CRL	Crown Rump Length
U/S	UltraSound.
GA	Gestational Age
MM	millimeter
UK	United Kingdom
NCS	National Screening Comitte
MHz	Meg a Hertz
HT	Hypertension
DM	Diabtus Mellitus
AF	Amniotic Fluid

Chapter One

Introduction

1.1 Introduction:

The nuchal translucency (subcutaneous) is fluid found at the back of fetus head and neck, between the skin and soft tissue just beneath the skin posterior to the cervical spine. The thickness of this fluid can be precisely measured and this is called the nuchal translucency (or NT) measurement. Normally the amount of fluid is small, producing a thin NT measurement. We know that the amount of fluid can increase in the presence of certain conditions, producing a thicker NT measurement the scan done between 11 weeks and 14 weeks of pregnancy or when the fetus measures between 45 mm (1.8in) and 84mm (3.3in). nuchal scan or nuchal translucency (NT) scan/procedure is a sonographicprenatal screening scan to detect abnormalities in a fetus, though altered extracellular matrix composition and limited lymphatic drainage can also be detected (Since chromosomal abnormalities can result in impaired cardiovascular development (Callen peter w etal.,2014). A nuchal translucency scan is used as a screening, rather than diagnostic tool for conditions such as down syndrome, and non-chromosomal abnormalities, including the genetic Di George syndrome and non-genetic Body-stalk anomaly. as nuchal translucency size increases, the chances of a chromosomal abnormality and mortality increase; 65% of the largest translucencies (>6.5mm) are due to chromosomal abnormality, while fatality is 19% at this size (SoukaAP etal., 2002). All women, whatever their age, have a small risk of delivering a baby with a physical or cognitive disability. The nuchal scan helps physicians estimate the risk of the fetus having down syndrome or other abnormalities more accurately than by maternal age alone. Nuchal scan (NT procedure) is performed between 11 and 14 weeks of gestation, because the accuracy is best in this period. The scan is obtained with the fetus in sagittal section and a neutral position of the fetal head (neither hyperflexed nor extended, either of which can influence the nuchal translucency thickness). The fetal image is enlarged to fill 75% of

the screen, and the maximum thickness is measured, from leading edge to leading edge. It is important to distinguish the nuchal lucency from the underlying amniotic membraneNormal thickness depends on the crown-rump length (CRL) of the fetus. Among those fetuses whose nuchal translucency exceeds the normal values, there is a relatively high risk of significant abnormality(Borrel A etal .,2004).

1.2 Problem Statement:

abnormal thickness of fetal nuchal translucency is indication for risk of such types of chromosomal anomalies where the trisomy 21(down syndrome) which has association with maternal age is the most common.

1.3 Objectives :

1.3.1General Objective:

To detect whether there is correlation between fetal nuchal translucency thickness and maternal age in Khartoum state.

1.3.2 Specific objectives:

- To measure the fetal nuchal translucency thickness in 11-14 weeks gestational age in the study population inKhartoumState and to detect whether there is relation between the measurement and maternal age.
- To measure crown rump length.
- To detect other factors that affect nuchal translucency measurement.
- To find significant difference in nuchal translucency measurement in the study population.

1.4 Significance of the study:

An increase NT thickness is a marker of a high-risk pregnancy even in karyotype normal fetuses. In addition, the increased incidence of structural abnormalities ,so routine antenatal screening can make the close follow-up of these pregnancies .

1.5 Overview of the study:

This study will falls into five chapters ,with chapter one is an introduction which include background about this study as well as problem of the study,objective and significance of study.whilechapter tow which include embryology, anatomy ,pathophysiology and literature review,it will present previous study that carried out by the scholar in the field of this study,Chapter three will present material used to collect the data and technique followed to accrue the collecteddata,chapter four include data presentation that illustrated in tables and figure.Finally chapter five will include discussion of the illustrated results,conclusion of the study and recommendation.

Chapter Two

Literature Review

2.1 Embryology and anatomy:

The embryo is first seen on transvaginal ultrasound as a focal thickening ontop of the yolk sac giving the appearanceof a “diamond engagement ring”at around the 5th menstrual week. First cardiac activity should be seen at 6to 6.5 weeks. The embryo can be recognized byhigh resolution transvaginal ultrasound at the 2-3mm length sizebut cardiac activity can be consistently seen when the embryo reaches a -7mm in length or greater(Clark EP etal ,.2005) Cardiac rhythm increases rapidly in early gestation being around 100-115 before 6 weeks, rising to 145-170 at 8 weeks and dropping down to a plateau of 137 to 144 after 9 weeks gestation.The size of the embryo increases rapidlybyapproximately 1mm per day in length. The measurement of the length of the embryo,referred to as the Crown-Rump-Length (CRL), is reported in millimeters, Gestational sac at 7 weeks gestation. The amniotic sac is seen as a thin reflective circular membrane. The yolk sac and vitelline duct areseen as extra-amniotic structures.It is the longest distance in a straight line from the cranial to the caudalend of the body and is the most accurate assessment for pregnancy dating.Recent studies suggestthat it is prudent to use acutoff of ≥7 mm(rather than ≥5 mm) for CRL with no cardiac activity for diagnosingfailed pregnancy. This would yield a specificity and positive predictivevalue at (or as close as can be determined) to 100%. Since cardiac activity is usually visible as soon as an embryo is detectable.the finding of no heartbeat with a CRL <7 mm is suspicious, though not diagnostic, for failed pregnancy(Callen Peter W etal ,.2014).

Note that the embryo develops within the amniotic cavity and is referred to as intraamniotic whereas the yolk sac is outside of the amniotic cavity and is referred to as extraamniotic.The fluid that the yolk sac in embedded into is the extra embryonic coelom.

The appearance of the embryo on ultrasound changes from 6 weeks to 12 weeks gestation. At 6weeks gestation, the embryo appears asa thin cylinder with no discernible body parts(the grain of rice appearance) (Syngelaki A etal ,.2011).

As gestational age advances, the embryo develops body curvature and clear delineation on ultrasound of a head, chest, abdomen and extremities(the gummy-bear appearance).Close observation of anatomic details on transvaginal ultrasound at or beyond 12 weeks gestation may allow for the diagnosis of major fetal malformations.

Normally the amount of fluid is small, producing a thin NT measurement. We know that the amount of fluid can increase in the presence of certain conditions, producing a thicker NT measurement (Nevo O etal,.2012).

2.2 Pathophysiology:

2-2-1 Down's syndrome:

Overall, the most common chromosomal disorder is down syndrome (trisomy 21). The risk rises with maternal age from 1 in 1400 pregnancies below age 25, to 1 in 350 at age 35, to 1 in 100 at age 40 . down syndrome is the second most common chromosomal abnormality associated with increased nuchal translucency, after Turner syndrome (45,X)(Nevo O etal,.2012).

Until recently, the only reliable ways to determine if the fetus has a chromosomal abnormality was to have an invasive test such as amniocentesis or chorionic villus sampling, but such tests carry a risk of causing a miscarriage estimated variously as ranging between 1%or 0.06% (Lee P etal ,.2003) Based on maternal age, some countries offer invasive testing to women over 35; others to the oldest 5% of pregnant women Most women, especially those with a low risk of having a child with Down syndrome, may wish to avoid the risk to the fetus and the discomfort of

invasive testing. In 2011, Sequenom announced the launch of MaterniT21, a non-invasive blood test with a high level of accuracy in detecting Down syndrome (and a handful of other chromosomal abnormalities). As of 2015, there are five commercial versions of this screen (called cell-free fetal DNA screening) available in the United States (Syngelaki A etal ,.2011).

Blood testing is also used to look for abnormal levels of alphafetoprotein or hormones. The results of all three factors may indicate a higher risk. If this is the case, the woman may be advised to have a more reliable screen such as cell-free fetal DNA screening or an invasive diagnostic test such as chorionic villus sampling or amniocentesis(Driscoll DA etal ,.2009).

Screening for Down syndrome by a combination of maternal age and thickness of nuchal translucency in the fetus at 11–14 weeks of gestation was introduced in the 1990s. This method identifies about 75% of affected fetuses while screening about 5% of pregnancies. Natural fetal loss after positive diagnosis at 12 weeks is about 30% (Callen Peter W etal ,.2014).At 11—14 weeks of gestation the fetal nasal bone is cannot be visualized by ultrasound in about 60—70% of fetuses with trisomy 21 and in less than 3% of chromosomally normal fetuses (Orlandi F etal,. 2003).

The relationship of increased NT and absence of fetal nasal bone has been coined as an ultrasonic screening tool during the first-trimester but adequate visualization of the nasal bone needs expertise and correct technique. A study of 701 fetuses with increased NT evaluated the existence of fetal nasal bones and reported that a nose bone could not be visualized in 73% of DS fetuses (43 of 59) and in only 0.5% of unaffected fetuses (three of 603) (Cicero S etal ,. 2011). This report was challenged by Hutchon et al. who described a series of five consecutive cases of DS with clearly visible nasal bones . More evidence-based studies are needed to validate the importance of absent nasal bone as a screening marker for DS (Ghi T etal ,.2010).

First trimester screening holds the promise of improved detection rates with lower false-positive rates. Serum, Urine and Ultrasound Screening Study (SURUSS) and First and Second Trimester Evaluation of Risk for Fetal Aneuploidy (FASTER) trials for the first time have allowed accurate comparison of currently available DS screening approaches in prospective studies of large populations (D'Alton M etal 2005) .

2-2-2 Nuchal translucency and cardiac anomalies:

The emerging effects and possible pathogenic mechanisms of enlarged NT include fetal heart failure secondary to a cardiac defect, anemia, infection, inappropriate expression of atrial natriuretic peptide; abnormal extracellular matrix; or abnormalities of lymphatic structure and drainage (Clark EP etal ,.2005) .`Enlarged NT leads to lymphatic obstruction which in its most severe form results in cystic hygroma. A cystic hygroma is a fluid-filled multi-septated cyst or cysts that arise from the back of the neck. When an enlarged NT or small cystic hygroma resolves before birth, the infant may be left with a webbed neck. Clark ,2005 reported a strong association between webbed neck and coarctation of the aorta in infants with Turner syndrome. In two reports including 205 Turner's cases, infants were found to have webbed neck at birth, were 8 times more likely to have a congenital cardiac defect, especially aortic coarctation, than those without neck webbing. The reported association between NT-webbed neck and cardiac anomalies, both in fetuses with a variety of genetic syndromes and in euploid fetuses, points to the possibility of an established relationship. The lymphatic obstruction that leads to an enlarged jugular lymph sac could also cause lymph to accumulate in the thoracic duct. Due to its anatomical location, in the thoracic cavity, the enlarged thoracic duct might exert pressure on or displace the heart, causing obstruction of blood flow through the cardiac chambers, and leading to abnormal (inadequate) growth of certain cardiac

structures. Cardiac anomalies believed to result from such abnormal intracardiac blood flow include aortic coarctation and hypoplastic left heart (Simpson J etal ,.2002)Currently, screening by fetal echocardiography is offered to the fetus following the observation of an NT of 3.5 mm or more (Driscoll DA etal ,.2009).The cost-effectiveness of offering fetal screening echocardiography at NT measurements of 2.5 to 3.4 mm has not been established.

There is growing body of evidence that patients with increased fetal NT and normal karyotype are at higher risk of adverse outcome, cardiac or otherwise (Sairm S etal ,.2012) .Cardiovascular anomalies are the most frequently encountered defects in chromosomally normal fetuses with increased NT. Based on such findings, early fetal echocardiography and anomaly scan should be considered in these fetuses. Patients also need to be informed, that in the presence of increased NT and a normal anomaly scan and fetal echo by 21—23 weeks, there is a 95% chance of a good outcome (Mogra R etal ,.2012).

2-2-3 Nuchal translucency and other anomalies:

Enlarged NT has been reported with other structural anomalies, including diaphragmatic hernia, exompholos, body stalk anomaly, fetal akinesia syndrome, skeletal dysplasias, various multiple anomaly syndromes, and fetal loss Keeping in view the published literature about the associations of enlarged NT, the euploid should also be evaluated by targeted second trimester ultrasound examination .An increased NT has been associated with parvovirus infection(Driscoll DA etal ,.2009). If increased NT leads to signs of fetal hydrops at 20 to 22 weeks, parvovirus screening is recommended, in addition to evaluating the standard infections associated with fetal hydrops, such as toxoplasmosis and cytomegalovirus (Goetzl L etal,.2010).

Associations of increased NT have also been described with cerebral hypoplasia, facial cleft, spine disorganization ,hydrops,hepatomegaly growth retardation and skin edema (Westin M etal ,.2006)

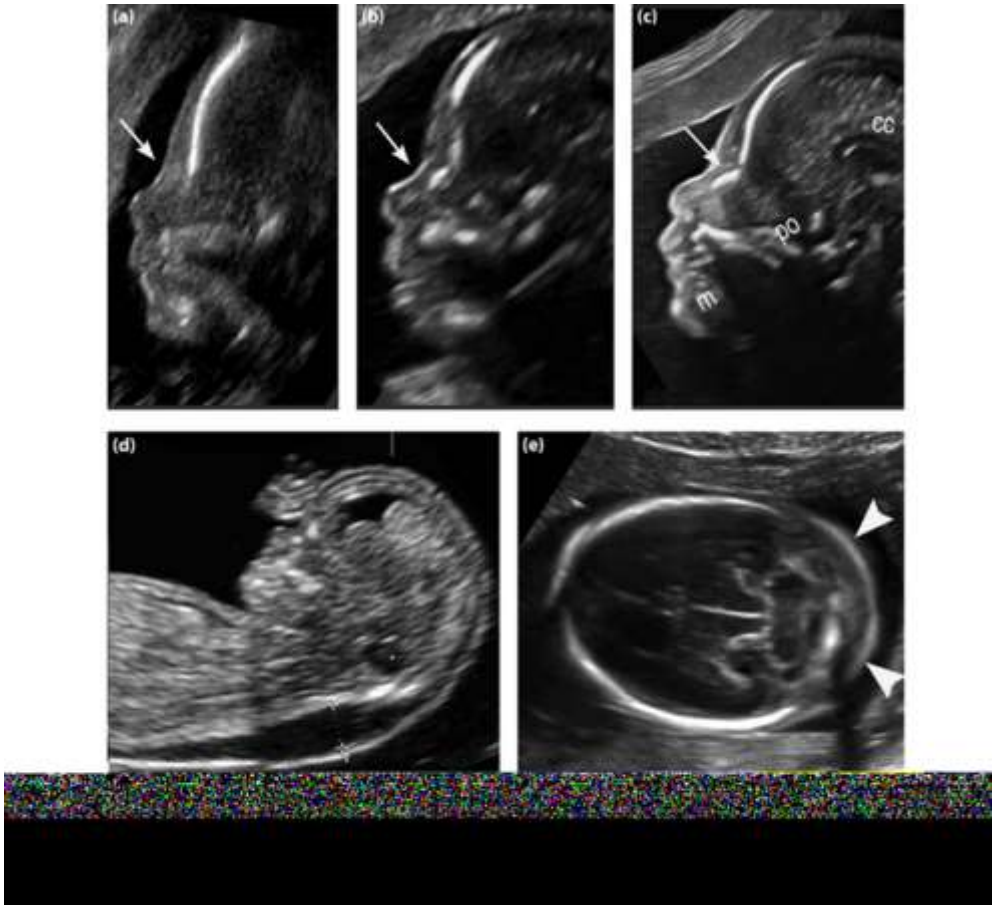

Figure (2. 1) show abnormal NT thickness and other chromosomal defects (Rumack)

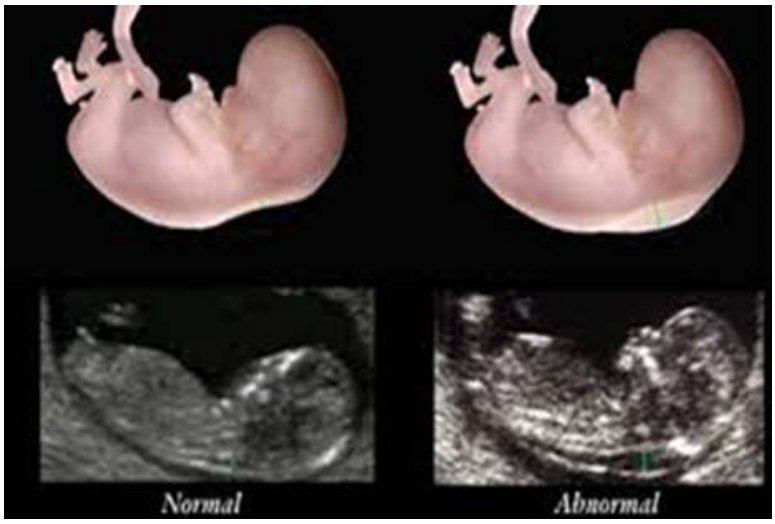

Figure (2. 2) show normal and abnormal nuchal translucency thickness

2.3 Previous studies:

Brizot et al concluded on their study that the incidence of trisomies 21, 18, or 13 was 18% (102 of 560 cases) and was significantly associated with both maternal age (r = 0.97) and fetal nuchal translucency thickness (r = 0.75).(

Snijders etal, on their study reported the estimated trisomy-21 risk, from maternal age and fetal nuchal-translucency thickness, was 1 in 300 or higher in 7907 (8·3%) of 95 476 normal pregnancies, 268 (82·2%) of 326 with trisomy 21, and 253 (77·9%) of 325 with other chromosomal defects. The 5% of the study population with the highest estimated risk included 77% of trisomy-21 cases.

Study appears in The Harris Birthright Research Centre for Fetal Medicine, King's College Hospital, London.(Fetal nuchal translucency: ultrasound screening for chromosomal defects in first trimester of pregnancy) done by K H Nicolaides, GAzar, D Byrne,C Mansur, K Marksdone They conclude that Fetal nuchal translucency >3 mm isa useful first trimester marker for fetal chromosomal abnormalities.

Study done by Szabó et al; (An ultrasound marker for fetal chromosomal abnormalities. The measurement of nuchal translucencyin a South American population) which showed a high degree of accuracy in screening overall chromosomal abnormalities and even higher accuracy for trisomy 21. The best cutoff point obtained for nuchal translucency was values 2.5 mm.

Study done by Niemimaa M, SuonpääM, Perheentupa A, Seppälä M, Heinonen S, Laitinen concluded that the first trimester ultrasound screening based on measurement of nuchal translucency seems to decrease less the live born incidence of Down's children, compared with the second trimester maternal serum double screening, when the detection rate of the methods is similar. There is a concern that NT screening identifies preferentially those DS fetuses which are destined to miscarry.

The study done in sudan by Fatima omer in 2015 put result that the age is most risk factor of down syndrome.

This study done by fatima shams eldin in sudanfound that the mean NT thickness in Sudanese population is 2-3mm.

Fatima Omer (2015) on her study in sudanreported that,U/S scanning is a good diagnostic tool for screening and diagnosing the anomaly related to down syndrome and more accurate than lab investigation in showing dilatation of nuchal translucency NT measurements, (The accuracy of U/S in prediction of Down'ssyndrome is 79%, and the accuracy of lab investigation is 59.3%.

Chapter Three

Material and Method

3.1 Material:

3.1.1 Type of the study and subject

This prospective study about correlation between fetal nuchal translucency thickness and maternal age in Khartoum including 60 pregnant women with gestation between 11 and 14 weeks conducted at Elsuadi hospital and Bashaier hospital.. The exclusion from this study are pregnant with gestation less than 10 weeks and more than 14 weeks and CRL less than 45mm.

3.1.2 Machine : Caliprated ultrasound machines used to conduct the exams with curvelinear scan probe with scan frequency of 3.5-5 mega Hertz (MHz) ,figures (3-1) and (3-2).

3.2Method:

3.2.1 Technique:

The exam was done with the maternal supine on the couch. The scan is obtained with the fetus in sagittal section and a neutral position of the fetal head (neither hyperflexed nor extended, either of which can influence the nuchal translucency thickness).

3.2.2 Image presentation and measurement:

The fetal image is enlarged to fill 75% of the screen, and the maximum thickness is measured, from leading edge to leading edge. It is important to distinguish the nuchal lucency from the underlying amniotic membrane.fetal nuchal translucency obtainedand compared with the maternal age to determine if any correlation.also other different variables were compared.

The Protocol for measurement of nuchal translucency:

1.The gestational period must be 11 to 13 weeks and six days.

2.The fetal crown-rump length should be between 45 and 84 mm.

3.The magnification of the image should be such that the fetal head and thorax occupy the whole screen.

4.A mid-sagittal view of the face should be obtained. This is defined by the presence of the echogenic tip of the nose and rectangular shape of the palate anteriorly, the translucent diencephalon in the Centre and the nuchal membrane posteriorly. Minor deviations from the exact midline plane would cause non-visualization of the tip of the nose and visibility of the zygomatic process of the maxilla.

5.The fetus should be in a neutral position, with the head in line with the spine. When the fetal neck is hyperextended the measurement can be falsely increased and when the neck is flexed, the measurement can be falsely decreased.

6.Care must be taken to distinguish between fetal skin and amnion.

7.The widest part of translucency must always be measured.

8.Measurements should be taken with the inner border of the horizontal line of the aliplacedonthe line that defines the nuchal translucency thickness –the crossbar of the caliper should be such that it is hardly visible as it merges with the white line of the border, not in the nuchal fluid.

9.In magnifying the image (pre or post freeze zoom) it is important to turn the gain down. This avoids the mistake of placing the

Caliper on the fuzzy edge of the line which causes an underestimate of the nuchal measurement.

10.During the scan more than one measurement must be taken and the maximum one that meets all the above criteria should be recorded inthe database.

11.The umbilical cord may be round the fetal neck in about 5% of cases and this finding may produce a falsely increased NT. In such cases, the measurements of NT above and below the cord are different and, in the calculation of risk, it is more appropriate to use the average of the two measurements.

fetal nuchal translucency obtained and compared with the maternal age to determine if any correlation.also other different variables were compared.

3.2.3 Statistic study:

Data was collected and data analysis carried out using statistical programmecalled Statistical Package for Social Sciences (SPSS).

3-2-4 Ithical consideration:

Informed consent obtained from the patients before the exam with considering of patient privacy.

Chapter Four

Results

The Results

Table (4. 1)frequency distribution of pregnant women age:

Age	Frequency	Percent	Valid Percent	Cumulative Percent
18-25 years	23	38.3	38.3	38.3
26-33 years	21	35.0	35.0	73.3
34-40 years	16	26.7	26.7	100.0
Total	60	100.0	100.0	

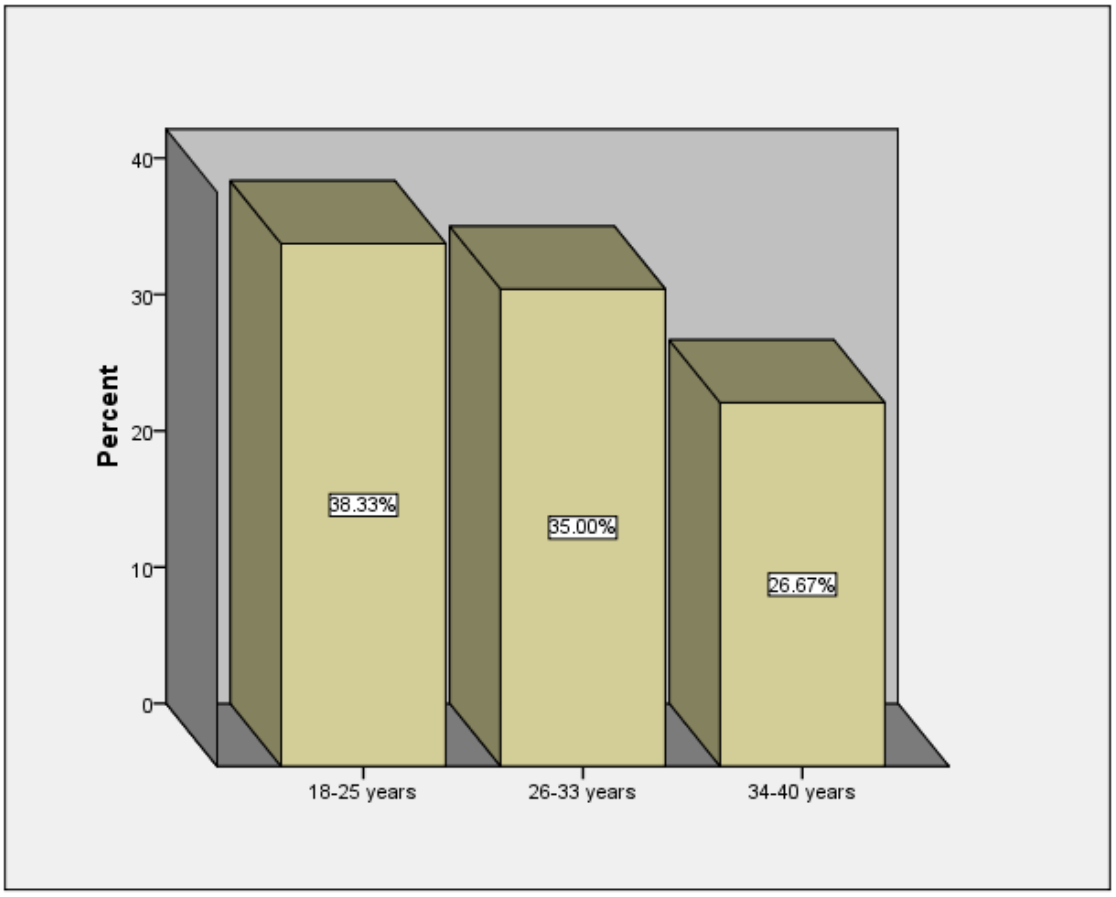

Figure (4. 1)frequency distribution of pregnant women age

Table (4. 2) frequency distribution of number of previous abortion

No of previous abortion	Frequency	Percent	Valid Percent	Cumulative Percent
1	12	20.0	20.0	20.0
2	7	11.7	11.7	31.7
0	41	68.3	68.3	100.0
Total	60	100.0	100.0	

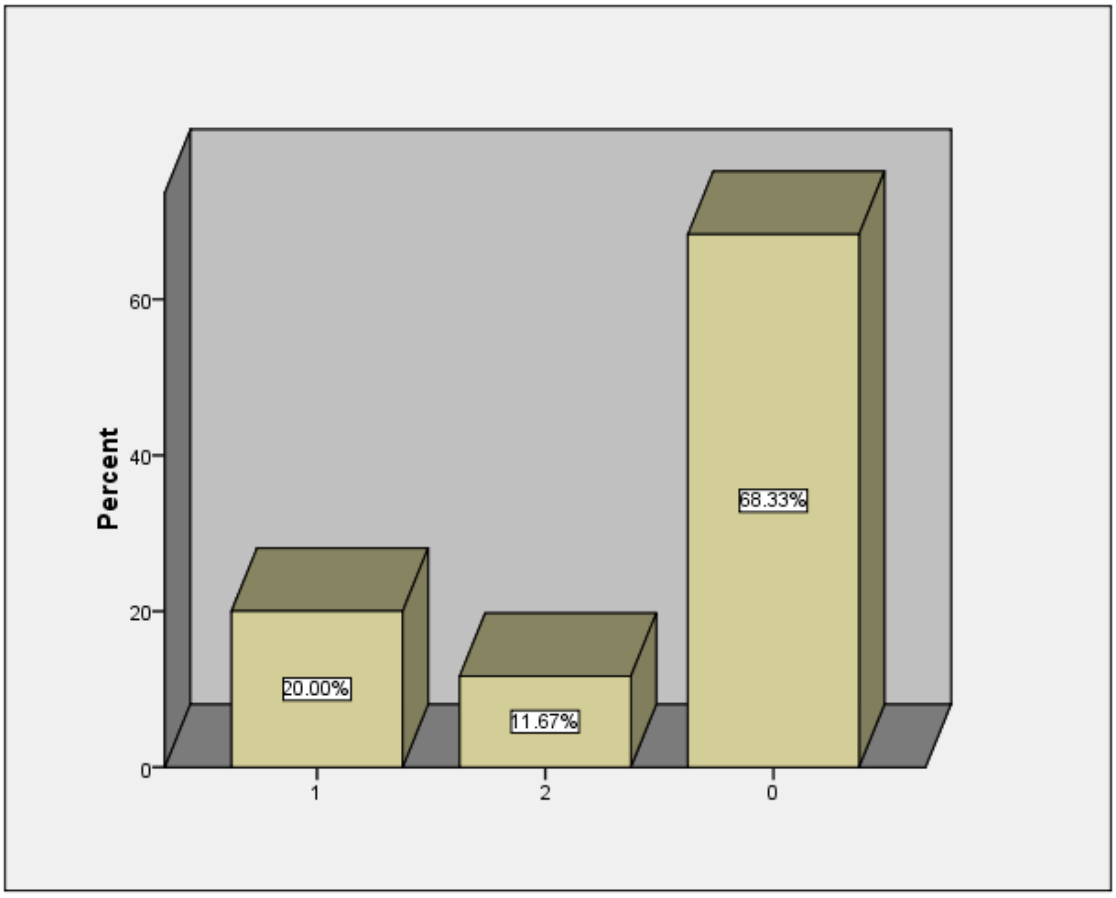

Figure (4. 2)frequency distribution of number of previous abortion

Table (4. 3)frequency distribution of DM

DM	Frequency	Percent	Valid Percent	Cumulative Percent
No	58	96.7	96.7	96.7
Yes	2	3.3	3.3	100.0
Total	60	100.0	100.0	

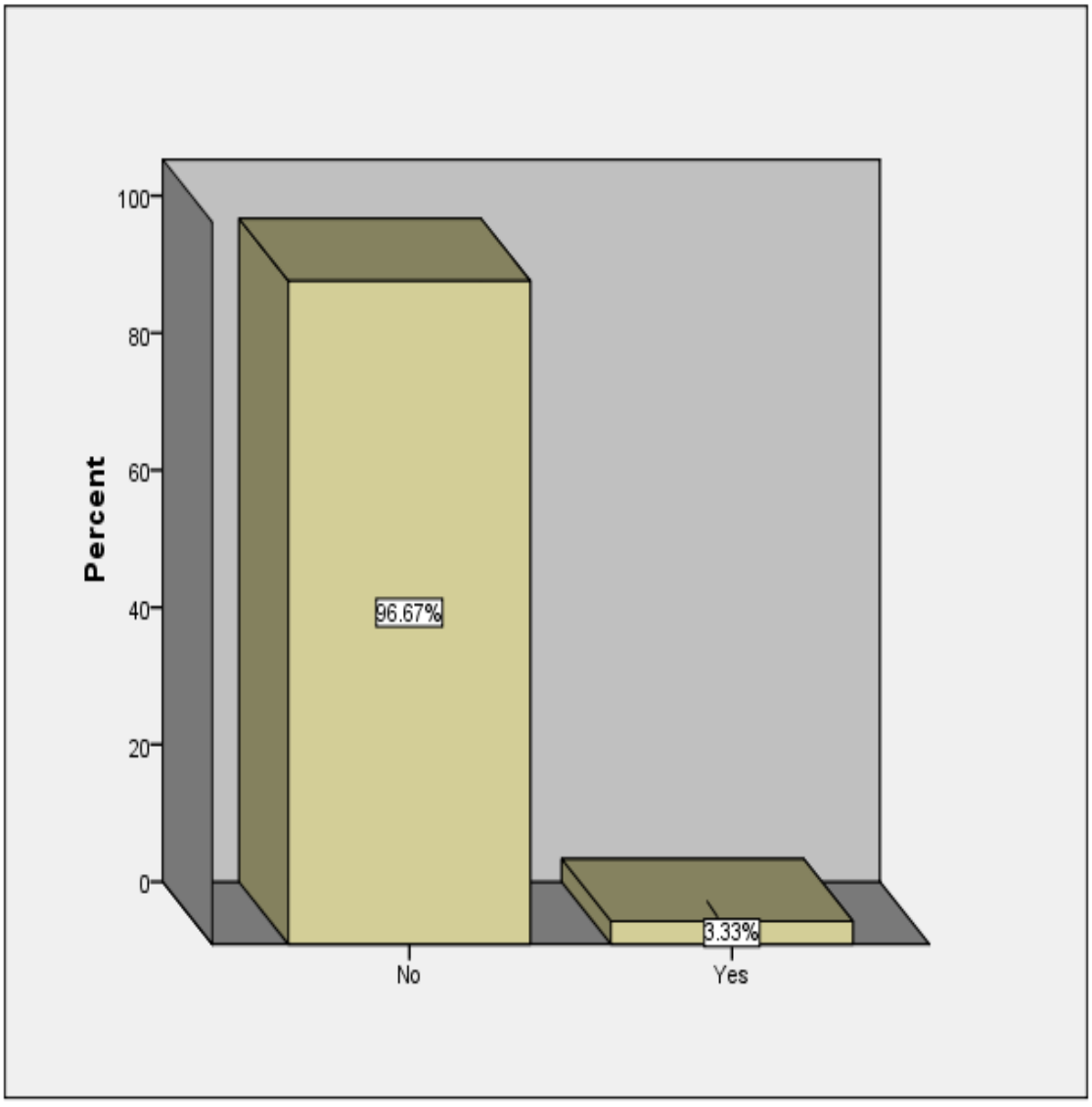

Figure (4. 3)frequency distribution of DM

Table (4. 4)frequency distribution of gravida

Gravida	Frequency	Percent	Valid Percent	Cumulative Percent
1	6	10.0	10.0	10.0
2	15	25.0	25.0	35.0
3	15	25.0	25.0	60.0
4	12	20.0	20.0	80.0
5	6	10.0	10.0	90.0
6	4	6.7	6.7	96.7
7	1	1.7	1.7	98.3
9	1	1.7	1.7	100.0
Total	60	100.0	100.0	

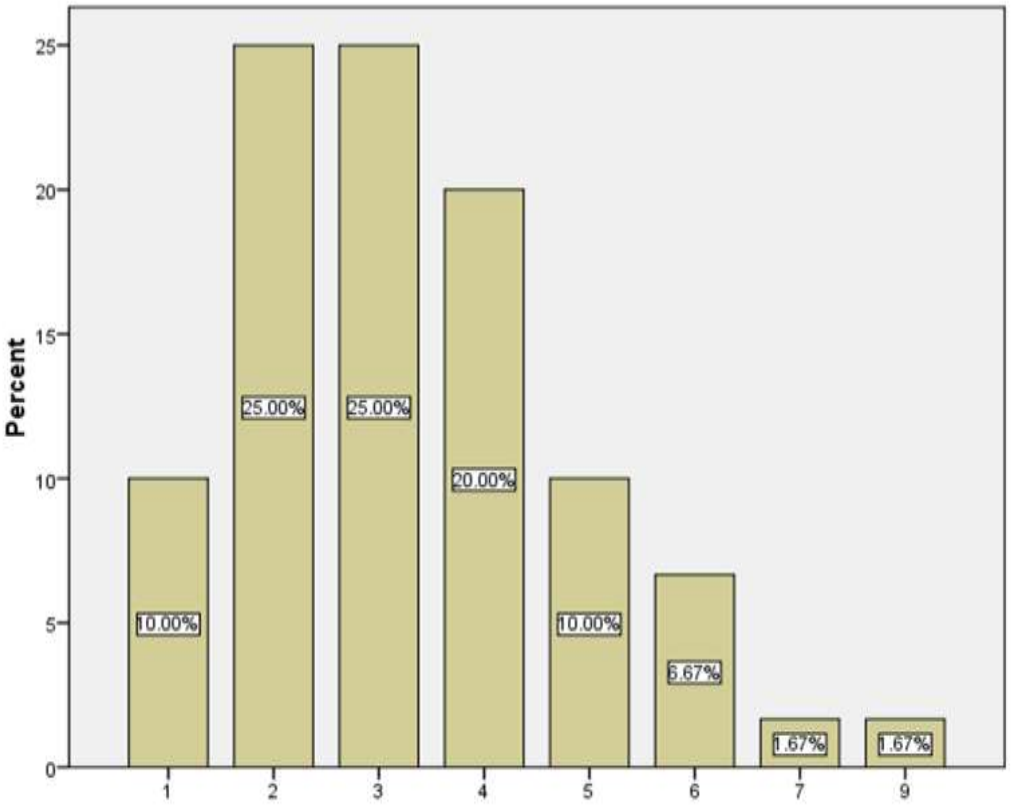

Figure (4. 4) frequency distribution of gravida

Table (4. 5) frequency distribution of gravida range

Cumulative Percent	Valid Percent	Percent	Frequency	Gravida range
60	60	60	36	3-Jan
96.7	36.7	36.7	22	6-Apr
100	3.3	3.3	2	9-Jul
	100	100	60	Total

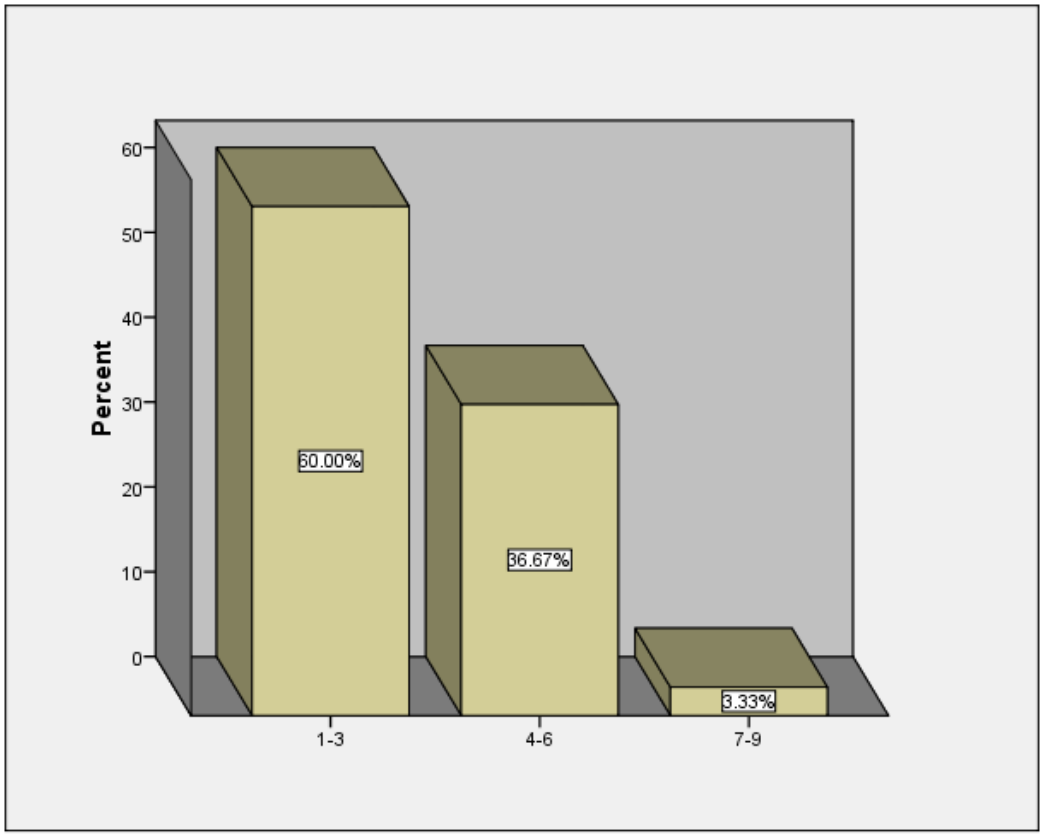

Figure (4. 5) frequency distribution of gravida

Table (4. 6) frequency distribution of number of fetus

Fetus no	Frequency	Percent	Valid Percent	Cumulative Percent
single	60	100.0	100.0	100.0

Table (4. 7) frequency distribution of AF

AF	Frequency	Percent	Valid Percent	Cumulative Percent
average	60	100.0	100.0	100.0

Table (4. 8) descriptive statistic , min, max ,mean and Std. Deviation for age, gravida ,CRL mm, GA CRL and NL\mm

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Age of pregnant women	60	18	40	28.47	5.967
Gravida	60	1	9	3.32	1.631
CRL \mm	60	32.6	70.5	52.118	7.1924
GA CRL	60	11.00	14.00	12.0738	.82569
Nuchal translucency \mm	60	1.1	2.6	1.795	.2925
Valid N (listwise)	60				

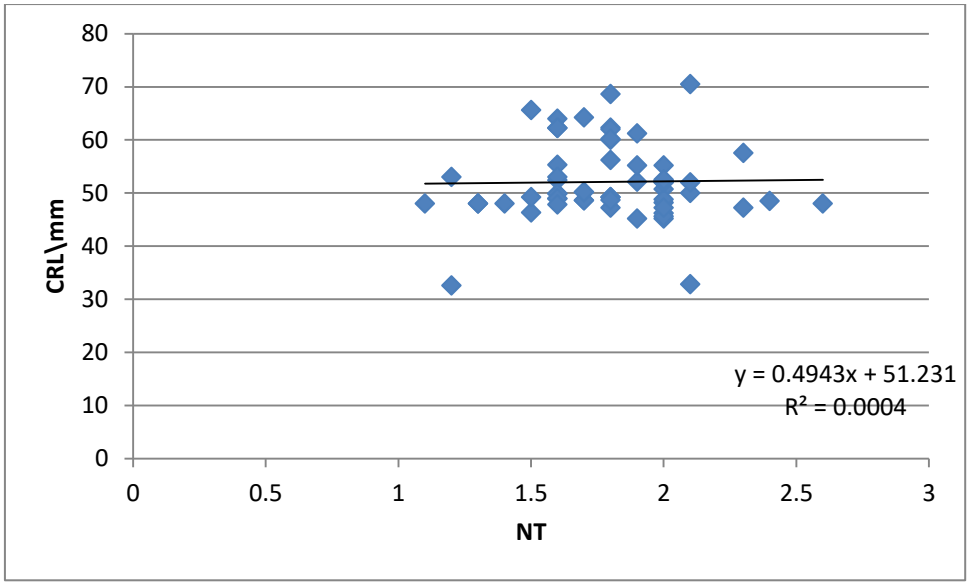

Figure (4. 6)scatterplot shows relationship between CRL and NT

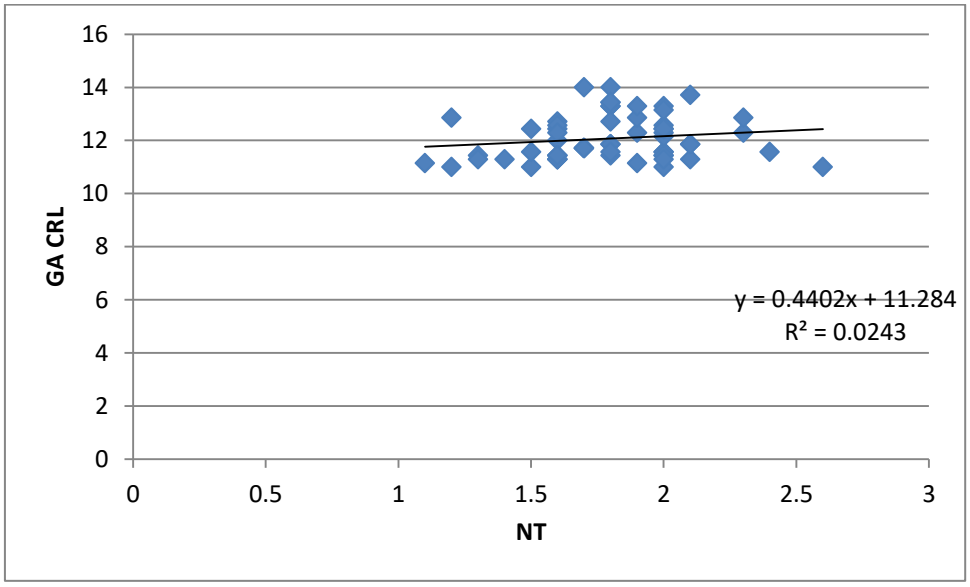

Figure (4. 7)scatterplot shows relationship between GA CRL and NL

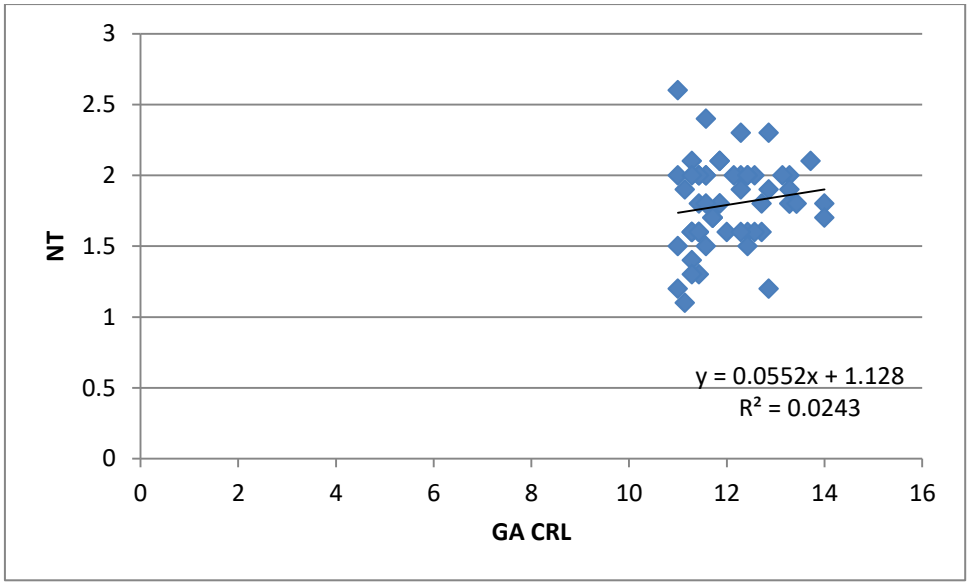

Figure (4. 8) scatterplot shows relationship between NL and GA CRL

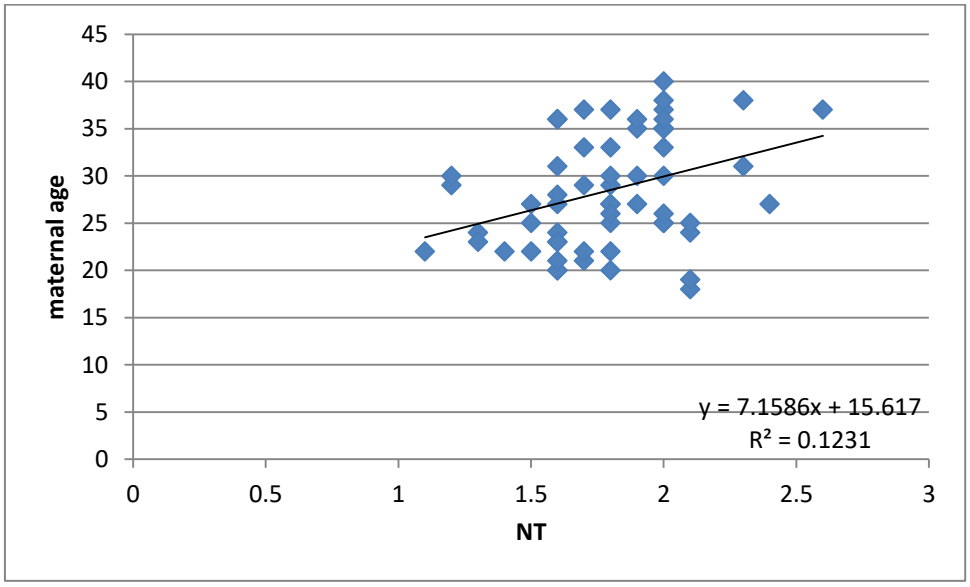

Figure (4. 9) scatterplot shows relationship between maternal age and NT

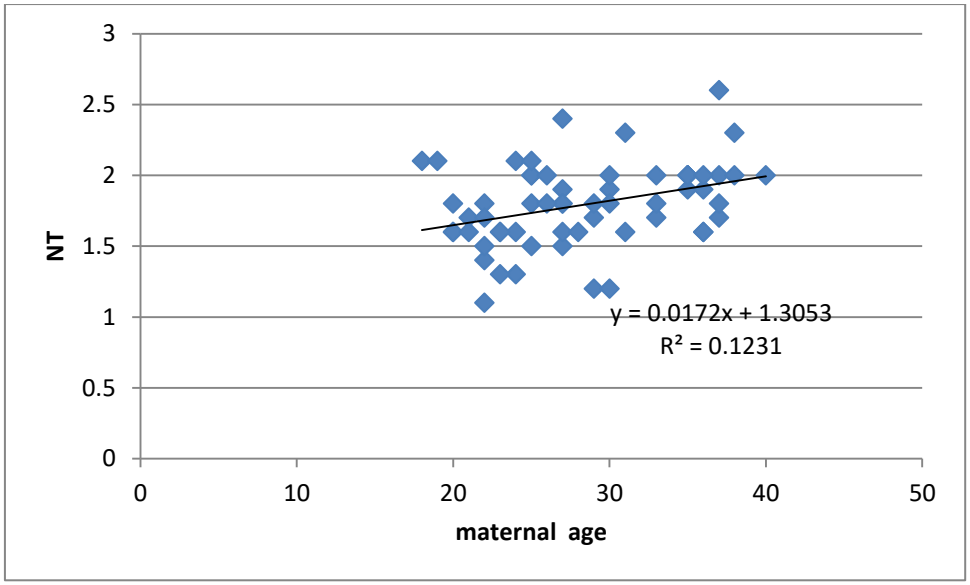

Figure (4. 10) scatterplot shows relationship between NT and maternal age

Table (4. 9) Correlation between maternal age, gravida , CRL \mm , GA CRL and NT

		Age	Gravida	CRL\mm	GACRL	NT
Maternal age	Pearson Correlation	1	.439**	-.202-	-.049-	.351**
	Sig. (2-tailed)		.000	.122	.708	.006
	N	60	60	60	60	60
Gravida	Pearson Correlation	.439**	1	-.057-	.092	.156
	Sig. (2-tailed)	.000		.663	.484	.234
	N	60	60	60	60	60
CRL \mm	Pearson Correlation	-.202-	-.057-	1	.720**	.020
	Sig. (2-tailed)	.122	.663		.000	.879
	N	60	60	60	60	60
GA CRL	Pearson Correlation	-.049-	.092	.720**	1	.156
	Sig. (2-tailed)	.708	.484	.000		.234
	N	60	60	60	60	60
NT\mm	Pearson Correlation	.351**	.156	.020	.156	1
	Sig. (2-tailed)	.006	.234	.879	.234	
	N	60	60	60	60	60
**. Correlation is significant at the 0.01 level (2-tailed).						

Chapter Five

Discussion, Conclusion and Recommendations

5.1 Discussion:

This was cross sectional descriptivestudy done to correlate fetal NT thickness with maternal age in sudanese pregnant women.The study done in 60 pregnant women in age ranged from 18 to 40 years.Most of them in age group 18-25 years and 26-33 years .the percentage of them was 38.3 and 35.0 respectivly as shown on table (4.1).in other study it range from 19-35 years.

31.7 percent of them had previous abortion as shown on table (4.2).

Only 3.3 percent have DM as shown on table (4.3).

60.0 percent of them were 1-3 gravida,36.7 percent of them were 4-6 gravida,3.3 percent of them were 7-9 gravida as shown on table (4.5).in other study they were 1-5 gravida

100 percent were pregnant with single fetus as shown on table (4.6).

100 percent have average AF as shown on table (4.7).so no relation between AF and NT this is aligned with the study done by Shasueldin,Fatima,2015

The study found that the age range,gravida,crl,gaand NT of women under study was 18-40 with mean age 28.47+- 5.967std, 1-9 with mean3.32+-1.631std, 32.6-70.5 with mean 52.118+-7.1924std, 11.00 -14.00 with mean 12.0738 +-.82569std and 1.1-2.6 with mean1.795 +-.2925std,recpectivly as shown in table (4.8). previous study reported that the age range,gravida,crl,ga and NL of women under study was 19-35 with mean age 25, 1-5 ,mean CRL was 55.5+16.8 mm(range 39-83 mm), The median gestational age was 12.9 weeksandMean, NT thickness was 2.3+4mm(range 1.1-2.9 mm), respectively.

The study found that there was weak linear association between GA, CRL and NT, r2 o.02 as shown on figures (4.8) and (4.9).

Also the study found that there is weak linear association between NT and maternal age, r2=0.12 for every year NT increased o.17 as shown on figure (4.10) and (4.11).

No significant correlation was found between NT, CRL,GA and gravida when p more than 0.05,but there was moderate significant correlation between maternal age and NT whenP was less than 0.01 and r =0.351.previous study documented that there was significant correlation between NT and maternal age and The age is most risk factor of down syndrome.

5-2 Conclusion:

This study was done to measure the NTthicknessof the fetus and to detect if there was correlation between the NT measurement and maternal age. Analytical study wascollectedfrom 60 pregnant women from June 2018 up to December 2018 using transabdominal scan through 3.5MHZ transducer.

The result showed that there was weak linear association between GA, CRL and NT and weak linear association between NT and maternal age, r2=0.12 for every year NT increased o.17 but,there was moderate significant correlation between maternal age and NT when P was less than 0.01 and r =0.351

Limitation Of This Study was that we cant use transvaginal US because not available in hospitals.

5-3 Recommendations:

1. Pregnant women in different agesmustdo U/S scanning routinely.
2. NT should be taken as a routine measurement for all pregnant women with pregnancy GA 11-14 weeks to exclude any chromosomal abnormalties.
3. More care and followup should bedonefor pregnant women in advance ages above 35 years.
4. The government should introduce the modern ultrasound machines and increase the training institutes of ultrasound for increasing the sonologist skills and experiences.
5. Ministry of health should conduct workshops to increase the awareness of our society about the importance of u/s scanning for pregnant women.
6. Further studies should be carried out in this field on many aspects such as increasing the sample or by taking bigsample that concentrate on pregnant women in advance age above 35 year3.

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Appendix

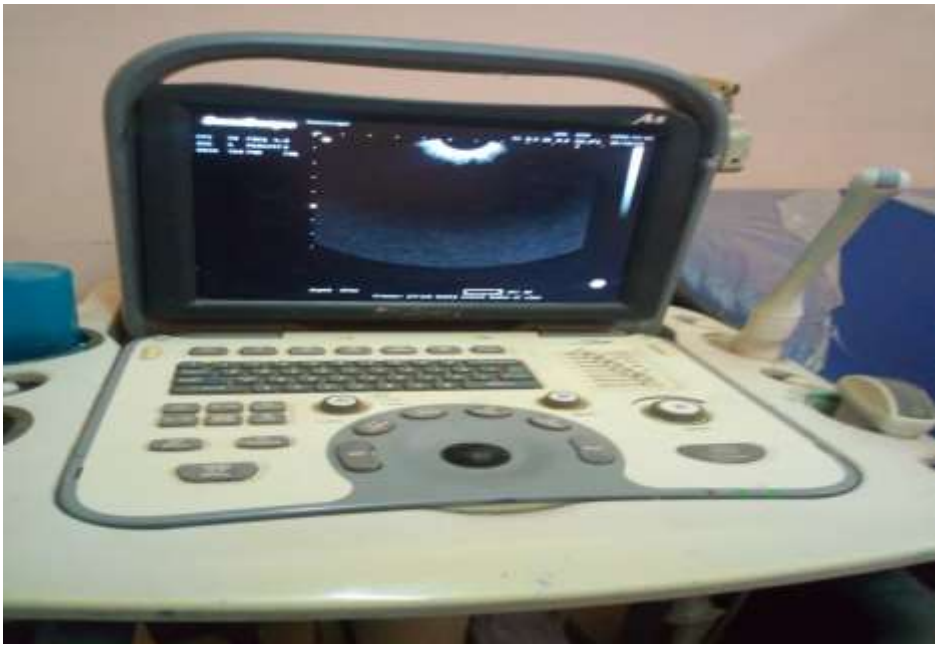
Appendix(A)

Data collection sheet

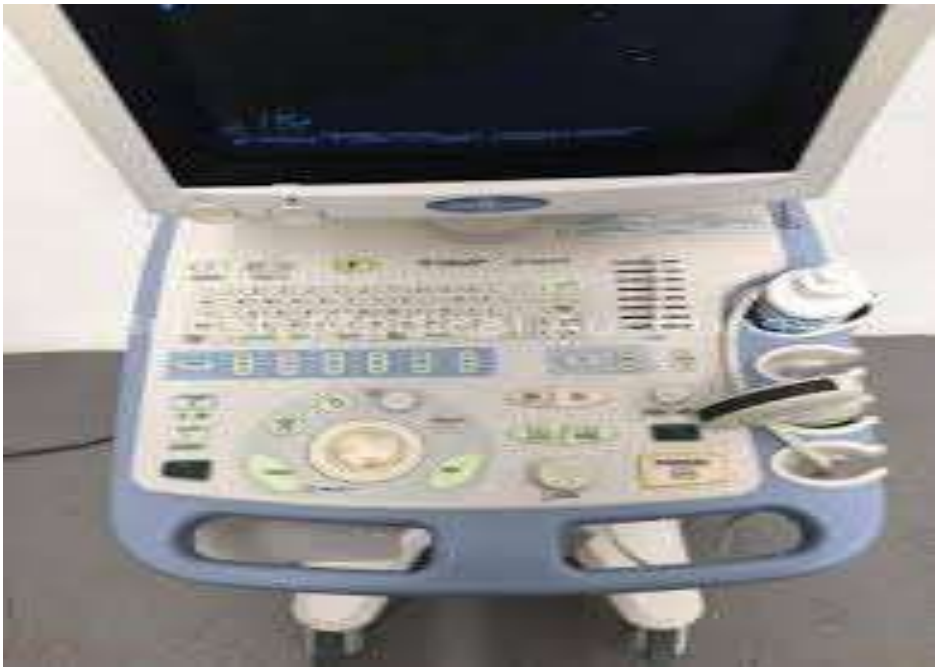
NO	Maternal age	HT	DM	Abortion or ubnormal baby	Number of pregnancy	Fetus no	Gestational age	CRL	AF	Nuchal

Appendix (B)

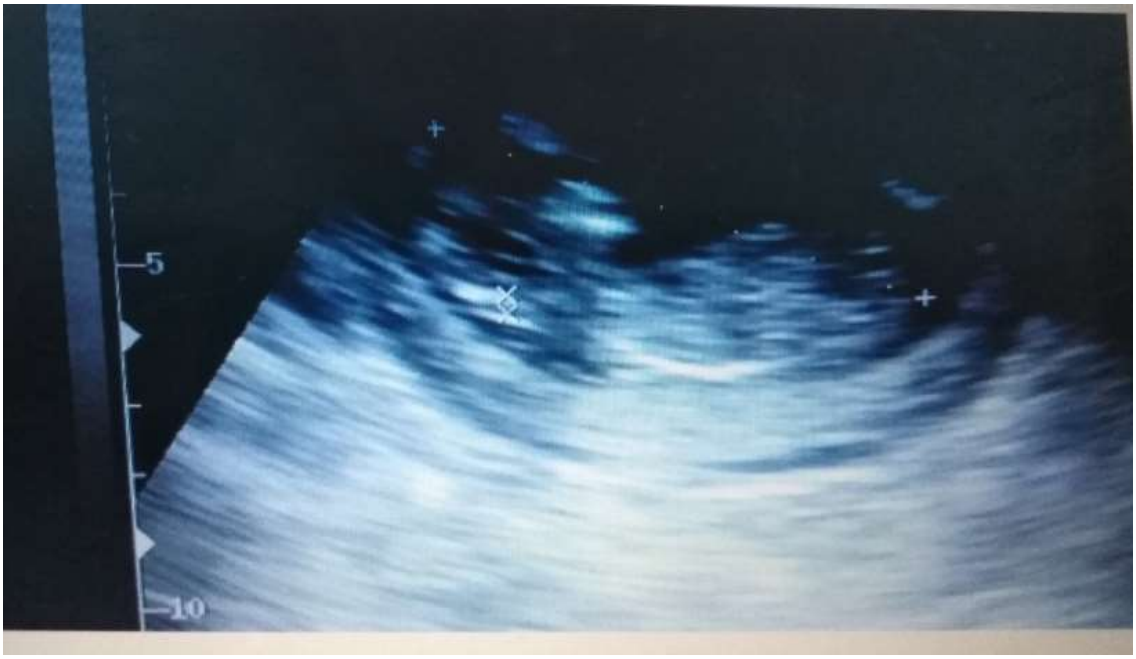
Ultrasound machines and images



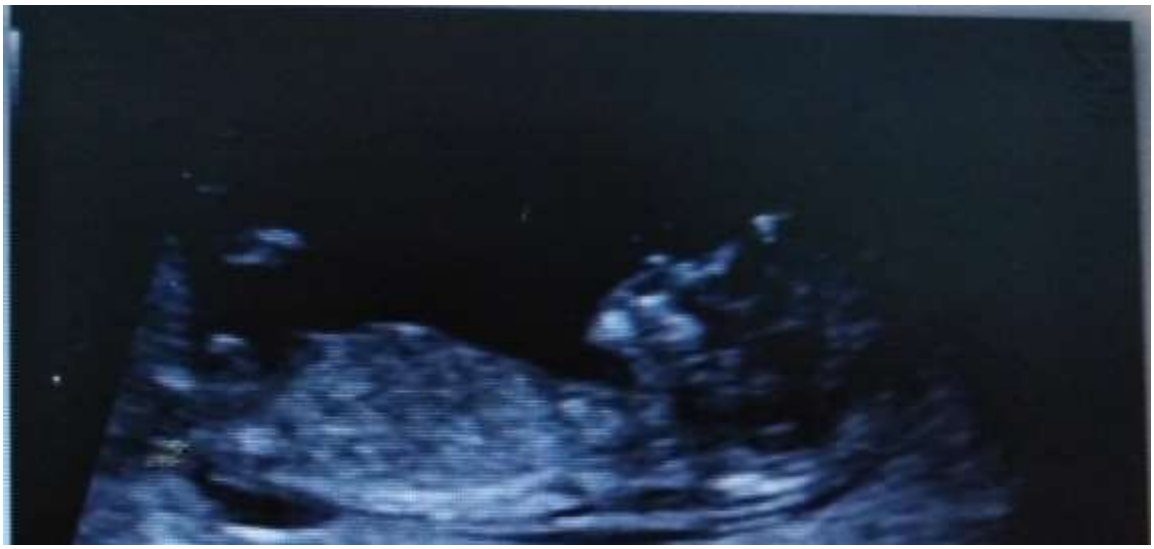
Sonoscape c3 52,ultrasound machine



Fukuda denshi ultrasound machine



NTImage(11 weeks) shows normal thicknness



NT Image(14 weeks) shows normal thickness