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Original Research Article

Maternal Outcomes in Patients with Oligohydramnios: A Prospective Observational Study

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Abstract

Background: Oligohydramnios, characterized by an amniotic fluid index (AFI) of ≤5 cm, is associated with increased maternal and perinatal risks, including fetal growth restriction, abnormal labor patterns, and higher rates of operative delivery. Timely identification and intervention are essential to improving outcomes. ***Aim of the study:*** To evaluate maternal outcomes in pregnancies complicated by oligohydramnios, with a particular focus on delivery methods, antepartum complications, and the effect of L-arginine supplementation. ***Methods:*** This prospective observational study included 115 pregnant women diagnosed with oligohydramnios at Department of Obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh. Data on maternal demographics, obstetric history, antepartum complications, labor characteristics, and delivery outcomes were collected. Management included hydration, rest, fetal surveillance, and in selected cases, L-arginine therapy. Statistical analysis was performed using SPSS version 26. ***Result:*** Most participants were aged 20–34 years (92.17%) and had normal BMI (53.91%). Common complications included anemia (37.39%) and hypertensive disorders (31.30%). Induced labor was required in 75.65% of cases. The most frequent mode of delivery was vaginal (55.65%), followed by emergency cesarean section (33.91%). Emergency cesarean indications were mainly non-reassuring fetal heart rate patterns (79.13%). ***Conclusion:*** Oligohydramnios significantly increases the risk of emergency interventions and adverse maternal outcomes. Early detection and close monitoring, along with supportive therapies such as L-arginine, may help optimize maternal and fetal well-being.

Keywords: Oligohydramnios, maternal outcomes, cesarean section, fetal distress, L-arginine, AFI.

INTRODUCTION

Oligohydramnios is a condition characterized by a reduced volume of amniotic fluid, defined as an amniotic fluid index (AFI) of less than 5 cm on ultrasonography [1]. It occurs in approximately 4.4% of term pregnancies and is associated with an increased risk of adverse maternal and perinatal outcomes [2]. A borderline AFI, ranging between 5 and 8 cm, is also linked to potential complications [3]. The amniotic fluid plays a crucial role in fetal development by providing mechanical protection, maintaining intrauterine temperature, and preventing umbilical cord compression [4]. Additionally, it facilitates musculoskeletal and pulmonary maturation by allowing fetal movements, promoting joint and limb development, and enabling fetal breathing exercises that are essential for lung expansion and alveolar maturation. [5]. By the mid-third trimester, amniotic fluid volume typically reaches 800 mL, ensuring a stable intrauterine environment for fetal growth and development [6]. A reduction in amniotic fluid volume triggers fetal adaptive mechanisms, including decreased urine output and preferential redistribution of blood flow toward vital organs such as the brain and heart [7]. However, prolonged oligohydramnios can result in significant complications, including restricted fetal movements, musculoskeletal deformities, pulmonary hypoplasia, and intrauterine growth restriction (IUGR) [8]. Additionally, the risk of umbilical cord compression increases, potentially causing variable fetal heart rate decelerations and fetal distress [9]. These complications contribute to higher rates of preterm birth, neonatal intensive care unit (NICU) admission, and perinatal morbidity and

mortality [10]. The maternal implications of oligohydramnios include an increased risk of prolonged labor due to inefficient uterine contractions, leading to higher rates of operative deliveries, including cesarean section [11]. Furthermore, meconium-stained amniotic fluid is more frequently observed in cases of oligohydramnios, raising concerns about neonatal respiratory distress syndrome and other perinatal complications [12]. These risks highlight the importance of early detection and management to optimize pregnancy outcomes. L-arginine, a semi-essential amino acid and a natural precursor of nitric oxide, has been proposed as a therapeutic option for improving amniotic fluid volume by enhancing placental perfusion, promoting vasodilation, and optimizing fetal hemodynamics, thereby potentially mitigating the adverse effects of oligohydramnios. [13]. Nitric oxide is a key regulator of vascular tone and placental circulation, playing a crucial role in maintaining uteroplacental blood flow [14]. Studies suggest that L-arginine supplementation may enhance umbilical blood flow, particularly in pregnancies complicated by IUGR or hypertensive disorders, which are commonly associated with oligohydramnios [15]. Additionally, L-arginine has been shown to improve AFI, potentially reducing the need for preterm delivery and invasive obstetric interventions [13]. Given the maternal and fetal risks associated with oligohydramnios and the potential benefits of L-arginine supplementation, this study aims to evaluate maternal outcomes in pregnancies complicated by oligohydramnios with and without L-arginine therapy.

METHODOLOGY & MATERIALS

This was a prospective observational study conducted over one year period, from July 2019 to June 2020, Department of Obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh. The study aimed to evaluate maternal outcomes in women diagnosed with oligohydramnios. A total of 115 pregnant women, who met the inclusion and exclusion criteria, were enrolled in the study. The diagnosis of oligohydramnios was confirmed via ultrasonographic assessment of amniotic fluid index (AFI).

Inclusion Criteria

- AFI ≤ 5.0 cm on ultrasonography, indicating oligohydramnios.
- Pregnant women from 24 weeks of gestation.
- Patients not receiving L-arginine but presenting for emergency delivery due to oligohydramnios during the study period were also included.

Exclusion Criteria

- Premature rupture of membranes (PROM).
- Multiple pregnancies, including twins.
- Pregnancy prior to the third trimester.
- Intrauterine fetal demise (IUFD).
- Pregnancies with congenital anomalies.

Ethical Considerations

Ethical clearance was obtained from the Institutional Ethics Committee prior to commencement of the study. Informed consent was obtained from all participants after explaining the nature, purpose, and potential risks of the study.

Data Collection

Demographic and clinical data, including age, education level, occupation, BMI, parity, gestational age, and antenatal care visits, were recorded. The diagnosis of oligohydramnios was made through ultrasound assessment of AFI. Patients received routine management, which involved maternal rest, left lateral positioning, hydration (oral and intravenous), and management of any underlying etiological conditions. Fetal surveillance was performed using ultrasound, modified biophysical profiles, and Doppler studies. The mode of labor onset (spontaneous or induced) and mode of delivery (vaginal, elective cesarean section, emergency cesarean section, or laparotomy) were documented. Additionally, indications for cesarean sections were analyzed.

Data Analysis

The collected data were systematically recorded and analyzed using appropriate statistical tools, mainly SPSS version 26.0. Descriptive statistics were used to summarize the characteristics of the participants. Categorical variables were expressed as frequencies and percentages. To assess changes in AFI following L-arginine treatment, a paired t-test was applied. All data were presented in table and graph.

RESULT

Most participants were aged 20–34 years (92.17%) and had varying education levels, with the majority having school-level education (37.39%). Half of the women were housewives (50.43%) (Table 1). Most patients (53.91%) had a normal BMI, while 27.83% were overweight and 13.91% were obese (Figure 1). Anemia (37.39%) and hypertensive disorders (31.30%) were the most common antepartum complications, followed by abnormal placentation (14.78%) and IUGR (8.70%). DM, asthma, and HIV were less common (2.61% each) (Figure 2). Regarding obstetric characteristics, 64.35% presented between 24–36 weeks of gestation, and 95.65% had attended four or more antenatal visits. Parity was mostly 0 with 47.83% or 1–3 with 50.43% (Table 2). Among women with spontaneous onset of labor, 80% delivered vaginally, 15.65% underwent emergency cesarean section, and 4.35% had operative vaginal delivery. For those with induced labor, 55.65% had vaginal deliveries, 41.74% required emergency cesarean section, 1.74% had

operative vaginal delivery, and 0.87% underwent laparotomy due to uterine rupture. Overall, vaginal delivery was the most common mode (55.65%), followed by emergency cesarean section (33.91%) (Table 3). Elective cesarean sections were most commonly performed due to a previous cesarean scar combined with oligohydramnios (40%). Emergency cesarean sections were predominantly indicated by non-reassuring fetal heart rate patterns (NRFHRP) in 79.13% of cases. Other indications included Grade III meconium-stained amniotic fluid (8.70%), failed induction (8.70%), previous CS scar with prolonged latent phase (1.74%), and labor abnormalities (1.74%) (Table 4).

Table 1: Demographic characteristics of the study population (n=115)

Variables	Frequency (n)	Percentage (%)
Age (years)		
≤ 19	1	0.87
20–34	106	92.17
≥ 35	8	6.96
Education		
No formal education	14	12.17
School	43	37.39
College	34	29.57
University	24	20.87
Occupation		
Housewife	58	50.43
Business	33	28.70
Service	24	20.87

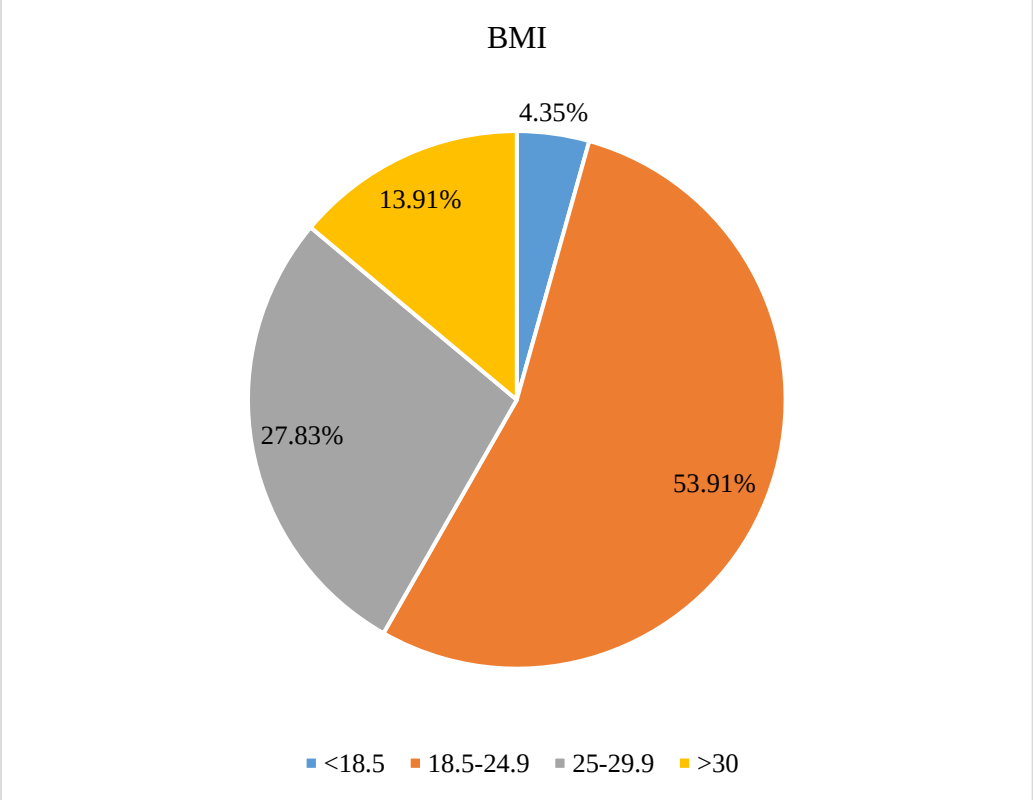

Figure 1: BMI among patients (n=115)

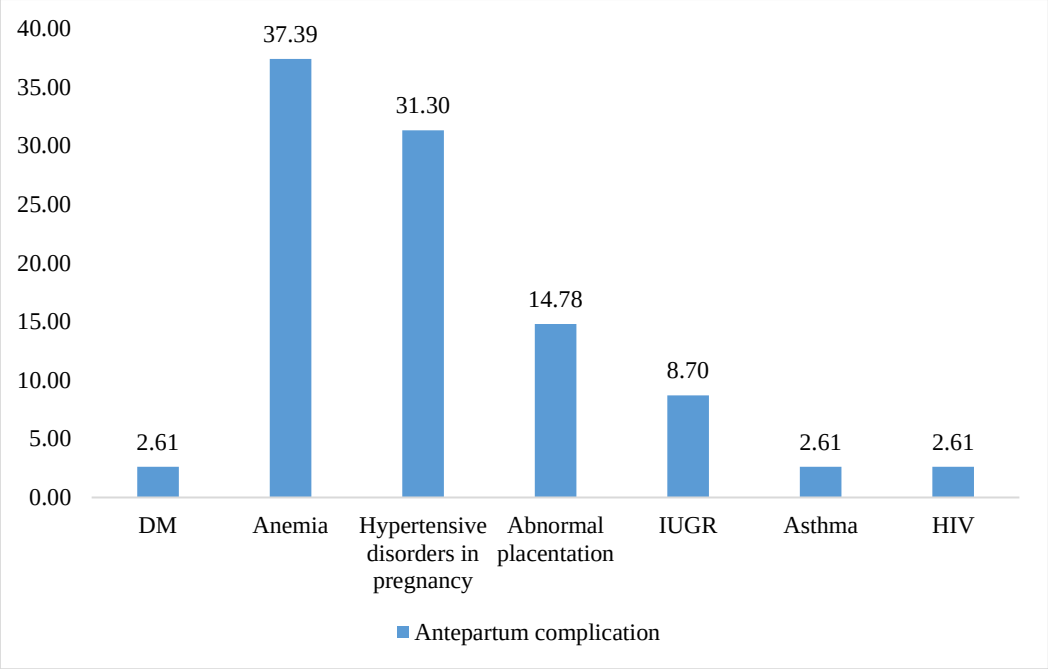

Figure 2: Antepartum complication among women (n=115)

Table 2: Obstetrics characteristics of the study population (n=115)

Variables	Frequency (n)	Percentage (%)
Parity		
0	55	47.83
1–3	58	50.43
≥ 4	2	1.74
Gestational age (weeks)		
24-36	74	64.35
≥ 37	41	35.65
Antenatal care		
Three visit	5	4.35
Four and above visit	110	95.65

Table 3: Labor and delivery conditions of women presented with the diagnosis of oligohydramnios (n=115)

Variables	Frequency (n)	Percentage (%)
Labor onset		
Spontaneous	20	17.39
Induced	87	75.65
Elective CS	8	6.96
Mode of delivery with spontaneous onset of labor		
Vaginal	92	80.00
emergency CS	18	15.65
Operative vaginal delivery	5	4.35
Mode of delivery in induced		
Vaginal	64	55.65
Emergency CS	48	41.74
Operative vaginal delivery	2	1.74
Laparotomy for uterine rupture	1	0.87
Overall Mode of delivery		
Vaginal	64	55.65
Emergency CS	39	33.91
Operative vaginal delivery	3	2.61
Elective CS	8	6.96
Laparotomy	1	0.87

Table 4: Indication for cesarean section among women (n=115)

Variables	Frequency (n)	Percentage (%)
Indication for elective cesarean section		
Oligohydramnios + breech presentation	23	20.00
Oligohydramnios + previous CS Scar	46	40.00
Oligohydramnios + Macrosomia	34	29.57
Oligohydramnios + bad obstetric history	12	10.43
Indication for emergency Cesarean section		
NRFHRP	91	79.13
Previous CS scar + Prolonged latent	2	1.74
GIII MSAF on induction	10	8.70
Labor abnormality	2	1.74
Failed induction	10	8.70

DISCUSSION

The majority of participants were aged between 20–34 years (92.17%), with a significant proportion having formal education with 37.39% attended school, 29.57% reached college level, and 20.87% had university education. Half of the women were housewives (50.43%), while others were engaged in business (28.70%) or service (20.87%). These demographics align with a study conducted in low-middle-income countries, which reported that 70.1% of women with oligohydramnios were aged 20–35 years, and 64.3% had at least primary education [16]. The majority, accounting for 53.91%, fall within the normal BMI range of 18.5 to 24.9, indicating that over half of the population maintains a healthy weight. This is followed by 27.83% of individuals who are classified as overweight, with a BMI between 25 and 29.9. This result is consistent with the finding of Figueroa et al [16]. In our study, the most prevalent complication was anemia, affecting 37.39% of the patients, followed by hypertensive disorders in pregnancy (HDP) at 31.30%, and abnormal placentation at 14.78%. Other complications included intrauterine growth restriction (IUGR) (8.70%), diabetes mellitus (DM) (2.61%), asthma (2.61%), and HIV (2.61%). These findings are consistent with existing studies that highlight anemia and hypertensive disorders as common maternal complications associated with oligohydramnios [17,18]. The presence of IUGR in 8.7% of cases is also a noteworthy finding, as oligohydramnios is strongly associated with placental insufficiency and fetal growth restriction. A study by Casey et al. emphasized that reduced amniotic fluid volume is a predictor of adverse perinatal outcomes including IUGR [8]. In terms of parity, 47.83% were nulliparous, and 50.43% had 1–3 previous births. Most women (64.35%) were diagnosed with oligohydramnios between 24–36 weeks of gestation, and a vast majority (95.65%) had attended four or more antenatal care visits. These finding are comparable with other relevant study [19]. The overall rate of CS in our study population (40.87%) was high. High rate of cesarean section was expected in mothers with oligohydramnios considering their risk of developing non reassuring fetal heart rate during labor [20-22]. There was significantly higher rate of emergency CS among the induced women than those with spontaneous onset of labor. This was also observed in previous observational studies comparing induction with spontaneous labor [23,24]. This higher rate of CS can be because of failed induction and abnormal fetal heart beat patterns. But, we should note that there is lower rate of CS with induction compared with expectant management in late term pregnancies [25]. The primary indications for elective cesarean sections were oligohydramnios combined with breech presentation (20.00%), previous cesarean scar (40.00%), macrosomia (29.57%), and bad obstetric history (10.43%). For emergency cesarean sections, non-reassuring fetal heart rate patterns (NRFHRP) were the leading cause (79.13%), followed by grade III meconium-stained amniotic fluid on induction (8.70%), and failed induction (8.70%). These results align with existing literature, which associates oligohydramnios with increased rates of cesarean deliveries due to fetal distress and other complications. A study found that women with oligohydramnios had a higher incidence of cesarean sections for fetal distress compared to those with normal amniotic fluid levels [21].

Limitations of the study:

Due to the limited study period, long-term maternal and neonatal outcomes, including complications and mortality, could not be adequately assessed.The observational design lacked a control group of pregnant women with normal AFI, which would have enabled more robust comparative analysis.

CONCLUSION

Oligohydramnios remains a significant contributor to adverse maternal outcomes, necessitating vigilant prenatal monitoring. The findings of this study emphasize a high incidence of labor induction and emergency cesarean sections primarily due to fetal distress. Management strategies involving hydration, fetal surveillance, and in some cases, L-arginine supplementation, appear beneficial. Improved access to antenatal care, routine AFI assessment, and early intervention protocols are recommended to reduce complications. Future research should explore the long-

term benefits of L-arginine and other therapies in managing oligohydramnios.

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