Polyhydramnios as a Predictor of Adverse Pregnancy Outcomes

*Kaukab Tashfeen and Ilham Moosa Hamdi

Objectives: This study aimed to ascertain the frequency of polyhydramnios in singleton pregnancies, to determine the associated risk factors, and assess the adverse maternal and perinatal outcomes. Methods: A retrospective cohort study of all singleton pregnancies complicated with polyhydramnios after 28 weeks of gestation was carried out in Nizwa Hospital's Obstetrics & Gynecology Department, Oman, from January 2002 to December 2007. Of 25,979 pregnant women reviewed, 477 were found to have polyhydramnios. The control group consisted of 900 pregnant women. Cases of polyhydramnios were diagnosed as mild, moderate, or severe based on their highest amniotic fluid index. Cases were compared with controls in terms of demographic data; prevalence of diabetes, macrosomia, or Caesarean deliveries; frequency of fetal anomalies, and perinatal mortality rate. Results: Polyhydramnios was diagnosed in 1.8% of pregnancies. It was mild in 382 (80%), moderate in 84 (17.6%), and severe in 12 (2.4%). A total of 72 (15.3 %) cases of polyhydramnios were complicated by diabetes (gestational or established diabetes mellitus) as compared to 10% of the control group and 39 (8.1%) neonates had congenital anomalies. Polyhydramnios was associated with advanced maternal age; 58 (12.2%) of subjects were over 40 years old. The perinatal mortality rate with polyhydramnios was 42 per 1,000 births compared to 14 per 1000 births in the control group. Conclusion: These data demonstrate that polyhydramnios is associated with an increased risk of adverse perinatal outcomes, and there is a significant positive relation with maternal age, diabetes, fetal anomalies, and fetal macrosomia.

Keywords: Amniotic fluid index; Caesarean delivery; Macrosomia; Perinatal outcome; Oman.

Advances in Knowledge
- Polyhydramnios occurs in 1–3.5% of pregnancies and is severe in 2.4% of these.
- The principal factors associated with polyhydramnios include fetal malformation, maternal diabetes mellitus, and multiple gestations.
- The majority of cases of polyhydramnios are idiopathic.
Polyhydramnios refers to an excessive accumulation of amniotic fluid, which is associated with an increased risk of adverse pregnancy outcomes. Polyhydramnios is diagnosed when a mother’s amniotic fluid index elevates to $>24 \pm 2$ cm standard deviation (SD) in the late second or third trimester. It complicates 0.4–1.9% of all pregnancies. The aetiology of polyhydramnios is diverse and involves many maternal and fetal conditions including diabetes, congenital anomalies, multiple gestation, and isoimmunisation. If none of these causes can be identified, then a diagnosis of idiopathic polyhydramnios is made. Magann reported the incidence of idiopathic polyhydramnios among subjects with polyhydramnios as 50–60%. However, it consistently has been documented that perinatal morbidity and mortality rates increased in association with polyhydramnios related to specific causes.

A pregnancy complicated by polyhydramnios can present difficult diagnostic and therapeutic dilemmas for obstetricians. Many clinicians have viewed polyhydramnios as a prognostic factor of increased risk of pregnancy complications and have recommended an extensive evaluation of these pregnancies, including multiple comprehensive ultrasound examinations, repeat diabetes screening, and amniocentesis for fetal karyotyping. However, counselling of a couple regarding idiopathic polyhydramnios often creates significant anxiety and fosters the impression of an abnormal pregnancy.

The rationale of our study was to determine the association between polyhydramnios and adverse obstetric and perinatal outcomes in singleton, third-trimester pregnancies.

Methods

This was a retrospective cohort study of 25,979 women with singleton pregnancies who delivered at Nizwa Hospital between January 2002 and December 2007. Permission was first gained from the Research and Ethics Committee of Nizwa Hospital, which is a secondary care hospital serving as a regional referral center for the Al-Dakhliya central region in Oman. The study group was composed of 477 women with polyhydramnios, while 900 women with normal amniotic fluid levels formed the control group, which was selected randomly.

Included in the study were women at 28 or more weeks’ gestation with confirmed polyhydramnios in singleton pregnancies who had been diagnosed by ultrasound examination. Pregnancies of less than 28 weeks’ gestation and multiple pregnancies were excluded.

Polyhydramnios was categorised as mild, moderate, or severe based on an amniotic fluid index of 25–30 cm, 30.1–35 cm, or 35.1 cm or more, respectively. A pregnancy complicated by polyhydramnios can present difficult diagnostic and therapeutic dilemmas for obstetricians. Many clinicians have viewed polyhydramnios as a prognostic factor of increased risk of pregnancy complications and have recommended an extensive evaluation of these pregnancies, including multiple comprehensive ultrasound examinations, repeat diabetes screening, and amniocentesis for fetal karyotyping. However, counselling of a couple regarding idiopathic polyhydramnios often creates significant anxiety and fosters the impression of an abnormal pregnancy.

The rationale of our study was to determine the association between polyhydramnios and adverse obstetric and perinatal outcomes in singleton, third-trimester pregnancies.
and risk factors known to be associated with polyhydramnios, including diabetes, macrosomia, and congenital anomalies.

Caesarean delivery rates and perinatal outcomes in the study group were compared with those of the control group. Neonatal information was obtained using the computerised obstetric database, which contains pregnancy outcomes for all women who have delivered at our hospital. Evaluation for major congenital anomalies was routinely carried out in the immediate neonatal period by attending pediatricians. Karyotype analysis was performed at the pediatricians’ discretion. No women had genetic amniocentesis during the antenatal period as we do not have the facilities for such testing. The control group included singleton pregnancies at ≥28 weeks of gestation who were evaluated during the study period and exhibited normal amniotic fluid levels upon ultrasound.

The Statistical Package for the Social Sciences (SPSS), Version 10 (IBM, Inc., Chicago, Illinois, USA) was used for statistical analysis. The rate of each specific outcome measure was calculated for patient and control subjects and rates were compared with Pearson’s chi-square test. Statistical significance was defined as \( P < 0.05 \).

### Results

Of the 25,979 singleton pregnancies seen at the hospital during the study period, 477 (1.8%) were diagnosed with polyhydramnios by ultrasound scan. Of those diagnosed, the severity was classified as mild, moderate, and severe in 80.1%, 17.6%, and 2.4% of cases, respectively. From our data, we were able to determine three prominent aetiological classifications of polyhydramnios: idiopathic polyhydramnios occurring in 76.8% of cases; diabetes mellitus, occurring in 15.3% of cases; and congenital anomalies, found in 8.2% of cases.

The demographic data for the control and study groups are displayed in Table I. There was a significant rise in polyhydramnios with advanced maternal age \( (P < 0.001) \). The analysis of parity distribution did not reveal any significant trend with polyhydramnios.

The cohorts of women were evaluated for diabetes, maintaining the view that there is an

### Table 1: Demographic data of study subjects

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Polyhydramnios (n = 477)</th>
<th>Control (n = 900)</th>
<th>( P ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Nulliparous</td>
<td>90</td>
<td>18.9</td>
<td>130</td>
</tr>
<tr>
<td>Multiparous</td>
<td>287</td>
<td>60.2</td>
<td>560</td>
</tr>
<tr>
<td>Grand multiparous</td>
<td>100</td>
<td>20.9</td>
<td>210</td>
</tr>
<tr>
<td>Mean maternal age (years)</td>
<td>30.1 ± 5.1</td>
<td>NS</td>
<td>28.2 ± 4.3</td>
</tr>
<tr>
<td>Maternal age &gt;40 years</td>
<td>58</td>
<td>12.2</td>
<td>34</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>73</td>
<td>15.3</td>
<td>89</td>
</tr>
</tbody>
</table>

\( NS \) = non-significant

Grand multiparity = >6 parity; Multiparous = 2-6 parity; Nulliparous = 0 parity.

### Table 2: Outcome measures for study subjects

<table>
<thead>
<tr>
<th>Outcome measure</th>
<th>Polyhydramnios (n = 477)</th>
<th>Control (n = 900)</th>
<th>( P ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Preterm delivery (&lt;37 weeks)</td>
<td>20</td>
<td>4.1</td>
<td>60</td>
</tr>
<tr>
<td>Macrosomia (&gt;4000 g)</td>
<td>90</td>
<td>18.8</td>
<td>50</td>
</tr>
<tr>
<td>Caesarean delivery</td>
<td>115</td>
<td>24.0</td>
<td>96</td>
</tr>
<tr>
<td>Congenital anomalies</td>
<td>39</td>
<td>8.2</td>
<td>39</td>
</tr>
<tr>
<td>Perinatal mortality rate</td>
<td>42/1000</td>
<td>14/1000</td>
<td></td>
</tr>
</tbody>
</table>
established association between diabetes and polyhydramnios. The prevalence of diabetes in the control group was 9.8%, while in the polyhydramnios group it was 15.3% (P <0.001) [Figure 1]. Of those patients, 59 were on a medically supervised diet and 12 were on insulin. Only two patients had pre-existing diabetes, as shown in Figure 1. The difference is statistically significant.

There were 115 Caesarean sections in the study group, yielding a 24% rate of Caesarean delivery versus a 10.6% rate in the control group (P <0.001), as shown in Figure 2. Eight (1.6%) of those in the study group had instrumental delivery as compared to 2.4% in the control group. Most of those were vacuum deliveries. Outcome measures are shown in Table 2.

As regards neonatal and fetal outcomes, Figure 3 details the major congenital anomalies that were detected in the infants of 39 women with polyhydramnios (8.2%), while in the control group 4.3% displayed anomalies (P <0.001). Central nervous system (CNS) anomalies included hydrocephaly, anencephaly, holoprosencephaly, and myelomeningocele; these were diagnosed in 12 pregnancies. Gastrointestinal anomalies included oesophageal and duodenal atresia, diaphragmatic hernia, and trachea oesophageal fistula; they were diagnosed in 10 pregnancies. Eight pregnancies had cardiovascular malformations including structural cardiac defect, hydrops, and pulmonary oedema. Four fetuses had multi-organ system malformations including those of the central nervous system, and the gastrointestinal and genitourinary systems. Inherited disorders of renal functioning are a rare cause of polyhydramnios. In our study, we diagnosed one baby with Bartter syndrome whose mother had uncontrolled diabetes mellitus. The infant died after 11 days due to associated complex cardiac disease.

In regard to macrosomia, the mean birth weight was 3,800 ± 300 grams in the polyhydramnios group, while in the control group it was 3,000 ± 300 grams. The heaviest newborn was 5,000 grams, born to a 7th gravida at 41 weeks of gestation by emergency Caesarean section. The incidence of macrosomia in the polyhydramnios group was 18.8%, while in the control group the incidence was 5.5%. A significant positive relationship was observed between polyhydramnios and birth weight (P <0.003) [Table 2].

Seventy-six (16.0%) neonates were admitted to the Special Care Baby Unit (SCBU) in the polyhydramnios group, compared to 11 babies (15.5%) from the control group [Figure 4]. Nineteen babies of the 76 in the study group had perinatal asphyxia and 3 had severe birth asphyxia. The latter babies had multiple congenital anomalies and died at the age of 3–4 hours. The other 16 were discharged in good condition.

Seven cases of shoulder dystocia were seen in the study group, while 11 babies in the control group had shoulder dystocia. The average birth weight of the babies who had shoulder dystocia was 3.8–4.0 kg, but none of them had any neurological problem. Eleven babies were admitted with hypoglycaemia, but only for observation.

The perinatal mortality rate in the polyhydramnios group was 42 per 1,000 births as compared to 14 per 1,000 births in the control. The increased perinatal mortality rate in the case of polyhydramnios was due to the underlying cause of
the polyhydramnios (i.e. congenital anomalies and uncontrolled diabetes).

Discussion

Recognition of polyhydramnios is of benefit as it allows identification of pregnancies that may be at increased risk of adverse outcomes. Once polyhydramnios is identified, patients need a thorough evaluation as it is associated with an increased frequency of both maternal and fetal complications. Chamberlain cited an increased rate of perinatal morbidity and mortality among patients with hydramnios.

In reviewing the adverse outcomes in pregnancies complicated by polyhydramnios, we found the overall incidence of polyhydramnios to be 1.8% in our population. Of those who were included in our study group, 80% were considered to have mild polyhydramnios, 17.6% of the cases were considered moderate, and 2.4% were considered severe. This is similar to Barnhart’s study, which noted polyhydramnios in 1.7% of 2,730 pregnancies.

A demographic analysis showed that polyhydramnios was more common in older gravida. However, parity had no significant relationship to polyhydramnios. This was consistent with Mariam’s study. However, Biggo et al. found a significant relationship between both rising maternal age and parity in polyhydramnios.

The association between diabetes and polyhydramnios is well known. A commonly supported theory is that increased amniotic fluid volume in diabetic pregnancies could be a result of maternal hyperglycemia which, in turn, produces fetal hyperglycemia and osmotic diuresis. It has consistently been reported that approximately 15% of pregnancies complicated by polyhydramnios occur in diabetic women. This figure was consistent with our study. We found that 73 of our polyhydramnios patients (15.3%) were diabetic, including 59 who were being treated for gestational diabetes or were on a medically supervised diet, Twelve had gestational insulin-treated diabetes. Only two patients had pre-existing diabetes mellitus.

The mean gestational age at delivery was 38.2 ± 1.4 weeks. There was no significant increase in preterm delivery as most preterm deliveries were noticed in case of severe polyhydramnios due to uterine overdistension or fetal anomalies. These comprised only 2.5% of the study group. This result was consistent with Many, whose study showed no increased rate of preterm delivery with polyhydramnios.

The mode of delivery was also influenced by polyhydramnios, with a higher proportion of Caesarean deliveries as compared with those mothers who had a normal volume of amniotic fluid. We found a significantly elevated Caesarean delivery rate in the polyhydramnios group, which had a 24% rate compared to 10.6% in the control group.

In our study, polyhydramnios had an impact on perinatal outcomes, the occurrence of fetal macrosomia and fetal congenital anomalies, and SCBU admissions of neonates. The prevalence of anomalies was 8.1%, which was fairly comparable
with other large series studies. This confirms reports of greater anomaly risks that occur with worsening polyhydramnios.\textsuperscript{17} Dashe reported in his study of polyhydramnios and anomaly detection that 11.0% of the neonates in his study had fetal anomalies.\textsuperscript{8}

In our study, the high incidence of macrosomia associated with polyhydramnios was consistent with several other studies, and showed a correlation between large-for-gestational-age infants and polyhydramnios.\textsuperscript{18}

**Conclusion**

The intention of the study was to compare neonatal and maternal outcomes in a control group with women with polyhydramnios. Our findings suggest that once a diagnosis of polyhydramnios is confirmed, a woman should be referred to a perinatal centre with expertise in fetal medicine in order for any anomalies to be detected.

This study demonstrates that the likelihood of an adverse perinatal outcome increases in association with polyhydramnios. There is a significant positive relationship between maternal age, diabetes, and fetal anomalies and macrosomia.

Collectively, data from other studies as well as our own suggests that if polyhydramnios is diagnosed a thorough evaluation for fetal or maternal factors is indicated. At minimum, this should include a comprehensive ultrasound examination and screening for diabetes as it is the most common cause of polyhydramnios. Careful maternal and fetal surveillance during the antepartum, intrapartum and postpartum periods is warranted to anticipate complications due to polyhydramnios.

**References**