

Transvaginal sonographic parameters of the cervix in low risk pregnancies in Ilorin

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Abstract

To determine values of mid pregnancy cervical length and internal os diameter in a low risk population and correlate measurements with parity and gravidity.

A cross sectional study of booked pregnant women at gestational age of 20 – 24 weeks with viable singleton pregnancy. Women with multiple pregnancies, cervical incompetence, cervical cerclage, previous history of cervical surgery, previous myomectomy, caesarean section scars, vaginal bleeding/low lying placenta, medical disorders in pregnancy were excluded. The transvaginal ultrasound scanning was performed with Aloka ultrasound machine at the frequency of 7.5MHz. The lubricated probe was inserted gently to a depth of 2-3 inches into the vagina. Cervical length was measured as distance between the internal and external cervical ostia along the endocervical canal. Internal Os was defined as the level where the cervical canal meets with the amniotic sac. Data were analyzed using Statistical Package for Social Sciences (SPSS) software package version 20. The results were expressed with descriptive statistics. P value of <0.05 was taken as significant. Percentiles, Pearson and Spearsman correlation tests were calculated and used.

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There were 159 participants. The mean age of the participants was 29.58 ± 4.64 years and a range of 15- 39 years, primigravida were 37.7%, 57.2% were multigravidas while (5%) were grandmultiparous. The mean cervical length of the population was 39.72 ± 6.81 mm and the range 25.00- 62.00mm. The mean Internal Os diameter was 3.06 ± 0.74 mm, range of 2.00- 5.00mm. In the study population 18.9% had internal Os diameter of <3mm while 81.1% had internal Os diameter of 3-5 mm. The mean cervical length at 5th, 10th, 25th, 50th, 75th, 90th and 95th percentiles were 31mm, 32mm, 35mm, 39mm, 44mm 49mm and 52.00 mm respectively. Correlations between parity, gravidity and cervical parameters were not statistically significant as well as the relationship between cervical length and internal os diameter. The mean values of cervical length and internal os diameter at 20-24 weeks in singleton pregnancy with low risk for preterm delivery were found to be 39.72 ± 6.81 mm and 3.06 ± 0.74 mm respectively. There was no significant correlation between the cervical parameters, parity and gravidity.

Keywords: Cervical length, internal os, mid-trimester, parity, transvaginal scan

Introduction

The human cervix has been shown to be a dynamic organ with varying length and size throughout the gestation.¹ It's length is the distance between the internal and the external cervical ostia along the endocervical canal.² Ultrasound examination has the potential to provide the objective estimates of the cervical length especially in antenatal cervical surveillance and is a more objective method than digital examination which assesses only

the vaginal portion of the cervix.^{1,3,4} There is a growing body of evidence regarding the association between the sonographic cervical status (that is cervical length, internal Os diameter) and the pregnancy outcome in terms of prediction of preterm delivery, gestational age at delivery, spontaneous onset of labour, mode of delivery, successful induction of labour and risk of undergoing caesarean section.⁵

Transvaginal ultrasound has recently been shown to be a more objective, reproducible and reliable method in the assessment of the cervix,⁶ when compared with a transabdominal approach in which the required full bladder tends to overestimate cervical measurements.⁷ Most of the previous studies were done in the late pregnancy in unselected population. Moreover, sonographic parameters of the Cervix in mid pregnancy have not been documented in low risk pregnancies to suggest reference limits in our immediate environment. Prior understanding of the normal range of cervical length and ostial diameter is required for recognition of abnormal cervical measurements. The aim of this study is to document range of normal values of cervical length and internal Os diameter in mid pregnancy with transvaginal sonography. Some authors inferred possible variations in cervical length and diameter with gestational age and parity; suggesting a possibility of changes in the cervix as a result of past deliveries and pregnancies⁸, and the need for gestational age defined measurements⁹. Hence, another objective is also to determine the relationship between parity and cervical changes in a population with low risk for preterm delivery and cervical abnormalities at 20-24 weeks.

Methodology

The study was carried out between May and August 2015, at the Department of Obstetrics and Gynaecology, University of Ilorin Teaching Hospital, Nigeria. The department runs four

antenatal clinics weekly under the supervision of consultant staff. Obstetric and gynaecological ultrasonographic studies are done in the foetal assessment unit by Consultant Obstetricians, Radiologists and Residents in training.

The study was a cross sectional study of booked pregnant women that received antenatal care and delivered at UITH Ilorin. Consenting pregnant women at the gestational age of 20 – 24 weeks who met the criteria for the study were recruited until the sample size was completed. The sample size was calculated using Fischer's formula ($n = z^2 pq / d^2$) and minimum sample size was 151. An institutional Ethical approval was obtained from the Ethical Review Committee of the University of Ilorin Teaching Hospital Ilorin before the commencement of the study. Pregnant women recruited from the antenatal clinic were informed and counselled in groups. Those who consented and satisfied the inclusion criteria were given the information sheet and counselled individually about the nature of the study.

Recruitment was by simple random sampling technique and consenting pregnant women who met the criteria for the study were recruited. Inclusion criteria were viable singleton pregnancy at 20-24 weeks, accurate recall of last menstrual period or with early ultrasound scans for dating. Women with multiple pregnancy, cervical incompetence, cervical cerclage, previous history of cervical surgery, previous myomectomy, caesarean section scars, vaginal bleeding/low lying placenta, and medical disorders in pregnancy were excluded.

The gestational age was determined from their last menstrual period and/or early ultrasound scan. The medical history and the socio-demographic characteristics were obtained from the participants using a study proforma. They had initial abdominal ultrasound to exclude low lying placenta, intrauterine foetal

death, uterine fibroids and multiple gestations. Participants who satisfied the inclusion criteria underwent transvaginal ultrasound scan to assess the cervical length, internal Os diameter using the Aloka ultrasound machine at the frequency of 7.5MHz. The transvaginal ultrasound scanning was performed by two of the researchers (together) for all participants. The participant emptied their bladder before the procedure and they were placed in dorsal position on the couch. Participants were draped with linen which exposed only the perineum. In the presence of a female chaperon, the transvaginal probe was lubricated with the coupling gel. It was covered with condom and then lubricated with coupling gel before insertion. The lubricated probe was inserted gently to a depth of 2-3 inches into the vagina. With gentle manipulation, the cervical length and the internal Os diameter was measured. Cervical length is the distance between the internal cervical Os and the external Os along the endocervical canal. Internal Os is normally at the level where the cervical canal meets with the amniotic sac. Measurements were recorded in the study proforma and data were analysed using Statistical Package for Social Sciences (SPSS) software package version 20. The results were expressed as percentages and means with standard deviation. The continuous variables were analyzed using the student t-test while categorical variables were analyzed with chi square test where two variables were compared. When more than two variables were compared, ANOVA was used. A p value of <0.05 was taken as significant. Percentiles of the cervical length and diameter were also calculated. Pearson and Spearmen correlation tests were used to determine the relationship between cervical parameters and parity.

Results

Socio-demographic variables of the Study participants

During the study period, 159 participants were

recruited. Of all the participants, 34(21.40%) were less than or equal to 25 years of age and below, 61(38.40%) were 26-30 years of age, 46(28.90%) were between 31-35 years of age while 18(11.30%) were 36-40 years of age. The mean age of the participants was 29.58 ± 4.64 years. The age range was 15- 39 years. All the participants were married. Of all the participants, 69(43.40%) were employed while 35(22.00%) were unemployed. Also, most of them had tertiary education 134(84.30%), 60(37.70%) were primigravidas, 91(57.20%) were multigravidas while 8(5.00%) were pregnant the fifth time or more. The socio demographic variables are shown in table I

Cervical length and Internal Os diameters of the participants

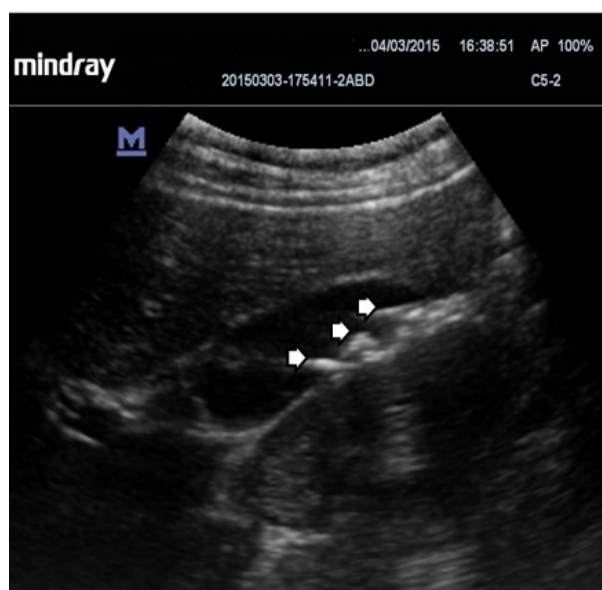
The mean cervical length of the subjects was 39.72 ± 6.81 mm and the range was 25.00-62.00mm.. The cervical length ranges between 21-30mm in 7 subjects (4.40%), 31-40 mm in 87 subjects (54.70%) and 65 subjects had cervical lengths greater than 40mm. The mean Internal Os diameter was 3.06 ± 0.74 mm, range of 2.00- 5.00mm. Out of all the pregnant women that were recruited, 30(18.9%) had internal Os diameter of less than 3mm while 129(81.1%) had internal Os diameter of 3-5 mm. This is shown in table II. The percentiles of cervical lengths and internal Os diameters are shown in table II.

The correlations between cervical parameters, gravidity and parity are outlined in table III. Correlation coefficients between gravidity and, cervical length and internal os diameter were 0.018 and -0.011 but they were not statistically significant. Similarly, parity was positively and negatively correlated with cervical length and internal os diameter respectively. $P = 0.737$ and 0.886 respectively. Even though there was an inverse relationship between the cervical length and internal os diameter, it was not statistically significant.

Discussion

Ultrasound scan has immense value in antenatal cervical surveillance. Trans-vaginal ultrasound scan can be used to objectively assess the cervical status. It has been shown that cervical status has a role in predicting the pregnancy outcome and normal reference limits are required to detect abnormalities.

Figure 1: Transvaginal sonogram showing cervical length measurement (dashed line between C and D)



The mean cervical length ranges from 35mm to 40mm.⁹ The mean cervical length in this study was 39 ± 6.80 mm and is similar to findings from related studies^{9,10,12,13}. Gramellini and co workers demonstrated that the cervical length in the mid pregnancy was 44mm¹³ and this was longer than the obtained mean length in this study. Similarly, cervical length in this study ranged between 25.00 - 62.00mm which was slightly different from a range of 39.90 - 40.30mm by Salomon et al probably because four different sonologists performed the scanning which could have given rise to inter observer error⁹. In our study, two sonologists carried out the procedure together per patient. Haborahy and his colleagues found that cervical length ranged between 37.8mm to

41.7mm at the gestational age of 22 to 24weeks¹⁴ this is different from a wider range obtained in this study; which is likely to be a more reliable normal value than the result of a heterogeneous study population which included previous miscarriages and preterm labour.

Table 1: Socio-demographic variables of the study participants

Socio-demographic variable	Frequency (N = 159)	Percent
Age group(years)		
≤ 25	34	21.4
26 – 30	61	38.4
31 – 35	46	28.9
36 – 40	18	11.3
Mean ± SD	29.58 ± 4.64 years	
Range (Min. – Max)	15 – 39	
Marital status		
Married	159	100.0
Ethnicity		
Yoruba	157	98.7
Others	2	1.3
Occupational status		
Employed	69	43.4
Self employed	55	34.6
Unemployed	35	22.0
Educational status		
None	1	.6
Primary	4	2.5
Secondary	20	12.6
Tertiary	134	84.3
<u>Gravidity</u>		
1	60	37.7
2 – 4	91	57.2
> 4	8	5.0

The mean cervical length at 5th, 10th, 25th, 50th, 75th, 90th and 95th percentiles were 31mm, 32mm, 35mm, 39mm, 44mm 49mm and 52.00 mm respectively. These findings were similar to those of Theron and colleagues^{11,15}. The cervical length in the mid pregnancy were 20mm, 36mm and 47mm at 5th, 50th and 95th percentiles respectively in a study where measurements were taken by transvaginal ultrasound among women with singleton pregnancy and those with history of preterm delivery, preterm rupture of membranes, use of cervical cerclage and vaginal progesterone were excluded¹⁶.

Table 2: Distribution of Cervical Parameters in study Participants

Maternal characteristics	Frequency (N = 159)	Percent					
Cervical length (mm)							
21 – 30	7	4.4					
31 – 40	87	54.7					
> 40	65	40.9					
Mean ± SD	39.72 ± 6.81						
Range (Min. – Max)	25.00 – 62.00						
Internal Os diameter (mm)							
< 3	30	18.9					
3 – 5	129	81.1					
Mean ± SD	3.06 ± 0.74						
Range (Min. – Max)	2.00 – 5.00						
Percentiles							
	5 th	10 th	25 th	50 th	75 th	90 th	95 th
Cervical length (mm)	31.00	32.00	35.00	39.00	44.00	49.00	52.00
Internal Os diameter (mm)	2.00	2.00	3.00	3.00	3.00	4.00	5.00

Table 3: Relationship between Internal Os diameter, Gravidity, Parity and Cervical length

Variable	Cervical length r (p value)	Internal Os r (p value)	Gravidity r (p value)	Parity r (p value)
Cervical length	1			
Internal Os diameter	-0.012 (0.879)	1		
Gravidity	0.018 (0.819)	-0.011 (0.888)	1	
Parity	0.027 (0.737)	-0.011 (0.886)	0.907 (<0.001*)	1

r correlation coefficient; P < 0.05 is significant

In this study, less than 50% of the participants had measurement less than 39mm. In addition, 4.4% of the participants had cervical length less than 3cm and also represented 5th percentile of the cervical length. According to Owen et al, a cervix is short in pregnancy if less than 25 mm and could be a significant predictor of preterm delivery¹⁷. The small proportion of short cervix in this study agrees with earlier finding but will require a follow up to confirm if it correlates with preterm delivery in our population.

The internal Os is normally at the level where the cervical canal meets with the amniotic sac and defined as open, when the internal Os $\geq$ 3mm.¹⁸ The range of internal Os diameter in this study was a little lower, though close to 5.60-6.00mm found by Hebbar et al,¹ even though both studies were conducted at 20-24 weeks. The only probable reason for the slight difference may be sample size. In addition, internal Os diameter in this study was lower

than that of 7.70mm found by Nzeh et al in Ilorin.¹⁹ The reason for the difference is probably because Nzeh et al measured the internal Os diameter trans-abdominally whereas measurements in this study were done trans-vaginally. Trans-abdominal sonographic measurement of internal Os diameter requires a full bladder which is likely to overestimate the cervical parameters.²⁰ Similarly, the mean internal Os diameter in this study was lower than that of mean internal Os diameter of 10.81mm found by Tobechuckwu.²¹ The difference may be due to the method of measurement as well as characteristics of study population. Tobechuckwu et al employed trans-abdominal route and participants with previous history of miscarriages and preterm labour were not excluded.²¹ In a study done by Kore, the internal Os was closed in 61 participants while it was opened with funnelling in 17 out of the 80 participants at gestational age of 22 – 24 weeks through the transvaginal ultrasound.²² The population selection and route of ultrasound measurements may also explain the differences in ranges of the internal Os diameter in this study and earlier findings (see table 2).²¹ The cervical assessment of low risk pregnancies is an important strength of this study for normative data; perhaps replications of similar investigations are required as a multicentre study. In nulliparous Indian women, association of cervical length and gestational age showed a strong inverse correlation¹² Follow up on outcome of pregnancies in our population of pregnant women will give more clinical implications to this study; this will verify the dynamics of cervical length and internal Os diameter described by Murkheji et al¹².

In addition, the relationship between parity and cervical parameters was investigated. There was no correlation between past pregnancies, deliveries and cervical parameters. Likewise, there was neither a direct nor inverse

relationship between cervical diameter and length. This was similar to findings of Cook et al.²³ and Tobeckukwu et al.²¹ Theron et al reported that cervical length was shorter in nulliparous than multiparous women in pregnancy.¹⁵ Other authors reported that cervical volume and width rather than length, are influenced by parity, delivery mode and labour²⁴. The aforementioned obstetric characteristics were used to select their study population while our study population was based on low risk for preterm delivery. Therefore, our study probably suggests that in low risk singleton pregnancies without cervical abnormalities, past deliveries may not define cervical parameters in mid pregnancy. Further studies, designed to examine this relationship across trimesters and in diagnosed cases of cervical dysfunctions, are required. Longitudinal studies to assess the cervix in subsequent pregnancies of same parturient are also required for confirmation.

Conclusion

This study suggests normal values of cervical length and internal os diameter in a pregnant population with low risk for preterm delivery and cervical abnormalities at 20-24 weeks. The mean cervical length was 39.72 ± 6.8 mm and mean internal Os diameter was 3.06 ± 0.74 mm. There was no significant correlation between parity, gravidity and cervical parameters in such selected population. Past pregnancies and deliveries should not alter the mid pregnancy cervical length and diameter where there is low risk for preterm delivery.

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