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Original Research Article

Nuchal translucency in first trimester of pregnancy: a descriptive study

Anshumala Joshi[1]*, Om Biju Panta[2], Riwaz Acharya[3], Astha Shrestha[1]

[1]Department of Obstetrics and Gynecology, Nepal Medical College and Teaching Hospital, Kathmandu, Nepal
[2]Department of Radiology, Nepal Medicity Hospital, Kathmandu, Nepal
[3]Department of Radiology, Nepal Medical College, Kathmandu, Nepal

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***Correspondence:**
Dr. Anshumala Joshi,
E-mail: janshumala@gmail.com

ABSTRACT

Background: American college of obstetricians and gynecologists' (ACOG) committee recommends all women should be offered aneuploidy screening before 20 weeks of gestation. Nuchal translucency (NT) measurement is currently a routine first trimester ultrasound. There is a void in studies of NT measurement in the Nepali population. The objective of the study was to determine the normal value of NT in the Nepalese population.
Methods: This was a hospital based descriptive study done in the obstetrics and gynecology department in Nepal medical college and teaching hospital, Jorpati, for one year. All pregnant women attending the antenatal care clinic before 11 weeks of gestation with a singleton live fetus, within the study period were considered for the study. The fetal NT at 11-13 weeks was measured.
Results: A total of 305 women participated in the study. Twenty-one women were excluded for various reasons, and a total of 284 women were included. The median age of the women was 26 years (IQR, 23-30 years), with a minimum age of 16 years and a maximum age of 41 years. The mean NT was 1.27±0.30 mm with a minimum of 0.6 mm and a maximum of 2.7 mm. There were two women with raised NT. The median Crown Rump length (CRL) was 65 mm (IQR, 54.8-68.3 mm). The minimum CRL was 45 mm and maximum was 79 mm. There was a weak positive correlation of NT with CRL with r=0.15 and p=0.013. The NT of male fetuses was slightly higher as compared to female fetuses (1.30±0.34 mm Vs 1.22±0.24 mm).
Conclusions: The normal value of NT in Nepalese population is within 3 mm. There was a weak positive correlation of NT with CRL.

Keywords: Aneuploidy screening, Down's syndrome, First trimester, Nuchal translucency

INTRODUCTION

Nuchal translucency (NT) is a useful antenatal screening marker for Down's syndrome (DS) and forms a part of the combined tests done for screening other aneuploidies.[1] DS is the most common major chromosomal disorder compatible with life. The global predictable incidence is generally between 1 to 10/1000 live births all over the world according to the world health organisation.[2] It is the single most common cause of mental retardation of school-age children.[3]

One hundred and forty years after the description of DS, between 1995 and 2003, several studies (primarily from Europe) evaluating a cohort of more than 200,000 pregnant patients found that an enlarged fetal NT measurement detected by ultrasound between 10 and 14 weeks 'gestation has a DS detection rate of 76% with a 4.2% false-positive rate.[4] It is believed that the increase in NT is caused by fluid accumulation in the nuchal region because of delayed development of the lymphatic system, abnormal aortic isthmic narrowing, other fetal cardiovascular defects, fetal anaemia, hypoproteinemia or infections, or abnormalities in the extracellular matrix.[5]

Since the introduction of NT thickness, several studies worldwide have determined the normal range of NT in different populations.[6] The primary objective of the study was to obtain the normal reference values for fetal NT measurements in the Nepalese population done in the first trimester between11-13 weeks of gestation.

METHODS

This was a hospital based observational study conducted in the department of Obstetrics and Gynaecology of Nepal Medical College Teaching Hospital, Jorpati, from the 1st of July 2019 to 30th June 2020. Ethical approval was taken from the iinstitutionnel review board. The investigation enrolled pregnant women who presented at the antenatal care clinic before 11 weeks of gestation with confirmed singleton viable pregnancies and agreed to attend late first trimester scan in the hospital. Written informed consent was obtained from all participants prior to enrollment in the study. Women carrying fetuses with nuchal tube defect or other anomalies, those who had spontaneous or induced abortion and those who could not be followed up till delivery were excluded from the study. Those presenting for initial consultation beyond 13 weeks of gestation, and individuals who declined participation or failed to do the scan between 11-13 weeks were also excluded from study.

All enrolled women underwent ultrasonographic assessment of fetal NT between 11 and 13 weeks of gestation, calculated from the first day of the last menstrual period. Gestational age determination was correlated with fetal CRL measurements on ultrasaound. NT measurements equal to or exceeding 3 millimeters were classified as high-risk and subsequently confirmed by a minimum of two qualified radiologists with specialized training in fetal ultrasonography. In accordance with established institutional protocols, women identified as high-risk were advised to undergo amniocentesis for definitive diagnosis. Upon confirmation of fetal chromosomal abnormalities, patients were given the option of second-trimester pregnancy termination at our designated medical facility. Patients diagnosed with chromosomal abnormality were excluded from the study. All participants also underwent a second trimester targeted image for fetal anomaly (TIFFA or anomaly scan) between 18 to 22 weeks. Any patients with structural abnormality incompatible with viability were also presented with the option of second trimester abortion and excluded from the study. Those with minor structural abnormality were followed up till birth for resolution.

All study participants were monitored through delivery, with meticulous documentation of birth outcomes. Comprehensive neonatal examinations were performed by qualified pediatricians to identify characteristics suggestive of DS. In cases where chromosomal abnormalities were suspected, neonatal blood specimens were obtained for karyotyping. Confirmed chromosomal abnormality were excluded from the study.

Data collection utilized a standardized proforma, with subsequent compilation into a comprehensive database for analysis using statistical package for social sciences (SPSS) version 16. Categorical variables were presented as percentage and numerical variables were presented as mean and standard deviation or median and interquartile range according to normality of distribution. Normality was assessed by using Saphiro Wilk test. Means were compared using t test when comparing 2 groups and one way ANOVA when comparing more than 2 groups.

RESULTS

Study enrolled a total of 305 women. Twenty-one women were excluded for various reasons, as shown in the Stard diagram, and finally 284 women were included in study.

The median age of the women was 26 years (IQR, 23-30 years), with a minimum age of 16 years and a maximum age of 41 years. The mean NT was 1.27±0.30 mm with a minimum of 0.6 mm and a maximum of 2.7 mm. The NT of male fetuses was higher than female fetuses which was statistically significant, but there was no significant difference of NT with age group and parity (Table 1).

The median CRL was 65 mm (IQR, 54.8- 68.3 mm). The minimum CRL was 45 mm and maximum was 79 mm. There was a weak positive correlation of NT with CRL with r=0.15 and p=0.013 (Figure 1). NT at different gestational ages is presented in Table 2.

Table 1: Variation of NT with demographic details of women (age group, and parity) and fetal sex, (n=284).

Variables	N	Nuchal translucency	P value
Age group (in years)			
Less than 19	14 (4.9%)	1.22±0.18	0.63*
20-34	248 (87.3%)	1.27±0.31	
More than 35	22 (7.7%)	1.27±0.28	
Parity			
Primi	188 (66.2%)	1.29±0.32	0.08**
Multi	96 (33.8%)	1.23±0.27	
Fetal sex			
Male	138 (48.6%)	1.31±0.35	0.02**
Female	146 (51.4%)	1.2±0.24	

*One way Anova; ** independent sample t-test.

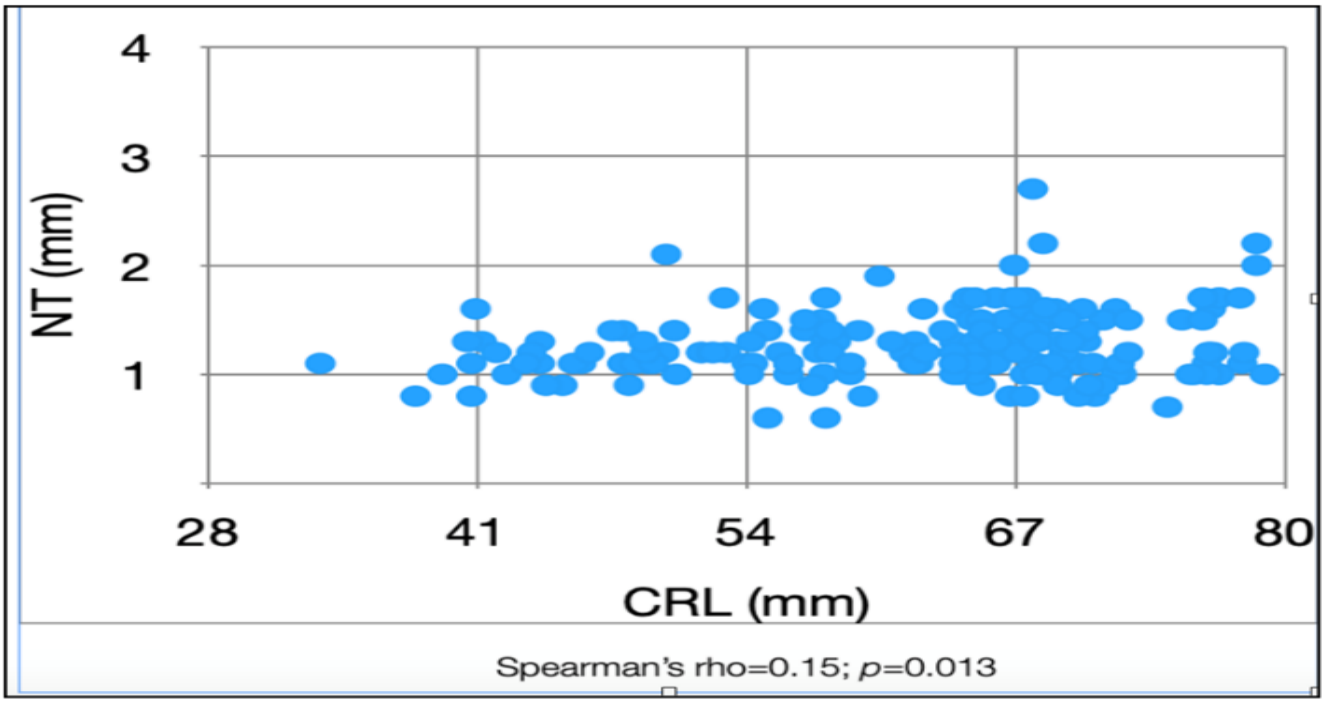

Figure 1: Scatter plot of NT thickness (mm) and CRL (mm) distribution.

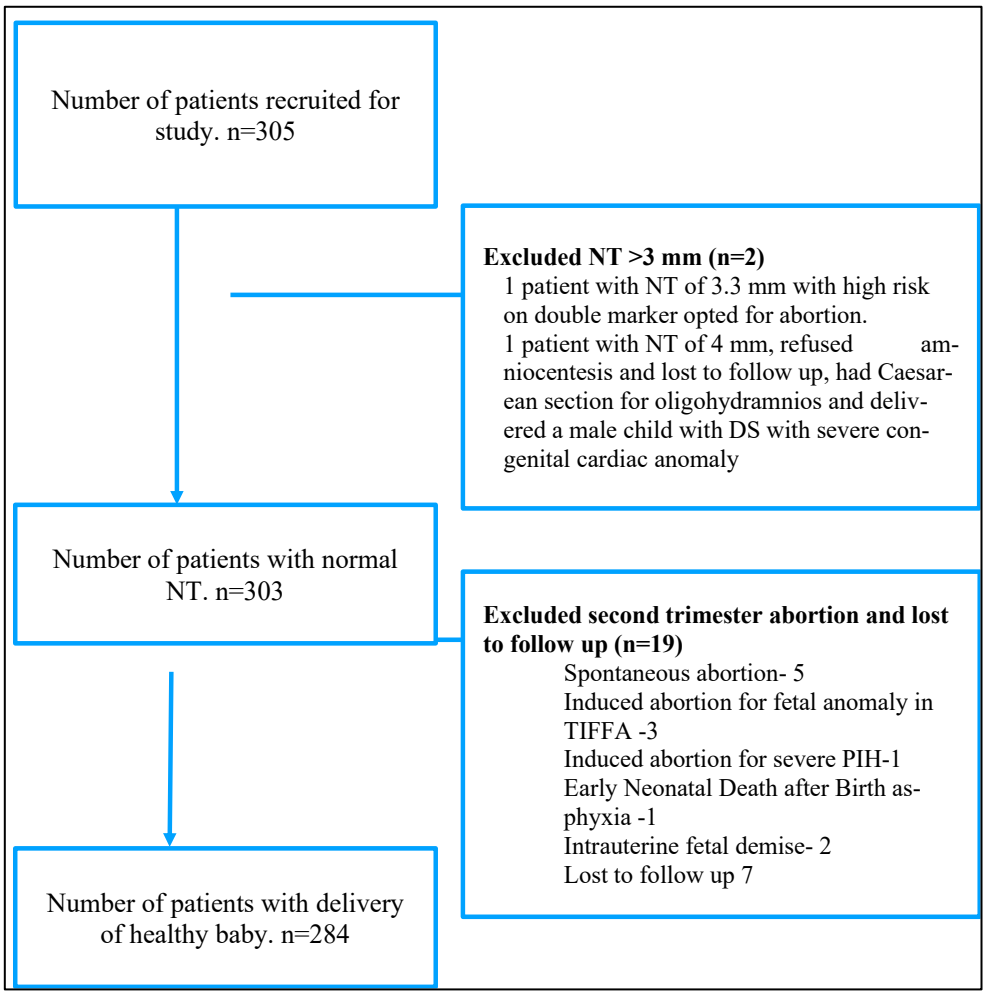

Figure 2: Standard diagram.

Table 2: NT at different gestational ages, (n=284).

Gestational age by ultrasound CRL	N	NT (mean)	Nuchal translucency, SD
11.0	34	1.15	0.21
11.1	5	1.00	0.10
11.2	24	1.21	0.20
11.3	7	1.06	0.05
11.4	10	1.14	0.28
11.5	16	1.31	0.41
11.6	14	1.29	0.33
12.0	19	1.17	0.20
12.1	19	1.46	0.54
12.2	18	1.25	0.25
12.3	6	1.40	0.24
12.4	24	1.27	0.35
12.5	7	1.39	0.22
12.6	18	1.32	0.24
13.0	63	1.32	0.28
Overall	284	1.27	0.30

The NT was more than 3 mm in two women (3.3 mm and 4 mm). Both women were counseled regarding amniocentesis for diagnostic confirmation. One participant elected to have termination of pregnancy after the double marker also showed a high risk of DS. She was a 26-year woman who refused confirmation by amniocentesis because of the cost and hassle. The second woman, a 40-year-old woman with two female children, declined amniocentesis because the result wouldn't change her decision and continued her pregnancy. She did not attend her anomaly scan and presented at term. Her obstetric scan showed oligohydramnios and she required an emergency cesarean delivery. She delivered a male infant weighing 4.2 kilograms who had characteristic features of DS (Figure 3 and 4) consistent with the earlier elevated NT measurement of 4 mm. The infant had severe congenital cardiac malformation (transposition of great vessels with moderate pulmonary stenosis) and expired on the eighth day of life in the neonatal intensive care unit. Both these patients were excluded from the study.

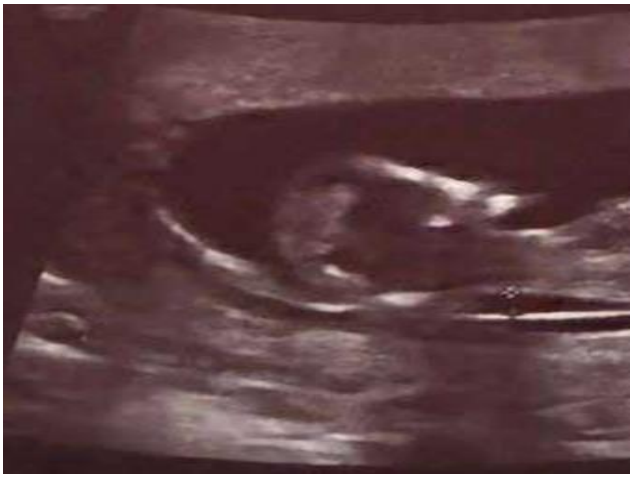

Figure 3: Raised nuchal translucency.

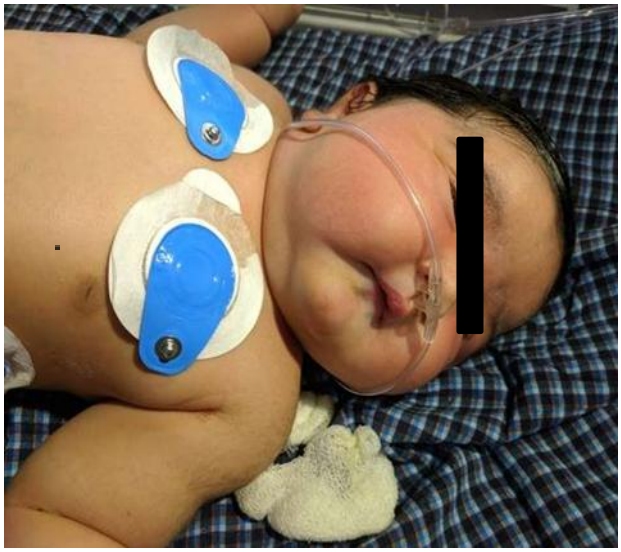

Figure 4: Baby with DS.

Apart from these two, additional 3 women had severe structural anomaly in TIFFA scan and had second trimester abortion, five women had spontaneous second trimester abortion and one woman had severe pregnancy induced hypertension and was induced in the late second trimester; and so, they were all excluded from the study. Two women had intrauterine fetal demise, one woman had early neonatal death due to birth asphyxia and 7 women lost to follow up for entire duration of pregnancy and were excluded.

During anomaly scan assessments, three fetuses were identified with unilateral prominent renal pelvis. These cases underwent monthly ultrasonographic monitoring. Subsequent evaluations demonstrated complete resolution of the renal pelvic dilation, with final scans revealing normal anatomical parameters. All three pregnancies progressed to full term with successful delivery outcomes.

Postnatal ultrasonographic evaluation done within 72 hours of life confirmed normal renal structures in all three neonates, with no evidence of persistent urinary tract abnormalities. One additional fetus had an echogenic focus within the cardiac chambers during routine anomaly scan. A comprehensive fetal echocardiogram performed at 24 weeks of gestation demonstrated normal cardiac structure and function. Following delivery, thorough neonatal assessment by a qualified neonatologist revealed no cardiovascular abnormalities upon clinical examination. The neonate had normal cardiac parameters with no evidence of structural or the functional cardiac pathology.

A total of 284 women delivered healthy babies. Table 3 shows the mode of delivery of the studied women and Table 4 shows the birth weight of the babies delivered.

Table 3: Mode of delivery, (n=284).

Mode of delivery	N	Percent (%)
Vaginal	155	54.5
Caesarean	125	44
Instrumental	4	1.4

Table 4: Baby weight at delivery.

Baby weight	N
<2.5 kg	22
2.5 kg to 4 kg	261
>4 kg	1

DISCUSSION

The risk of DS significantly increases with age; however, the most affected babies are born to women younger than 35 years.[7,8] The median age of the women in this study was slightly lower than in the study done in Thai, Turkish and Taiwanese population probably because women in our part of the world relatively prefer to start family at a younger age than elsewhere as evidenced by similar studies done by Raksha et al in Bangalore and Karki et al in Kathmandu, where the median ages were similar to the present study.[9-13] In another study done by Marsis in Jakarta, in advanced maternal age, the age ranged from 35 years to 43 years, with a mean age of 37.8 years, which was higher than that in the present study because their study included only advanced maternal age women.[14] Similarly, in another study done by Naidoo et al in South Africa, the mean age of the patients with screen negative was 30.1 and in the screen positive women it was 31, which wasn't statistically significant.[15] Also, in the study done by Barati et al there was no significant difference in the age of the women and the NT thickness.[16] Although for years, maternal age was used as the sole screening test for trisomy 21, it is now clear that such an approach is ineffective when compared with many other tests that are available nowadays.

The mean CRL in this study was slightly lower than in the South African study but was slightly higher than that recorded in the study done by Sharifzadeh et al in Iran.[6,15]

As a single screening test considered without maternal age, NT alone has revised detection rates of 71%, 68% and 61% for a 5% false-positive rate at 11, 12 and 13 completed weeks, respectively, compared with previous estimates of 67%, 63% and 55%, respectively for DS.[17]

During 2010, there were changes made to the DS screening. First trimester combined test, the gestational age range for NT is from 11+2 to 14+1 weeks (previously up to 13+6 weeks), and NT should be when the crown-rump length is between 45 and 84 mm (previously up to 80 mm). Also, the enactment of quadruple testing for patients who present after 14 weeks instead of the triple test. The cut-off for high risk of screening tests changed from 1:250 to 1:150.[18]

The mean NT in our study is lower than that reported by Karki et al (1.55±0.35 mm) which is possibly because they included fetuses with CRL of 41.2 to 88 mm, while in the present study it was 45 to 79 mm. Similarly, in the study done by Jou et al in Taiwan (1.72±0.49 mm) and Raksha et al (2.204±1.10 mm) was also slightly higher than in the present study.[10,11] Also in the study done by Barati et al in Iran, the average NT thickness was slightly higher than in the present study (1.75 mm) probably because they included all fetuses even those with abnormal karyotypes while calculating the average NT.[16] But was similar to that done by Sharifzadeh et al (1.30±0.54 mm).[6] In this study there were two women who had an increased NT. The average median NT thickness in a Thai study done was 1.15 mm, which was slightly lower than that recorded in this study.[10]

The main challenge for pregnant women is to absorb all the relevant information in early pregnancy and then be able to choose the best screening option for her.[19] In this study, among the two with raised NT, one consented to do further investigation, but refused to wait until the second trimester for the confirmatory report. She thus had an induced abortion in the first trimester itself. The other mother, a 40-year lady refused to get the confirmatory test as it wouldn't change her decision. The prenatal screening and confirmatory tests shouldn't be considered a 'search and destroy' mission and women who do not want any further information regarding the chromosomal status of their fetus should not be required to undergo any further testing or screening.[4,20]

All pregnant females should be offered both screening and diagnostic tests irrespective of maternal age, all should undergo counselling and have the right to accept or reject the test.[7,18]

In an era of non-invasive prenatal testing (NIPT) where one can detect chromosomal anomalies non-invasively with a 99% sensitivity and specificity, it may replace NT as a screening method in the developed world, but in our part of the world, NIPT is still not within everyone's reach due to it's cost and unavailability in all cities.

CONCLUSION

This study shows that NT measurement in the first trimester of pregnancy can vary with the type of population, but is within the normal limits of 3 mm in the Nepalese population. Studies such as these can help establish the reference data for NT measurement in the Nepali population.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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