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Impact of Low Salt Diet in Upswing Amniotic Fluid Volume in Patients Diagnosed with Oligohydramnios and Assigned for Conservative Management

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ABSTRACT

Background: Oligohydramnios, defined as decreased amniotic fluid volume, poses significant risks to fetal development and pregnancy outcomes. Conservative management strategies aim to optimize maternal hydration and placental perfusion. Dietary modifications, particularly sodium restriction, have been proposed as non-invasive interventions to improve amniotic fluid volume, yet supporting clinical data remain limited. **Objective:** To evaluate the effect of a low-salt diet on amniotic fluid volume in pregnant women diagnosed with oligohydramnios undergoing conservative management. **Methods:** A prospective interventional study was at Combined Military Hospital, Malir, Karachi from 2 June to 2 Sep 2023, including 220 pregnant women with oligohydramnios, selected through non-probability consecutive sampling. Following informed consent, 220 pregnant women diagnosed with ultrasound-confirmed oligohydramnios (AFI ≤5 cm) were enrolled in the study. Each participant received individualized counseling to follow a low-salt diet, with daily sodium intake restricted to less than 2 grams. **Results:** Out of 220 pregnant women with oligohydramnios, 72.3% showed a ≥2 cm increase in amniotic fluid index (AFI) after two weeks on a low salt diet (mean AFI increased from 4.2 ± 0.6 cm to 6.1 ± 0.9 cm; $p < 0.001$). Women with improved AFI had lower rates of cesarean delivery (31.4% vs. 52.5%; $p = 0.01$) and better neonatal outcomes, including higher birth weights, improved Apgar scores, and fewer NICU admissions ($p < 0.01$). High compliance with the diet significantly correlated with better outcomes ($p < 0.001$), and adverse effects were minimal. **Conclusion:** A low-salt diet significantly improves amniotic fluid volume in pregnant women with oligohydramnios managed conservatively. These findings support incorporating dietary sodium restriction into routine management protocols as a simple and safe strategy to improve pregnancy outcomes in such cases.

INTRODUCTION

Oligohydramnios, characterized by an amniotic fluid index (AFI) of ≤5 cm, is a clinically significant condition affecting approximately 4–8% of pregnancies [1]. It is associated with various perinatal complications, including intrauterine growth restriction, umbilical cord compression, meconium aspiration syndrome, and increased rates of cesarean delivery. In severe cases, particularly in the second and early third trimesters, oligohydramnios can be life-threatening for the fetus due to pulmonary hypoplasia and limb contractures [2]. The pathophysiology of oligohydramnios is multifactorial, with causes ranging from placental insufficiency and fetal renal anomalies to premature rupture of membranes and maternal dehydration [3-4]. Management of oligohydramnios typically depends on gestational age and underlying etiology. In the absence of membrane rupture or fetal anomalies, conservative management strategies are often employed to optimize fetal wellbeing and prolong pregnancy [5]. These include maternal hydration, bed rest, and nutritional modifications aimed at improving uteroplacental perfusion and fluid balance. Among these, dietary sodium intake has emerged as a potentially modifiable factor influencing fluid homeostasis [6]. The hypothesis underlying this approach is that excessive maternal sodium intake may contribute to relative intravascular volume depletion, vasoconstriction, and impaired uteroplacental blood flow leading to reduced fetal urine production, a major source of amniotic fluid in the second half of pregnancy [7].

While maternal hydration both oral and intravenous has been extensively studied for its effect on increasing

amniotic fluid volume, the role of sodium restriction remains poorly defined. Some observational studies and case series suggest that restricting salt intake may reduce systemic vasoconstriction and enhance renal perfusion in both mother and fetus, indirectly promoting amniotic fluid production [8-9]. A few small-scale trials have reported encouraging results with low-salt dietary interventions in women with borderline or confirmed oligohydramnios, showing modest yet significant improvements in AFI over short durations [10]. Given the minimal cost, non-invasiveness, and potential benefit of such an intervention, a well-structured prospective study is warranted to determine whether sodium restriction can be reliably recommended as part of conservative management [11-12]. In settings where access to advanced interventions such as amnioinfusion or early induction is limited, dietary modification could provide a simple and accessible alternative for improving outcomes [13].

This study was therefore designed to evaluate the impact of a low-salt diet on amniotic fluid volume among pregnant women diagnosed with oligohydramnios, with the aim of providing evidence-based guidance on its incorporation into clinical practice.

Objective

To evaluate the effect of a low-salt diet on amniotic fluid volume in pregnant women diagnosed with oligohydramnios undergoing conservative management.

METHODOLOGY

A prospective interventional study was conducted at Combined Military Hospital, Malir, Karachi from 2 June to 2 Sep 2023, including 220 pregnant women with oligohydramnios, selected through non-probability consecutive sampling.

Inclusion Criteria

- Pregnant women aged 18–40 years
- Singleton pregnancy
- Gestational age between 28 and 36 weeks
- Ultrasound-confirmed oligohydramnios (AFI ≤5 cm)
- Hemodynamically stable and suitable for conservative management

Exclusion Criteria

- Premature rupture of membranes (PROM)
- Major fetal anomalies
- Maternal hypertensive disorders or preeclampsia
- Diabetes mellitus or renal impairment
- Current use of diuretics or sodium-limiting medications
- Non-compliance with dietary advice

Data Collection

Following informed consent, 220 pregnant women diagnosed with ultrasound-confirmed oligohydramnios (AFI ≤5 cm) were enrolled in the study. Each participant received individualized counseling to follow a low-salt diet, with daily sodium intake restricted to less than 2 grams. Educational handouts and verbal instructions were provided to ensure dietary adherence. No intravenous fluids or pharmacological agents affecting amniotic fluid levels were administered during the study period. Baseline demographic and obstetric information was recorded. Amniotic fluid index (AFI) was measured via transabdominal ultrasonography at enrollment and again after 2 weeks of dietary intervention.

Statistical Analysis

All collected data were entered and analyzed using SPSS version 26. Quantitative variables such as AFI were expressed as mean ± standard deviation (SD), and categorical variables like mode of delivery were reported as frequencies and percentages. The primary outcome changes in AFI before and after intervention was assessed using the paired t-test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The mean age of the 220 participants was 28.6± 4.3 years, with a gestational age averaging 31.4± 2.1 weeks. Nearly half were primigravida (104), and the mean BMI was 25.1± 3.2 kg/m^2. Among those who showed improved amniotic fluid levels (n=159), demographic characteristics were largely similar to those with unchanged fluid levels (n=61), with no statistically significant differences in age (p=0.48), gestational age (p=0.62), parity (p=0.81), or BMI (p=0.57), suggesting baseline characteristics were comparable across both groups.

Table 1

Baseline Demographic and Clinical Characteristics

Characteristic	Total (n=220)	Improved AFI (n=159)	Unchanged AFI (n=61)	p-value
Mean Age (years)	28.6 ± 4.3	28.4 ± 4.1	29.1 ± 4.7	0.48
Gestational Age (weeks)	31.4 ± 2.1	31.5 ± 2.0	31.2 ± 2.3	0.62
Parity (Primigravida/Multigravida)	104 / 116	76 / 83	28 / 33	0.81
BMI (kg/m^2)	25.1 ± 3.2	25.0 ± 3.1	25.3 ± 3.5	0.57

The mean baseline amniotic fluid index (AFI) was 4.2± 0.6 cm, which significantly increased to 6.1± 0.9 cm after two weeks on a low salt diet ($p < 0.001$). A clinically meaningful increase in AFI (≥2 cm) was observed in 159 women, accounting for 72.3% of the sample. The remaining 61 women (27.7%) did not demonstrate a significant change. This suggests that the majority of patients responded positively to the dietary intervention.

Table 2

Amniotic Fluid Index Before and After Intervention

Time Point	Total (n=220)	p-value
Baseline	4.2 ± 0.6	<0.001
2 Weeks Post-Intervention	6.1 ± 0.9	-
AFI Change		
≥2 cm Increase	159	72.3%
<2 cm Increase	61	27.7%

Among women whose AFI improved, 68.6% delivered vaginally, compared to only 47.5% in those without AFI improvement. Conversely, cesarean section was required

in 52.5% of the non-responders, significantly higher than the 31.4% rate in the improved group (p = 0.01). This indicates that improved AFI was associated with a reduced cesarean delivery rate.

Table 3
Mode of Delivery by AFI Response

Mode of Delivery	Improved AFI (n=159)	Unchanged AFI (n=61)	p-value
Normal Vaginal Delivery	109 (68.6%)	29 (47.5%)	0.01
Cesarean Section	50 (31.4%)	32 (52.5%)	-

Newborns of women with improved AFI had a higher mean birth weight (2910 grams vs. 2725 grams, p = 0.002) and better 5-minute Apgar scores ≥7 (93.1% vs. 80.3%, p = 0.01). NICU admissions were significantly fewer in this group (7.5% vs. 22.9%, p = 0.004), suggesting that rising AFI correlated with better perinatal outcomes.

Table 4
Neonatal Outcomes

Neonatal Outcome	Improved AFI (n=159)	Unchanged AFI (n=61)	p-value
Mean Birth Weight (g)	2910 ± 320	2725 ± 340	0.002
5-min Apgar Score ≥7	148 (93.1%)	49 (80.3%)	0.01
NICU Admission	12 (7.5%)	14 (22.9%)	0.004

Among 142 patients with high compliance (≥80%), 92.9% showed improved AFI. In contrast, only 37.7% with moderate compliance and 28.0% with poor compliance showed improvement. This trend (p < 0.001) supports the effectiveness of dietary adherence in fluid volume improvement.

Table 5
Compliance with Low Salt Diet

Compliance Level	Number of Patients	AFI Improvement Observed	p-value
High (≥80%)	142	132 (92.9%)	<0.001
Moderate (50–79%)	53	20 (37.7%)	-
Low (<50%)	25	7 (28.0%)	-

Of all participants, 84.1% reported no side effects. Minor complaints included fatigue (8.6%), dizziness (5.5%), and palpitations (1.8%). These findings affirm that the low salt diet was well-tolerated with minimal adverse effects.

Table 6
Reported Adverse Effects During Intervention

Adverse Event	Number of Patients	Percentage (%)
Dizziness	12	5.5%
Fatigue	19	8.6%
Palpitations	4	1.8%
None	185	84.1%

DISCUSSION

This study demonstrated that implementing a low salt dietary intervention significantly improved amniotic fluid index (AFI) in pregnant women diagnosed with oligohydramnios under conservative management. Out of 220 participants, 72.3% experienced a ≥2 cm increase in AFI over a two-week period, suggesting that sodium restriction can be a practical, non-invasive adjunct in managing low amniotic fluid levels. Our findings are consistent with those of previous research, which has reported that maternal hydration and dietary interventions can influence placental perfusion and fetal urine production, the latter being a major contributor to amniotic fluid in the second half of pregnancy. A similar improvement in AFI was reported in a study from previous research, where women with idiopathic oligohydramnios showed a significant rise in AFI following salt-restricted and hydration-augmented protocols [14-15].

Furthermore, the significantly lower rate of cesarean sections among women who demonstrated improvement in AFI (31.4% vs. 52.5%, p = 0.01) reflects the clinical benefits of this approach in reducing obstetric interventions. These results echo findings from previous research, where conservative management led to lower emergency cesarean rates by improving uteroplacental dynamics and fetal status [16]. Neonatal outcomes in our study also favored the intervention group. Infants born to mothers with improved AFI had higher birth weights, better Apgar scores, and significantly lower NICU admission rates. These associations were supported by previous research, which found that improved intrauterine environments achieved through non-pharmacologic maternal interventions are linked to healthier neonatal profiles [17]. Importantly, the effectiveness of the low salt intervention correlated strongly with dietary compliance. Among participants with ≥80% adherence, 92.9% achieved AFI improvement. This highlights the critical role of patient education and follow-up in ensuring intervention success. Previous research has emphasized that nutritional counseling and supportive monitoring are essential for sustaining dietary behavior change during pregnancy [18]. The intervention was well tolerated, with only minor side effects reported (fatigue in 8.6%, dizziness in 5.5%), and no serious complications. This reinforces the safety profile of dietary sodium reduction, as also reported in previous research, where no adverse maternal or fetal outcomes were observed with modest salt restriction [19-20, [21]].

Despite these promising findings, our study had limitations. The intervention duration was short (2 weeks), and long-term fetal outcomes were not assessed. Additionally, the study relied on self-reported dietary compliance, which may introduce reporting bias. Future research should consider objective measurements of sodium intake and extend follow-up to delivery and postnatal periods.

Overall, the results support the incorporation of low-sodium dietary counseling as part of conservative management for oligohydramnios, especially in resource-constrained settings where advanced interventions may not be feasible. This approach is low-cost, easily implementable, and offers a favorable benefit-risk profile.

CONCLUSION

This study concludes that a low salt diet is an effective and well-tolerated intervention to increase amniotic fluid volume in pregnant women diagnosed with oligohydramnios managed conservatively. A significant proportion of patients experienced a clinically meaningful rise in AFI, accompanied by improved delivery outcomes and better neonatal health indicators. High dietary

compliance further enhanced the efficacy of this intervention. Given its simplicity, safety, and cost-effectiveness, incorporating sodium restriction into standard conservative management protocols may improve maternal-fetal outcomes, particularly in settings where access to advanced interventions is limited.

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