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Role of amino acid in amniotic fluid index during 3rd trimester of pregnancy

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Abstract
Background: *Amniotic fluid is the protective liquid contained by the amniotic sac of a growing fetus. Amniotic fluid index (AFI) is a quantitative estimation of amniotic fluid volume in centimeter. The amount of amniotic fluid volume varies according to age of gestation. In the third trimester the decrease amount of amniotic fluid may cause IUGR, IUD, pre-term birth, foetal distress, cord compression, increase incidence of caesarean delivery etc which leads to increase operative interference and increase neonatal complications.*
Objectives: *To compare the efficacy of different amino acid supplement during third trimester in two different routes and also to compare the efficacy of both route in improvement of AFI in third trimester.*
Method: *This study was conducted on 132 pregnant women's with gestational age >32 weeks. Patients were divided in two groups of 66 patients each group. One group was prescribed with intravenous amino acid infusion, and the other group was prescribed with oral amino acid supplementation for two consecutive weeks. Data collected on day one was compared with the data on 21st day of the treatment.*
Result: *The maternal hemodynamic status were unchanged for both groups. There were statistically significant difference in increase in maternal weight, AG, SFH, AFI, EFW in two groups.*
Conclusion: *In this study Intravenous amino acid infusion cause a notable increase in SFH, AG, AFI, EFW than oral amino acid supplementation.*
Keywords: *amniotic fluid, amino acid, abdominal girth, Estimated fetal weight.*

Introduction

Amniotic fluid is the protective liquid contained by the amniotic sac of a growing fetus. Amniotic fluid (AF) is swallowed by the developing fetus, and both its volume and composition play important roles in fetal growth and development. AF, which is a dynamically changing nutrient reservoir, is a composite of secretions from maternal plasma, from the placenta, and from the developing fetal urinary, respiratory, and alimentary tracts.[1] Amniotic fluid

(AF) contains free amino acids that enter via transplacental and transmembranous routes from maternal sources. Amniotic fluid index (AFI) is a quantitative estimation of amniotic fluid volume in centimeter. The amount of amniotic fluid volume varies according to age of gestation. In the third trimester the decrease amount of amniotic fluid may cause IUGR, IUD, pre-term birth, foetal distress, cord compression, increase incidence of caesarean delivery etc which leads to increase operative interference and increase neonatal complications. AFI is one of the indicator of foetal wellbeing.[2] A fetus in distress should be identified at the earliest so that timely delivery will not only salvage the fetus but also prevent long term neurological impairments such as injury to fetal central nervous system.[3] The values between 8 and 25 are considered to be normal, 5–8 low normal, and less than 5 severe oligoamnios.[4] Normally it peaks at 32 to 34 weeks of gestation and thereafter there is a gradual reduction in amniotic fluid due to increase in concentrating capacity of fetal kidneys. In addition to number of other factors, poor maternal nutrition status has been co-related with increased incidence of Oligohydromnios in 3rd trimester and adverse fetal outcome in developing countries. Apart from the poor maternal nutrition, biological, socioeconomic, teenage pregnancy, short inter-pregnancy interval also influence poor birth outcomes.[5] Food and Agriculture Organization/ World Health Organization (WHO)/United Nations University recommend pregnant women to have their energy intake increased by 85, 285, and 475 kcal/day during the first, the second, and the third trimesters of pregnancy.[6] Sufficient reports showed significant reduction in LBW babies among women receiving multi-micronutrient supplements compared with women only receiving iron and folic acid supplements.[7]

Aims and Objectives

To compare the efficacy of different amino acid in two different route

1. Administration of amino acid supplement during third trimester in two different routes,
2. Compare the efficacy of both route in improvement of AFI in third trimester.

Materials and Methods

The present study was conducted on 132 pregnant women's with gestational age >32 weeks with oligohydramnios.

Inclusion Criteria

- Patient age between 18-30 years
- Gestational age >32 weeks and <40 weeks
- Single live pregnancy
- AFI <7cm and >5cm
- Fetal membrane- Intact

Exclusion Criteria

- Patients having no co-morbidity
- Foetal anomaly

Patients were divided in two groups of 66 patients each group.

Group A (n=66)- prescribed with intravenous amino acid infusion for two consecutive weeks. 10% Dextrose (500ml) followed by 200cc of complex amino acid solution.

Group B (n=66)- prescribed with oral amino acid supplementation, for two consecutive weeks. - 3gm of complex amino acid powder with a glass of water, twice daily.

Detailed clinical history including parity, Obstetrical history has been taken. General examination, systemic examination, obstetrical examination has been done for every patient. All the routine investigations including complete haemogram, urine routine examination, S. Thyroid profile, liver and kidney function test, ABO grouping and Rh typing, blood sugar estimation, trans-abdominal sonography has been carried out on routine basis. Inform written consent was taken for each patient. On the day of treatment in both groups following parameters were recorded.

- Patients weight
- Gestational age
- Symphysis fundal height (SFH)
- AG- abdominal girth in cm
- Estimated fetal weight (EFW) in kilogram
- AFI

Advice given to both groups;

- Complete bed rest
- Plenty of fluid intake
- Intake vitamins and nutrients
- Maintain DFM

Data Collection Method: Data collected from the patient in a prescribed protocol.

Data Analysis: All data were analyzed by standard statistical tools.

Result

One hundred and thirty two hospitalized pregnant patients at gestational age>32 weeks with AFI < 7cm were randomly allocated into two groups of 66 patients each. The groups were comparable with respect to POG and age of the patient. Gestational age was estimated from the date of last menstrual period (LMP) and amended by means of ultra-sonography in women with unknown or unreliable LMP. Efficacy depending on the route of amino acid supplementation in relation to maternal weight gain, increase in AFI, AG, EFW was contemplated and plotted accordingly.

Outcome after intervention was assessed with the points:

1) Maternal weight gaining.
2) Increase in AG
3) Increase in SFH
4) Gain in AFI
5) Increase in EFW

Maternal Weight Gaining

In group A, maternal weight gain was 0.65 - 0.80 kg per week; while in group B, maternal weight gain was 0.40 – 0.60 kg per week

Increase in AG:

In group A, increase was 1.2-1.6 inch while in group B, increase was 1- 1.3 inch in three weeks

Increase in SFH:

In group A, SFH increase was 0.68 – 0.98 cm while in group B, SFH increase was 0.58 – 0.65 cm

AFI increase:

In group A, AFI increase was 1.5 – 2.8 cm while in group B, AFI increase was 1 – 1.3 cm

EFW Increase

In group A, EFW increase was 0.62 – 0.67 kg while in group B, EFW increase was 0.580 – 0.55 kg.

Table 1: Relationship between Intravenous Amino Acid supplementation and Estimated AFI Increase

AFI after oral amino acid supplementation	Number	AFI on day 1st	AFI on day 21st
≤ 5cm	4	5.1	6.2
5.1 – 6.9	20	6.8	7.9
≥ 7cm	42	7.3	8.3
Total no. of babies	66		

Table 2: Relationship between Intravenous Amino Acid infusion and Estimated AFI Increase

AFI after amino acid infusion	Number	AFI on day 1st	AFI on day 21st
≤ 5cm	5	5	6.4
5.1 – 6.9	17	6.5	7.6
≥ 7cm	44	7.5	8.6
Total no. of babies	66		

Figure 1: Distribution of patients according to foetal outcome (Dead/Live) at birth

Figure 1 Foetal outcome

Distribution of patients according to foetal outcome at birth was alive 98% which were 129 babies and dead only 2% which were only 3 babies.

Table 3: Relationship between Intravenous Amino Acid infusion and Estimated EWF Increase

AFI after amino acid infusion	Number	EWF on day 1st	EWF on day 21st
≤ 5cm	5	1.4	2.2
5.1 – 6.9	17	2	2.62
≥ 7cm	44	2.3	3.02
Total no. of babies	66		

Table 4: Relationship between Intravenous Amino Acid supplementation and Estimated EWF Increase

AFI after oral amino acid supplementation	Number	EWF on day 1st	EWF on day 21st
≤ 5cm	4	1.6	2.1
5.1 – 6.9	20	2.1	2.7
≥ 7cm	42	2.5	2.9
Total no. of babies	66		

Discussion

There is a complex and dynamic process which involves the fetus, placenta, and mother in amniotic fluid production and regulation. There is increase in amniotic fluid volume gradually till 32–34 weeks of gestation and thereafter there is a gradual reduction till term. There is wide variation in reference standards for mean AFI values according to population, race, and geography.[8] In developing countries, specific dietary intakes in pregnancy are often inadequate, some selected nutrients are often insufficient in pregnant and lactating women. Specific cases requiring clinical examinations and targeted interventions in the peri-natal period include women with weight problems smokers, adolescents, mothers who have had multiple or close pregnancies, and those with previous unfavorable pregnancy outcomes. Micronutrient deficiencies are common among women in South Asia.[9] Maternal supplementation trials in some studies have been shown to reduce low birth weight and preterm birth.[10] The combination of folic acid and iron or the multiple micronutrient supplements reduced the risk of low birth weight by 16 and 14%, respectively. An excessively low intake of protein is associated with potentially negative effects in terms of weight and length of the foetus at birth.[11] The protein quality of foods is measured by their PDCAAS (Protein Digestibility Corrected Amino Acid Score), which is the score for amino acid digestibility.[12] Values close to 1 are typical of animal products, providing all nine essential amino acids, while values below 0.7 are typical of plant products. However, the consumption of two or more vegetable foods with different amino acidic composition can help improving the overall quality of their protein component. Amino acids are actively transported across the placenta to fulfill the needs of the developing foetus. During pregnancy, protein catabolism is decreased as fat stores are used to provide for energy metabolism. Amino acid supplementation during late trimester of pregnancy appeared to have the greatest beneficial effect on both foetal weight gain and AFI. But as the pregnancy progresses, mechanical changes in the alimentary tract also occur, caused by the growing uterus. The stomach is increasingly displaced upwards, leading to an altered axis and increased intra-gastric pressure. The oesophageal sphincter tone is also decreased and these factors may predispose to symptoms of reflux, as well as nausea and vomiting.[13] This study provides unique data on the effects of manner of supplementation of essential nutrients during 3rd trimester of pregnancy on their efficacy on increase in AFI and in improving peri-natal outcome.

Conclusion

Both intravenous amino acid infusion and oral amino acid supplementation cause improvement in amniotic fluid index accelerated foetal weight gain during 3rd trimester of pregnancy and indirectly improvement in BPP. These positive results are increasingly articulated in bunches with intravenous infusion. It is concluded that for oligohydromnios due to maternal nutrients deficiency or idiopathic Oligohydramnios intravenous amino acid infusion may prove useful in improving AFI, EFW and ultimately peri-natal outcome more than oral amino acid supplementation.

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