

Sonographic evaluation of uterine cervical dimension within 4–24 weeks of pregnancy

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Abstract

Objective: To determine the normal range of uterine cervix within 4–24 weeks of pregnancy and also assess whether variations are related to some selected extraneous human conditions.

Setting and Design: This was a prospective study conducted in University of Benin Teaching Hospital, Benin, Nigeria, and Nigerian National Petroleum Cooperation Health Centre, Warri, Nigeria.

Materials and Methods: A prospective ultrasonographic (USS) study of uterine cervical dimension of 150 pregnant women within 4–24 weeks gestational age in two sonographic centers in Nigeria between January 2007 and October 2007 was conducted. The patients were examined by the authors. The uterine cervical dimensions (length, upper lip diameter, and lower lip diameter) were taken by means of ultrasonography. In addition, vital history, height and weight of patients were documented. The vital history included the age, number of childbirths, number of induced abortion, miscarriages and family history of miscarriages. Using Statistical program of social science (SPSS), the data were analyzed. Informed consent was obtained from all the patients and the study was done in line with the ethical guidelines of the centers.

Results: The following uterine cervical dimensions were obtained: mean cervical length of 6.14 cm and standard deviation of 2.0, and the upper and lower lips' uterine cervical diameters of 1.81 and 1.76 cm, respectively, with standard deviations of 0.86 and 0.71, respectively. There was no significant correlation of dimensions of uterine cervix to the aforementioned extraneous human condition. However, the increasing number of miscarriages correlated with decreasing length or shortness of the cervix.

Conclusion: Uterine cervical dimension in pregnancy between 4 and 24 weeks is reproducible with sonographic documentation and the following normal ranges were deduced: cervical length (6.14 ± 2.0 cm), upper lip (1.81 ± 0.86 cm) and lower lip (1.76 ± 0.71 cm). The study revealed that increasing number of miscarriages was associated with effacement or reduction in the cervical length.

Key words: Cross-tabulation, dimensions, pregnancy, ultrasonography, uterine cervix

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Introduction

Suprapubic sonography is not regularly used as means of evaluating the cervix in pregnancy, even though it may be a routine in general obstetric evaluation. Cervices of pregnant women have been previously studied using suprapubic ultrasound between 6 and 40 weeks gestational age.^[1] It is now necessary to come down to between 4 and

24 weeks gestational age in order to assess normal range of cervical dimension at this period of pregnancy. The reason is that most cervical effacement leading to abortion takes place at the mid trimester of pregnancy and may be amenable to obstetric management if detected early. This will support the clinical assessment by the obstetrician

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since the onset of incompetent cervix in pregnancy is associated with painless effacement, thinning of the wall and dilatation of the cervical os. The use of ultrasound in the assessment of the cervix in pregnancy is reproducible, and with present day knowledge is devoid of any significant adverse effect.^[1] The determination of the normal range of the cervix at this period is necessary because such knowledge will assist in the choice of an appropriate option in the available management protocol for treating cervical incompetence. The options available are the use of cervical cerclage, bed rest and muscle relaxation/anxiolytic drug therapy. The cervical dimensions in this study were cross-tabulated with the variables such as age, number of childbirths, number of induced abortions, number of miscarriages and family history of miscarriage. We also assessed the height and weight of the subjects in order to assess their relationship or correlation to the dimension of the uterine cervix. Other studies have shown the effective use of transperineal and transvaginal ultrasonography in assessing the uterine cervical effacement in pregnancy and the shape of the cervical canal opening.^[2,3] The drawback of this method of evaluation, in our practice, is lack of freewill cooperation by the subjects to these minimally invasive methods of evaluation. Magnetic resonance imaging (MRI) has been used to assess variation in signal intensity of the uterine cervical wall in relation to gestational age.^[4]

We used suprapubic ultrasonography in this study, taking into cognizance the environment of study, the common availability of use, and in addition, the cost of the equipment. The gestational age of the patients was measured by suprapubic ultrasonography based on the following guidelines:

- Gestational sac diameter measurement was used at 4–6 weeks of pregnancy because at this stage fetal nodes are difficult to demonstrate sonographically.
- Crown–rump length (CRL) at 6–13 weeks. This decision was based on the studies showing that there is good accuracy in the use of CRL in predicting menstrual age of fetuses in 416 patients with good menstrual history between 5 and 18 weeks. However, this was not better than Biparietal diameter (BPD) and Fetal length (FL) after 14 weeks.^[5]
- Bi-parietal diameter in combination with femoral length was used at 14–24 weeks based on the study which demonstrated that the use of multiple parameters in estimating fetal age offers a significant advantage over any single parameter used alone, and that regression equation developed from a middle-class White population appears to be applicable to fetuses from a population with different socioeconomic and racial characteristics.^[6]

Another study further suggested that results from multiple ultrasonic parameter models did show statistically significant improvement in the prediction of age.^[7] Hence,

multiple parameter models for dating fetal development between 14 and 42 weeks provide a more accurate estimate of fetal age, especially in 2nd trimester of pregnancy.^[7]

There is good correlation in the use of ultrasound for measuring gestational age in the Nigerian environment as it is in Caucasians.^[8,9]

Materials and Methods

The subjects were 4–24 weeks pregnant patients who presented for routine ultrasound scanning. Informed consents were obtained from the subjects, and the study was done in line with the ethical guidelines of the centers. The examinations were conducted in the ultrasound center of the University of Benin Teaching Hospital, Benin, and Nigerian National Petroleum Cooperation Health Centre, Warri. One hundred and fifty pregnant women were evaluated from January 2007 to October 2007. The patients were scanned with different models of B-mode real-time ultrasound machines with gray scale imaging, which were available at the centers. The patients were scanned in supine position, using a 3.5 curvilinear array transducer, through an inert ultrasonic gel spread on the suprapubic region for good skin contact, and moderately filled urinary bladder was required as acoustic window. The following parameters were evaluated:

- Maximum length of uterine cervix, starting from the inferior wall of the gestation sac (as it deepens into internal cervical os) to external cervical os.
- Maximum diameter of the anterior lip of the uterine internal cervical os.
- Maximum diameter of the posterior lip of the uterine internal cervical os [Figures 1–4].

The gestational age of the patients was measured by ultrasound based on the following guidelines:

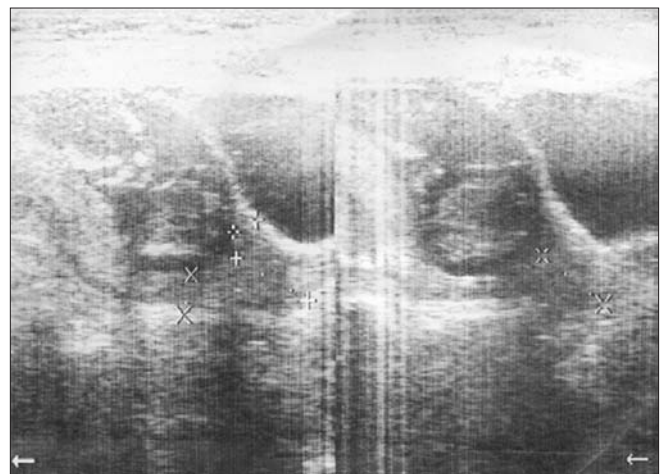


Figure 1: USS image of a 14-week-old gestation in a 28-year-old woman with three induced abortions and five miscarriages, showing cervical length of 2.6 cm, upper lip diameter of 0.81 cm and lower lip diameter of 1.4 cm

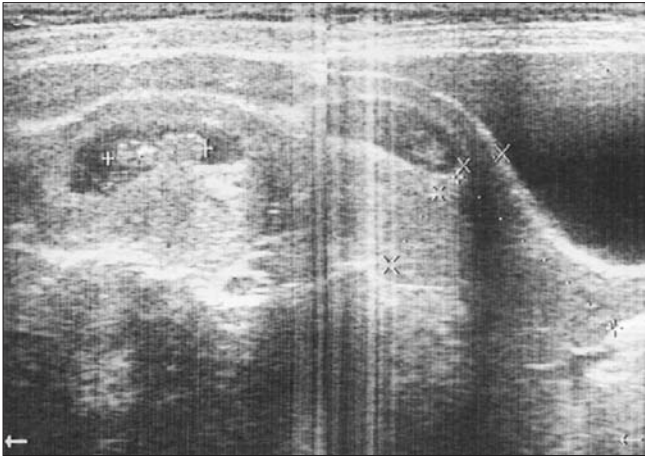


Figure 2: USS image of a 10-week-old gestation in a 27-year-old woman with one childbirth, no induced abortion and no miscarriage, showing cervical length of 7.1 cm, upper lip diameter of 1.2 cm, and lower lip diameter of 2.9 cm

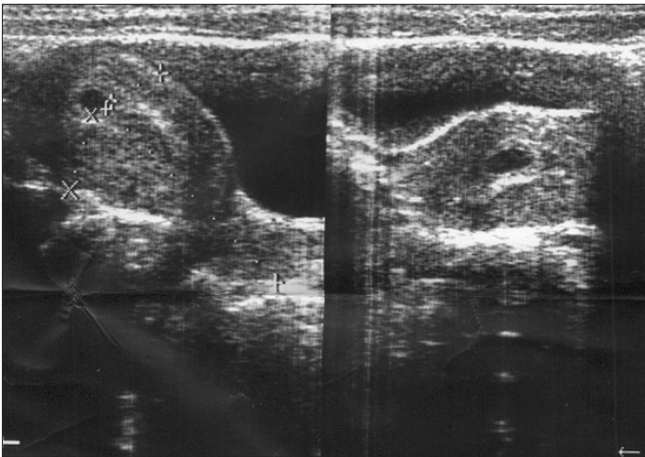


Figure 3: USS image of a 5-week-old gestation in a 23-year-old woman with no history of child birth, induced abortion or miscarriage, showing cervical length of 7.8 cm, upper lip diameter of 1.7 cm and lower lip diameter of 2.6 cm

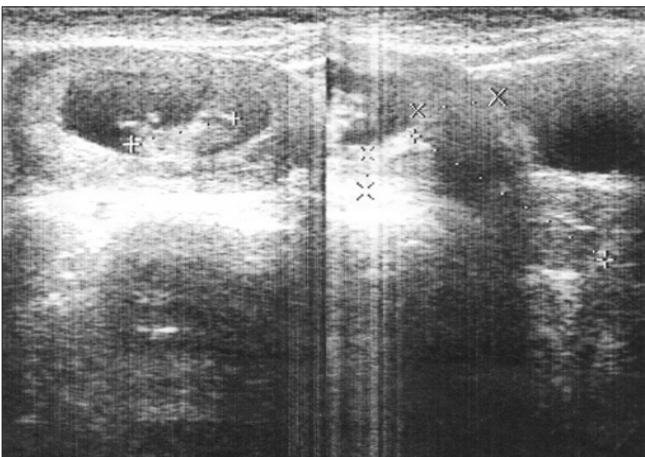


Figure 4: USS image of an 11-week-old gestation in a 32-year-old woman with four child births, two induced abortions, and no miscarriage, showing cervical length of 8.5 cm, upper lip diameter of 2.8 cm and lower lip diameter of 1.6 cm

- Gestational sac diameter measurement was used at 4–6 weeks of pregnancy.
- CRL at 6–13 weeks.
- Bi-parietal diameter in combination with femoral length at 14–24 weeks.

The following data were also collected from the subjects: age of the patients, number of childbirths, number of induced abortions, number of miscarriages and number of miscarriages of family members. The weight and height of the patients were also taken. The data were analyzed using statistical package for social science (SPSS). Data comparison (statistical test of significance) was done with chi-square test. At 95% interval, two-tailed *P*-values less than or equal to 0.05 were considered to be statistically significant.

Results

The following mean values with the standard deviation were deduced from the data analyses using SPSS:

- The age range of the subjects was 16–42 years, with a mean age of 29.43 years and standard deviation of 4.895 years.
- The range of the number of childbirths among the subjects was 0–7, with a mean of 1.33 and standard deviation of 1.583.
- The range of the number of induced fetal abortions among the subjects was 0–5, with a mean value of 1.31 and standard deviation of 1.371.
- The range of the number of miscarriages before 24 weeks gestation was 0–5, with a mean value of 0.35 and standard deviation of 0.752.
- The range of the number of miscarriages noted among direct family members was 0–10, with a mean value of 0.32 and standard deviation of 1.302.
- The range of the weights of the subjects was 43–106.20 kg, with a mean value of 68.61 kg and standard deviation of 14.17 kg.
- The range of the heights of the subjects was 1.44–1.95 m, with a mean value of 1.64 m and standard deviation of 0.08 m.
- The subjects' gestational age ranged between 5.28 and 24 weeks, with a mean value of 14.10 weeks and standard deviation of 5.25 weeks.
- The ultrasound-measured uterine cervical length ranged between 2.60 and 12.20 cm, with a mean length of 6.15 cm and standard deviation of 2.00 cm.
- The ultrasound-measured uterine inner cervical upper lip diameter ranged between 0.50 and 4.21 cm, with a mean value of 1.81 cm and standard deviation of 0.86 cm.
- The ultrasound-measured uterine inner cervical lower lip diameter ranged between 0.68 and 4.10 cm, with a mean value of 1.76 cm and standard deviation of 0.72 cm.

A cross-tabulation analysis of each of the aforementioned quantified parameters with the ultrasound cervical dimensions did not show any recognizable and quantifiable relationship, except evidence showing that the mean value of cervical length decreases with increasing number of miscarriages (1–5) [Table 1]. Also, majority of the subjects (132) had no family history of miscarriage.

Discussion

The mean values of the cervical dimensions in this study were as follows: cervical length was 6.15 cm with standard deviation of 2.00; upper lip of the inner uterine cervical dimension was 1.81 cm with standard deviation of 0.86 cm and lower lip of the inner uterine cervical dimension was 1.76 cm with standard deviation of 0.72 cm.

This study has shown close correlation of its uterine cervical dimensions with uterine cervical dimensions of a previous study (even though the measurements were taken at any stage of pregnancy in the previous study). For re-emphasis, the gestational age of the patients used in this study was between 4 and 24 weeks and the statistical range was 9.10–19.35 weeks (14.10 ± 5.25 weeks), whereas patients in the previous study were not restricted to any period of pregnancy, and the gestational age fell statistically within 21 weeks \pm 14 days and 42 weeks \pm 24 days.^[1]

This study in comparison with the previous study (note the uterine cervical length was 6 cm with standard deviation of 1.34 cm, the upper and lower lips were 1.56 ± 0.88 cm and 1.73 ± 0.78 cm, respectively^[1]) has shown that irrespective of the gestational age and the different models of ultrasound machines used in the studies, their values are close.

This study has also shown that the cervical length in pregnancy at 4–24 weeks of gestation was not dependent on the following extraneous human conditions: age of subject, number of childbirths, and frequency of induced abortions. There could be a genetic predisposition since the study found that the subjects with uterine cervical length at lower border of normal or less had three or more previous miscarriages. There is no correlation or relationship of the

measured cervical dimensions with the height and weight of the subjects.

The uterine cervical dimension study done on pregnancies with gestational ages between 4 and 24 weeks was aimed to determine statistically the normal range below which cervical incompetence can be suspected sonographically. Most incompetence of the cervix that occurred before 20 weeks gestation may lead to miscarriage. The effect of recurrent miscarriage is always devastating to the patients, both physically and emotionally. This necessitated the rationale to determine the normal uterine cervical dimensions at this period of gestation in order to help in the early detection of uterine cervical incompetence. This will lead to early commencement in the management of incompetent cervix which may help prevent its devastating consequences. In addition, it can be used to assess the effectiveness of the existing management protocol.

The causes of cervical incompetence are mainly grouped into idiopathic and others (previous dilatation and curettage, cone biopsy, deep cervical laceration, diethylstilbestrol exposure and inherited physical condition of the cervix). This study has found some relationship to possible inherited condition of uterine cervix as a cause of incompetent cervix, since statistically the increasing mean value of the number of miscarriages correlated with the decreasing mean value of cervical length.

There is evidence showing that even though 115 of the subjects had no history of miscarriage, those found with cervical uterine dimension below or at the lower limit of normal had a history of three or more previous miscarriages [Table 1]. Among the 150 patients evaluated, majority (132 patients) showed no documented family history of miscarriage among their siblings.

This was unlike what was found in the documented number of induced abortions where there was no discriminating mean length value in relation to the increasing number of induced abortions [Table 2]. The other assessed parameters like weight, height, age, and number of childbirths of the subjects in relation to cervical dimensions did not show any significant discriminating values.

Table 1: Mean uterine cervical length versus frequency of miscarriages

Miscarriage	Mean (cm)	n	Std. deviation (cm)
0	6.069	115	1.84806
1	7.1519	21	2.40605
2	5.53	12	2.1893
3	4.91	1	.
4	2.6	1	.
Total	6.1466	150	2.00408

Table 2: Mean uterine cervical length versus frequency of induced abortions

Induced abortion	Mean (cm)	n	Std. deviation (cm)
0	6.3493	57	2.29339
1	6.2686	35	1.9476
2	6.2367	30	1.81081
3	5.15	16	1.27123
4	5.9414	7	2.14003
5	5.918	5	1.46334
Total	6.1466	150	2.00408

Conclusion

The study has documented reproducible uterine cervical dimensions with normal range of uterine cervical dimensions determined for pregnancy of gestational ages between 4 and 24 weeks, a period of pregnancy in which incompetent uterine cervix is commonly found which has devastating consequences. The findings in this study may aid in the early detection and consequently prompt management of cervical incompetence.

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