Original Research

PREDICTIVE ACCURACY OF CERVICAL LENGTH IN MID TRIMESTER ON TRANSABDOMINAL ULTRASOUND FOR CESAREAN SECTION

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Abstract: *The Cesarean section (CS) delivery is a most frequent surgical technique worldwide. The CS increasing rate and its related problems have drawn an attention towards CS related morbidity. As recommended by WHO, C-section could be carried out only when required medically. In mid-pregnancy cervical extended length predicts the probability of CS early in the pregnancy. The objective of the study is to find the predictive accuracy of cervical length (CL) on transabdominal ultrasound for cesarean section in mid trimester taking mode of delivery as gold standard. It was a cross sectional study in which 362 females were enrolled. Females were undergoing transabdominal ultrasonography for assessment of cervical length. A 2x2 contingency table was generated to calculate sensitivity, specificity, positive predictive valve (PPV), negative predictive value (NPV) and diagnostic accuracy of transabdominal ultrasound taking actual mode of delivery as gold standard. The mean age of the females was 27.92 + 5.75 years while mean parity and mean CL were 2.22 + 1.30 and 35.83 + 7.96 mm, respectively. Among 30 females who had cervical length <25 mm, 24 had CS and 6 had spontaneous vaginal delivery (SVD). Among 332 females who had cervical length >25 mm, 96 had CS and 236 had SVD. The sensitivity, specificity, PPV, NPV and diagnostic accuracy of transabdominal ultrasound for cesarean section were 20.0%, 97.5%, 80.0%, 71.1% and 71.8%, respectively. Study concluded that cesarean section takes place among pregnant females when cervical length is ≤25mm on transabdominal ultrasound during mid trimester.*

Keywords: Predictive accuracy, cervical length, mid trimester, transabdominal ultrasound, cesarean section

Introduction

"Once a cesarean, always a cesarean" was rule for the traditional CS (cesarean section) however, currently cesarean section is believed a secure delivery mode related to less perinatal difficulties regardless of elevated health and pecuniary cost (Ehtisham and Hashmi, 2014). The CS delivery is a most frequent surgical technique worldwide for females during childbearing age (Anjum *et al*., 2020) with 18.5 million estimated cases carried out yearly (Stark *et al*., 2017). Among both developed and industrialized countries, cesarean section is believed an ideal technique for childbirth (Verma *et al*., 2020). The CS increasing rate and its related problems have drawn an attention towards CS scars as well as their possible related morbidity (Naji *et al*., 2012). A CS delivery could be conducted based on mother's pelvis shape or CS previous history. After cesarean section, vaginal birth trial could be possible. As recommended by WHO, C-section could be carried out only when

required medically. Several cesarean deliveries are conducted without any medical cause, on someone request, mostly the mother (Caughey *et al*., 2014). Generally, the cesarean sections lead to a little rise in the poor outcomes among low-risk pregnancies. Also, they normally require longer time to heal, almost 6 weeks (Caughey *et al*., 2014), than the vaginal delivery. The enhanced risks comprise breathing difficulties in child and postpartum hemorrhage & amniotic fluid embolism in mother. Traditional guidelines propose that CSs not be utilized prior to pregnancy 39 weeks with no any medical cause. The delivery technique does not affect the sexual function afterward (Yeniel and Petri, 2014).

The shortening of cervix is an initial step during processes causing labor and may precede the labor by numerous weeks. During 2nd trimester a reduction in the cervical length (CL) is predictive of impulsive

preterm delivery, with an elevated risk among females with untimely and significant cervical shortening. As effacement starts at internal cervical os and grows backwardly, it is mostly identified on ultrasound (US) evaluation before it could be valued upon physical examination (Romero *et al.*, 2016; Valentin, 2013). Females who experienced CS were 27.5 percent while 33.1 percent delivered babies normally those identified for cervical length during 2nd trimester (Gameraddin, 2018). Measurement of cervical length utilizing transvaginal ultrasound is a crucial part of evaluating the chance of preterm birth. It is a helpful technique at mid gestation to forecast the possibility of later preterm delivery in asymptomatic females (Kagan and Sonek, 2015). However, CL is believed as forecaster regarding mode and timing of the delivery, this is not utilized like a screening instrument in asymptomatic low risk populace (Thangaraj *et al.*, 2018). Transabdominal ultrasound is most frequently utilized to attain images of urogenital, hepatobiliary & pelvic structures. Its usefulness regarding imaging the alimentary GIT (gastrointestinal tract) is not well recognized, principally due to technical problems in getting quality images for these areas. Though, advancements in US technology and growing knowledge with US findings in various gastrointestinal complaints are expanding its applications (Nylund *et al.*, 2017). At vaginal assessment, cervix digital evaluation is biased and is unsurprisingly subject to significant bias (Pomorski *et al.*, 2016). Hence, the cervical length measurement on ultrasound is apparently more appealing alternative to forecast the success of labour induction (Hatfield *et al.*, 2007). In mid-pregnancy cervical extended length predicts the probability of CS early in the pregnancy. Therefore, during mid-pregnancy cervical length can be significant to predict the delivery mode during early pregnancy (Kalu *et al.*, 2012). It was reported the transabdominal ultrasonography sensitivity and specificity as an investigation to identify the cervical length upto 25mm were 10 percent and 94 percent, respectively, to predict CS as delivery mode (Westerway *et al.*, 2015). Current study is carried out to get the evidence regarding accuracy of transabdominal ultrasound for prediction of mode of delivery using cervical length in second trimester and plan the mode of delivery and prepare the patients for particular mode of delivery on the basis of cervical length assessment on transabdominal ultrasound. This would help health care providers to improve their practice and will also add information to already existing literature.

Material and methods

It was a cross sectional study in which 362 females were enrolled. Females were undergoing transabdominal ultrasonography for assessment of cervical length by researcher and findings were recorded. Females were labeled as positive or negative and all females were booked and followed-up in OPD by obstetrician. At time of delivery, mode of delivery was noted as decided by obstetrician. Data was entered and statistically analyzed using SPSS 21.0. Quantitative variables were described as mean and SD. Qualitative variables were described as frequency and percentage. A 2×2 contingency table was generated to calculate sensitivity, specificity, PPV, NPV and diagnostic accuracy of transabdominal ultrasound taking actual mode of delivery as gold standard.

Results

Table-1 describes that among 362 females, 140 (38.7%) were up to 25 years old and most of them 180 (49.6%) were 26-35 years old while only 42 (11.7%) females were more than 35 years old. The mean age of the females was 27.92 ± 5.75 years. Table 1a indicates that among 362 females, 22 (6.1%) had no parity while 194 (53.5%) and 146 (40.4%) females had given birth to 1-2 and 3-5 children, respectively. The mean parity among females was 2.22 + 1.30. Table 2 shows that out of 362 females, only 30 (8.3%) had cervical length <25 mm while major proportion 332 (91.7%) of females had cervical length >25 mm. The mean cervical length was 35.83 + 7.96 mm. Table-3 highlights that among 362 females, 120 (33.1%) experienced cesarean section while for majority 242 (66.9%) the mode of delivery was SVD (spontaneous vaginal delivery). Table-4 exhibits that among 30 females who had cervical length <25 mm, 24 (6.6%) had cesarean section and 6 (1.7%) had SVD. Among 332 females who had cervical length >25 mm, 96 (26.5%) had cesarean section and 236 (65.5%) had SVD. The sensitivity, specificity, PPV, NPV and diagnostic accuracy of transabdominal ultrasound for cesarean section were 20.0%, 97.5%, 80.0%, 71.1% and 71.8%, respectively.

Table 1. Frequency distribution of females according to age

Age	Frequency	Percentage (%)
Upto 25 years	140	38.7
26-35 years	180	49.6
Above 35 years	42	11.7
Total	362	100.0
Mean + SD	27.92 + 5.75	

Table 1a: Frequency distribution of females according to parity

Age	Frequenc	Percentage (%)	Average Child
Upto 25 years	194	53.5	1-2
26-35 years	146	40.4	3.5
Above 35 years	42	11.7	
Average child			
Total	362	100.0	
Mean + SD		2.22 + 1.30	

Table 2. Frequency distribution of females according to measurement of cervical length

Cervical Length	Frequency	Percentage (%)
<25 mm	30	8.3
>25 mm	332	91.7
Total	362	100.0
Mean + SD		35.83 + 7.96

Table 3. Frequency distribution of females according to mode of delivery

Mode of Delivery	Frequency	Percentage (%)
C-section	120	33.1
SVD	242	66.9
Total	362	100.0

Table 4. Predictive accuracy of cervical length in mid trimester on transabdominal ultrasound for cesarean section

Cervical Length	Mode of Delivery		Total
	C-section	SVD	
<25mm	24 (6.6%) **True positive**	6 (1.7%) **False positive**	30 (8.3%)
>25mm	96 (26.5%) **False negative**	236 (65.2%) **True negative**	332 (91.7%)
Total	120 (33.1%)	242 (66.9%)	362 (100.0%)

Sensitivity	Specificity	PPV	NPV	Diagnostic accuracy
20.0%	97.5%	80.0%	71.1%	71.8%

Discussion

Current study was undertaken to assess the predictive accuracy of cervical length in mid trimester on transabdominal ultrasound for cesarean section at Department of Radiology, University of Lahore, Raiwind Road, Lahore. To acquire adequate outcomes, a group of 362 females was included in the study. Study revealed that most of the females were in their good reproductive age group as 88.3% were up to 35 years old and only 11.7% females were more than 35 years old. The mean age of the females was 27.92 + 5.75 years. The findings of our study are comparable with a study carried out by Gameraddin and Bashab who reported that major proportion (75.5%) of females was up to 35 years old 24.5% females were more than 35 years old (Gameraddin and Bashab, 2018). 10 The findings of another study conducted by Nambiar and his fellows also demonstrated similar scenario that mean age of the pregnant females was 27.27±4.87 years (Nambiar *et al.*, 2017). It was found during study that only 6.1% females had no parity while more than half (53.5%) of the females delivered 1-2 children and 40.4% females delivered 3-5 children. The mean parity was 2.22 + 1.30. Nambiar and fellows reported in their study that majority of females (77.2%) gave birth to one child while 22.8 females gave birth to more than one child (Nambiar *et al.*, 2017). Another recent study conducted by Peng and his colleagues indicated that more than half (55.4%) of the females 19 nulliparous while 44.6% were multiparous (Peng *et al.*, 2015). Cervical length is believed as important predictor in pregnant females to assess the mode and timing of the delivery. It is believed that when cervical length <25 is mm then there is great chance of cesarean section delivery. It is significant to mention here that only 8.3% females have cervical length up to 25 mm while significant major (91.7%) had cervical length above 25 mm. The mean cervical length was 35.83 + 7.96 mm. The findings of study undertaken by Hernandez-Andrade and his coworker showed almost similar results that mean cervical length was 34.6+ 7.55 mm (Hernandez-Andrade *et al.*, 2012). But the results of a study carried out by Gameraddin and Bashab exhibited different scenario that mean cervical length was 38.20±5.20 mm (Gameraddin and Bashab, 2018) The findings of another study conducted by Buathum a comrades (2019) also confirmed that mean cervical length was 39.3+6.4 mm. As far as mode of delivery is concerned, study highlights that among 33.1% females the mode of delivery w cesarean section while among majority (66.9%) the mo of delivery was SVD (spontaneous vaginal delivery). The findings of a similar study carried out by Rane and his associates exhibited better scenario than our study results who confirmed that only 18.9% female experienced cesarean section while mainstream (81.1%) females had vaginal delivery (Rane *et al.*, 2003). Also the results of another study performed by Gameraddin and Bashab are better than our study results who stated that 27.5% females experience cesarean delivery (Gameraddin and Bashab, 2018). When

the cervical length and mode of delivery was assessed, study indicated that among 30 females who has cervical lengths <25 mm, 24 (true positive) experienced C-section and only 6 (false positive) had spontaneous vagina delivery. Likewise, among 332 females who had cervical length >25 mm, 96 (false negative) had cesarean section and 236 (true negative) had SVD. The sensitivity specificity, PPV, NPV and diagnostic accuracy transabdominal ultrasound for cesarean section we 20.0%, 97.5%, 80.0%, 71.1% and 71.8%, respectively was reported in a recent study carried out by El Mekka and his collaborators reported that CL <28 mm had sensivity 87.5%, specificity 86.3%, PPV 61.4%, and NPV 96.5% the induction of successful labor (El Mekkawi *et al.*, 2019). In a study, Saul and his colleagues found 100 percent sensitivity of transabdominal ultrasonography for cervical length assessment upto 25 mm (Saul *et al.*, 2008). Westerway and his colleagues reported that transabdominal ultrasonography sensitivity a specificity to identify the cervical length upto 25mm was 10 percent and 94 percent, respectively, to predict CS delivery mode (Westerway *et al.*, 2015).

Conclusion

Study concluded that cesarean section takes place among pregnant females when cervical length is ≤25mm on transabdominal ultrasound during mid trimester.

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