

## PREDICTION OF SHORT-TERM PERINATAL OUTCOME IN OLIGOHYDRAMNIOS AT TERM-ROLE OF UMBILICAL CORD ARTERIAL BLOOD LACTATE LEVELS

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### ABSTRACT

**Objective:** Investigating the perinatal outcome in pregnant patients with oligohydramnios at term.

**Study Design:** Prospective observational study.

**Place and Duration of Study:** Department of Obstetrics and Gynaecology, Pakistan Naval Ship (PNS) Shifa Hospital Karachi, from Mar to Oct 2020.

**Methodology:** The investigation comprised of 60 parturient ladies with gestational amenorrhoea of 37-42 weeks and no associated medical illnesses. Collection A consisted of 30 patients with maximum vertical pocket (MVP) <2cm or amniotic fluid index (AFI) ≤5cm. Collection B involved 30 pregnant women having normal amniotic fluid index >5cm. The 2 collections were tallied with respect to demographic characteristics and perinatal outcome particularly low birth weight, delivery mode, poor APGAR score, umbilical artery acidosis and meconium staining. Neonatal future stands upon evaluation of levels of lactate found in umbilical cord arterial blood.

**Results:** According to our findings, commonest mode of childbirth 37 (61.7%) was Caesarean section. No statistical difference was found between the two aggregations of low weight at birth i.e. 4 (13.3%). Based on our study, meconium staining at birth was prevalent in 8 (13.3%) of neonates however no meconium aspiration was seen, umbilical artery acidosis was apparent in 27 (45%) and only 5 (8.3%) accounted for poor APGAR scores.

**Conclusion:** Detrimental pregnancy aftermath and elevated perinatal morbidity correlates with oligohydramnios.

**Keywords:** Neonatal outcome, Oligohydramnios, Umbilical cord arterial blood lactate levels.

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### INTRODUCTION

Amniotic fluid is almost produced exclusively by the foetus and is detected right from the start of the pregnancy. Not only the growth and development but for good sustenance and maintenance of pregnancy, amniotic fluid plays a crucial part<sup>1</sup>. Its significance is prevalence from the fact that a decrease in its optimum volume gives rise to oligohydramnios. The tendency of oligohydramnios at full-term is 10% as per AFI volume of <5cm<sup>2</sup>. Oligohydramnios is suspected when the symphysis-fundal height is not corresponding to gestational age. Ultrasonic examination is a reliable way of measuring amniotic fluid volume (AFV). The maximum vertical pocket measurement (MVP) stipulates a largest amniotic fluid pocket excluding umbilical cord or foetal extremities when vertically analysed. Oligohydramnios is characterised by an MVP <2cm. Amniotic fluid index can be estimated by making four quadrants of the uterus with the help of linea nigra and umbilicus.

Factors accounting for oligohydramnios comprise of membrane rupture, foetal genital and urinary abnormalities, uteroplacental insufficiency (stunted foetal

growth), placental problems and diseases like pre-eclampsia, which are maternally associated. Majority of the cases are idiopathic. It is in correlation with unfavourable gestational outcomes which may be due to placental insufficiency and umbilical cord compression as per different studies. Either or both of these can lead to increase in caesarean sections, still birth and poor neonatal outcome consequent to foetal heart rate irregularity<sup>3,4</sup>.

This also correlates with meconium staining, low APGAR scores, small for gestational age (SGA) foetus and Neonatal intensive care unit (NICU) admission. Underlying etiology, timing, intensity and duration of oligohydramnios further complicates the pregnancy. Controversy arises regarding the time of delivery. In correlation to normal AFV cases, there is no foetal acidosis and unfavourable neonatal outcome in third trimester in parturient with AFI below 5cm<sup>5</sup>. In isolated oligohydramnios cases, delivery is usually conducted at completion of 37 weeks of gestation.

By predicting the level of lactate as well as the value of pH for the blood in the umbilical cord artery, we can approximate the neonatal outcome. Neonatal hypoxia, a concerning situation can be determined by both prognostics: lactate measurement and pH. It occurs when there is not sufficient oxygen available to

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Received: 12 Dec 2020; revised received: 18 Jan 2021; accepted: 24 Feb 2021

provide the tissue with energy, leading to anaerobic respiration. Hydrogen ions and lactate elevated levels lead to primarily, respiratory and then consequently, metabolic acidosis<sup>6</sup>. Deficient oxygen supply accompanied with acidosis leads to multiple organ damage so the metabolic state of new-born is of utter significance.

When determining the neonatal state, pH is usually employed more than lactate. However, a massive quantity of blood as well as complex machinery is imperative for pH calculation instead of lactate levels. On the other hand, the procedure for measuring lactate requires a lesser amount of blood, lower cost and is easier to maintain<sup>7</sup>. The lactate, which is a result of anaerobic respiration, is significantly more important than pH or of comparable importance in deciding neonatal morbidity<sup>8</sup>. Therefore, our research used the levels of lactate in the umbilical cord's arterial blood to estimate short-lived neonatal outcome. Other variables as well as lactate levels were utilized to analyse both collections i.e. including and excluding oligohydramnios. The objective of the study was to find out the neonatal outcome in women with uncomplicated oligohydramnios at term.

## METHODOLOGY

This research was conducted between the months from March 2020 to October 2020 at Pakistan Naval Ship Shifa Hospital Karachi, department of Obstetrics and Gynaecology. The ethical committee of the aforementioned hospital was consulted for approval (ERC/2020/Gynae/17). The sample size (n=30) was found using WHO sample size calculator, with expected rate of caesarean-sections 72.6% vs 17.5% between the two collections<sup>9</sup>.

All expecting females without any existing medical illnesses, booked at 20 weeks of pregnancy were included in this research. Willing participants were asked to give informed consent. The exclusion criteria included: women with polyhydramnios (AFI>18cm), pregnancy induced hypertension (PIH), pre-labour rupture of membranes (PROM), gestational diabetes mellitus (GDM), multifetal pregnancy, foetal growth restriction (FGR), congenital anomalies, post-term gestation, prior record of C-sections, any correlating medical affliction and patients who did not consent to participate. The inclusion criterion for this research was singleton uncomplicated pregnancy with oligohydramnios. All pregnancies were confirmed and dated using last menstrual period (LMP) as well as the ultrasonography of the first trimester. Two collections were formed and the 60 shortlisted parturient participants were

divided and grouped according to ultrasonic findings of isolated oligohydramnios monitored from 28 weeks onward as collection A and the ones without any oligohydramnios development as collection B. The standard for diagnosing oligohydramnios was AFI ≤5cm or MVP<2cm. Both categories had 30 pregnant women each. Their mode of delivery, between 37-42 weeks pregnancy, was monitored and the consequent neonatal variables were utilised as a contrast in the two collections. Demographic features were corresponded too.

A 20cm of double clamped segment of umbilical cord was used as standard procedure for the collection of umbilical cord arterial blood right after the birth. Heparinised syringes were used for the collection of sample that was immediately transferred to the laboratory within 30minutes for lactate levels by an automated analyser machine. Trained staff including midwives and nurses collected the samples. Proformas specifically designed for this study were filled out with APGAR scores, baby weight and the lactate levels for every patient.

Perinatal outcome was figured out as follows:

**Acidosis of umbilical artery:** Lactate levels being >3.5 mmol/l, (1.0-3.5) in umbilical cord arterial blood.

**Poor APGAR scores:** APGAR scores after 5 mins post-delivery being <5.

**Low birth weight:** baby weighing <2500g instantly at birth, as recorded by weight machine.

The two collections, A and B (with and without oligohydramnios), were matched for period of gestation, mode of delivery, presence of meconium in amniotic fluid, umbilical cord acidosis (lactate levels), birth weight and APGAR scores along with demographic profile. Data was interpreted and analysed using IBM-SPSS-22. Accordingly, *p*-values and frequencies were estimated. Dis-similarities in the two collections were compared and categorical data with chi-squared and Fisher's exact test. The *p*-value of ≤0.05 was considered significant.

## RESULTS

This study collection constituted 60 pregnant women who gave birth between 37-42 gestational weeks. There was no difference in demographic profiles of the two collections as displayed by table-I.

As per our deductions, the most common child-birth mode was Caesarean section with a statistic of 37 (61.7%). Among collection A, 22 (73.3%) delivered by C-section while among collection B, 15 (50%) had C-section. Eight (26.7%) delivered vaginally in collection

A and 15 (50%) had the same mode of delivery in collection B. There was no statistical difference of low weight at birth found between the two collections i.e. 4 (13.3%) in each collection. Twenty six (86.7%) in collection A and B had normal birthweight. Overall, our study population showed the following trends: 8 (13.3%) neonates were born with meconium staining however no meconium aspiration; 5 (16.7%) in collection A had meconium staining and only 3 (10%) in collection B had meconium. Umbilical artery acidosis ( $\text{pH} < 7.3$ , lactate  $> 3.5 \text{ mmol/l}$ ) was prevalent in 27 (45%)  $p$ -value 0.025, 18 (60%) in collection A had umbilical artery acidosis evident, while 9 (30%) in collection B showed acidosis. Low APGAR score was in only 5 (8.3%)  $p$ -value 0.034; 4 (13.3%) showed low APGAR scores in collection A and only 1 (3.3%) in collection B had poor APGAR score. There was a great difference in umbilical artery acidosis and APGAR at birth,  $p$ -value  $< 0.05$ , as visible in table-II.

**Table-I: Demographic profile of the two collections.**

Variable		Collection A	Collection B	$p$ -value
Age (years)	Less than 30	25 (41.7%)	21 (35%)	0.360
	More than 30	5 (8.3%)	9 (15%)	
Weeks of Gestation	Less than 40	28 (46.7%)	29 (48.3%)	1.000
	More than 40	2 (3.3%)	1 (1.7%)	
Equivalence	Average $\pm$ SD	1.45 $\pm$ 1.50	1.83 $\pm$ 1.08	0.263

**Table-II: Comparison of neonatal outcomes in two collections.**

Variables of the Study		Collection A Findings	Collection B Findings	$p$ -value
Delivery Method	Vaginal Delivery	8 (26.7%)	15 (50%)	0.110
	Caesarean Section	22 (73.3%)	15 (50%)	
Meconium	Affirmative	5 (16.7%)	3 (10%)	0.706
	Negative	25 (83.3%)	27 (90%)	
Umbilical Artery Acidosis	Affirmative	18 (60%)	9 (30%)	0.025
	Negative	12 (40%)	21 (70%)	
Poor PGAR Value	Affirmative	4 (13.3%)	1 (3.3%)	0.034
	Negative	26 (86.7%)	29 (96.7%)	
Inadequate Weight at Time of Birth	Affirmative	4 (13.3%)	4 (13.3%)	0.114
	Negative	26 (86.7%)	26 (86.7%)	

## DISCUSSION

A healthy normal pregnancy persists with amniotic fluid being its vital component whose adequate amount is not only beneficial for foetal growth but serves as a barrier against injuries, maintains body temperature, fulfills necessary nutritional requirements and provides room for foetal movements<sup>1,2,10</sup>. Low amniotic fluid figures are detrimental for the foetus because they may be correlated with stunted growth, skeletal deformities, pulmonary hypoplasia, declined APGAR values, increased likeliness of caesarean sections, meconium aspiration and NICU admissions<sup>3,4</sup>. Increased rate of C-section (20.2%) coupled with foetal

distress and low APGAR scores at 5 minutes is resultant of reduced amniotic fluid quantity as per Chauhan *et al*<sup>11</sup>. Accumulative caesarean section rates in both collections were (61.7%) while collection A (that had oligohydramnios) reported (73.3%) in this study.

Golan *et al*<sup>12</sup> expressed a reduced APGAR score of (4.6%) in neonates whereas our study found it to be 8.3% at low APGAR figures in both categories with collection A showing 13.3%. Jamal *et al*<sup>13</sup> exhibited 9.6% had low APGAR scores and acidosis of umbilical artery was 11.2% in oligohydramnios at term. Kahkhaie *et al*<sup>14</sup> discovered no significant deviation in the occurrence of meconium in research aggregations, whereas our findings depicted amniotic fluid containing meconium in 13.3% of neonates; collection A had 16.7%.

Lactate levels in umbilical cord blood are significantly essential after 37 weeks of gestation for deter-

mining neonatal outcome. In our study 45% reported elevated lactate levels; 60% fell into collection A. According to an article by Tuuli *et al*<sup>7</sup> the results were analogous. Lactate levels accounted for more specificity than pH in regulating the neonatal morbidity. Lactate majorly formed earlier as a result of anaerobic metabolism, persists longer than pH and proves more hazardous than pH. Respiratory acidosis is depicted by pH while metabolic acidosis is shown by high umbilical arterial blood lactate levels which is more harmful. Wiberg *et al*<sup>15</sup> reported that umbilical cord arterial blood lactate to be equally good as low pH for estimating 5 minute APGAR <4. Blood lactate levels in

artery of umbilical cord determine neonatal prognosis. Suidan *et al*<sup>16</sup> concluded lactate as the major inducer of acidosis in the foetus since the foetus produces lactate on its own. Einikyte *et al*<sup>17</sup> discovered that lactate is agreeably as important as pH in predicting the state of neonates at birth. Umbilical cord arterial lactate levels were found to be raised among neonates with low APGAR scores and more in emergency than elective Caesarean sections<sup>18</sup>. Hina *et al*<sup>19</sup> deduced no relation between oligohydramnios and poor neonatal result but unveiled an elevated Caesarean sections rate and elective induction labour as contrasted to term pregnancies without oligohydramnios.

In a study by Tahmina *et al*, the mean birth weights among the two study collections were found to be important statistically ( $p=0.0017$ ), while our study depicted no prominent difference among the research categories<sup>20</sup>. There is strong association of meconium staining of amniotic fluid and oligohydramnios<sup>21</sup>. This is comparable to our research. Another study depicted more incidence of caesarean section, haemorrhage and fetal malposition in women with oligohydramnios than those having normal AFV. It also revealed higher occurrence of intrauterine deaths, neonatal demise and low birth weight<sup>22,8</sup>. Our findings were a higher rate of operative delivery, occurrence of meconium, umbilical arterial blood acidosis and low APGAR scores in pregnant women with oligohydramnios. Another study showed umbilical cord arterial blood lactate dehydrogenase levels were a better predictor of neonatal prognosis when compared with pH values in hypertensive patients<sup>23,24</sup>.

## CONCLUSION

Oligohydramnios is the major cause of adverse pregnancy and perinatal outcome. Proper analysis of amniotic fluid is a vital step for a good antenatal diagnosis. Unfortunate neonatal results can be avoided by close observation of pregnant women with oligohydramnios. Umbilical cord arterial blood lactate levels anticipate neonatal outcomes markedly, proving this marker pivotal in assessment of acidosis in new-borns.

## CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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