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ORIGINAL ARTICLE

Significance of Echogenic Amniotic Fluid at Term Pregnancy and its Association with Meconium

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Abstract

Background: **Echogenicity of amniotic fluid refers to size, number, & amount of particles in AF, which in turn represents turbidity of AF. This could result in identification of echogenic particles via ultrasound, as well recognized as AF sludge, & presence of homogeneously echogenic AF.**

Aim and objectives: **Research's goal was to look into prevalence of echogenic amniotic fluid during term pregnancy & how often it was related to meconium.**

Subjects: **& methods: Cross-sectional research was carried out on 70 term pregnant (37−40 weeks) women who presented to the Obstetrics & Gynecology Department at Al-Azhar New Damietta University Hospital for labour and women admitted for scheduled caesarean section.**

Results: **Clear amniotic fluid was found in 35.71% of patients with echogenic amniotic fluid on ultrasound, meconium-stained amniotic fluid was found in only 7.14%, and amniotic with vernix caseosa was found in 57.14%.**

Conclusion: **Existence of highly echogenic amniotic fluid is unusual, & its existence generates quandary for clinician. Meconium, blood, & vernix caseosa have all been linked to echogenic AF. In current research, meconium was found in 7.14% of cases of echogenic amniotic fluid.**

Keywords: Echogenic amniotic fluid, Meconium-stained amniotic fluid, Term pregnancy, Ultrasonography, Vernix caseosa

1. Introduction

Amniotic fluid is clear to pale yellow liquid that surrounds the developing foetus in the amniotic sac. The structure of amniotic fluid is complex, with several maternal & foetal constituents. It is primarily composed of foetal plasma volume, foetal urine, foetal respiratory system, gastrointestinal tract, umbilical cord, & foetal placenta surface. Amniotic fluid properties differ with gestational age, with average pH of 7.2 & specific gravity of 1.0069−1.008.[1]

For several years, amniotic fluid evaluation has been an essential component of obstetrical scanning, foetal evaluation in modern obstetrics, & foetal health surveillance.[2]

Minor variations in amniotic fluid that can take place within hour or 2 of normal physiological manoeuvres consequence in obstetrical intervention & further investigations. Amniotic fluid abnormalities have been linked to number of adverse maternal, foetal, & obstetrical situations.[3]

Modern obstetrical management heavily relies on amniotic fluid evaluation as measure of foetal well-being, with ultrasound used to assess amniotic fluid fluid volume & provide amniotic fluid physiology.[4]

Harlequin ichthyosis & epidermolysis bullosa letalis are congenital result of particulate matter in amniotic fluid. Echogenic amniotic fluid is found infrequently because of existence of numerous echogenic particles in fluid. Most of time, this is caused by existence of vernix caseosa in amniotic

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fluid; even so, in small number of cases, it could be because of meconium & blood.[5]

Obstetricians tend to raise regularity of prenatal visits to evaluate foetal well-being with non-stress tests & biophysical profiles, & early recognition with ultrasound is suggested to reduce prolonged & obstructed labour, & even to induce labour when amniotic fluid is echogenic.[6]

Study's goal was to determine importance of echogenic amniotic fluid at term pregnancy, as well as sensitivity & specificity of echogenic amniotic fluid for meconium detection.

2. Patients and methods

Study design: Cross sectional study at Al-Azhar university Hospital (New Damietta), Department of Obstetrics & Gynecology.

Duration of study: from December 2020 to January 2022.

Target population: Women admitted at Al-Azhar New Damietta university Hospital Obstetrics and Gynecology Department for either vaginal delivery (before rupture of membranes), or for elective caesarean section. The study included 70 patients.

Inclusion criteria: all patients admitted to our department presented by: Term pregnancy (37–40 weeks) admitted for vaginal delivery. Scheduled patients (37–40 weeks) admitted for elective cesarean section.

Exclusion criteria: Congenital fetal malformation by ultrasound (e.g. anencephaly). Maternal co-morbidity (Diabetes mellitus, hypertension, cardiac diseases, renal diseases & auto-immune diseases), suspected maternal infection (High grade fever, Anorexia, malaise, past history of infection one week prior to delivery), Placental abnormality (abruption placenta & placenta previa) and Cases with normal amniotic fluid study with ultrasonography.

Study tools: After taking informed consent all patients were subjected to;

Thorough Medical history focusing on: Personal and demographic data: Name, age and residence, Obstetrical history: Gravidity, parity, mode of delivery, detailed history of previous miscarriage, Last menstrual period, gestational age, past history of chronic disease, obstetric problems (e.g. attacks of Ante-partum hemorrhage).

By full Examination: General examination, Gynecological examination, obstetric examination.

Ultrasonography examination: Routine obstetric ultrasound examination: Measurements of fetal biometric parameters (BiParietal diameter, Femur Length, Abdominal circumference.)Were obtained using a real-time, grayscale, 3.5–5.0 MHz curvilinear array transducer of Voluson P8 BT 16 ultrasound machine, amniotic fluid assessment for amniotic fluid index, and presence of sludge, particles, size, and distribution.

Lab Investigations: Hemoglobin level, total leucocytic and platelet count, C.R.P level, Random blood sugar, urine analysis, kidney function examination, liver function examination Figs. 1 and 2.

2.1. Statistical analysis

Collected information was coded, processed, & analysed using SPSS programme for Windows. When necessary, appropriate statistical exams were used. P values less than 0.05 (5%) were deemed statistically significant.

2.2. Ethical consideration

Research strategy was succumbed for support by Institutional Review Board of Al-Azhar University

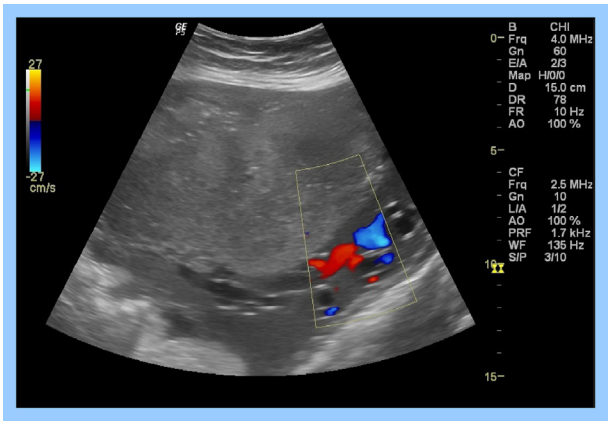

Fig. 1. Echogenic amniotic fluid in relation to umbilical vessels.

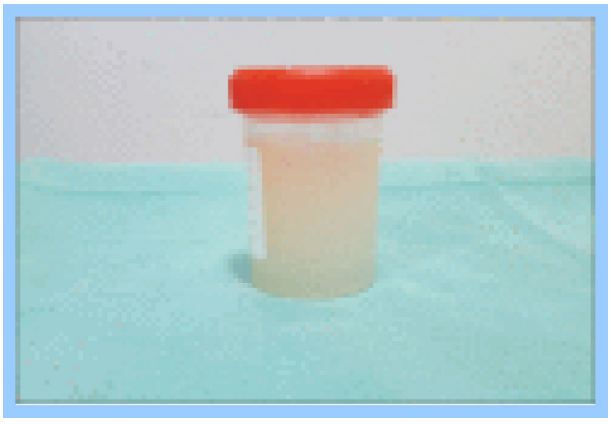

Fig. 2. Sample of amniotic fluid.

Faculty of Medicine (New Damietta) (I.R.B. 00012364/20-12-005), Approval of the mangers of the health care facilities in which the study was conducted. Informed consent was found from each participant sharing in research.

3. Results

Mean age of included subjects was 32.46 (±3.98) years, many of them was older than 32 years old (see Table 1). Mean BMI reached 27.98 ± 1.42 kg/m^2.There were no significant difference between urban and rural distribiution Table 2.

Parity mean was 3 and Gravidity mean was 3.67. CS to Vaginal delivery ratio was 1:1 Table 3.

Gestational age mean reached 38.36 and mean of birth weight was 3.6 Kg. 52.86% were females Table 4.

Regarding amniotic fluid characteristics in patients with echogenic amniotic fluid on ultrasound, clear amniotic fluid was in 35.71%, meconium-stained amniotic fluid was only 7.14% and amniotic with vernix caseosa reached 57.14% Table 5.

There was no important correlation among Echogenic Ultrasound & low APGAR score Table 6.

Thin meconium-stained amniotic fluid represented 60%, while thick meconium-stained amniotic fluid was only 40%.

Table 1. Maternal basal characteristics.

Variable (n = 70)	Study group	P value
Age (Years) Mean ± SD	32.46 ± 3.98	0.774
BMI (Kg/m^2) Mean ± SD	27.98 ± 1.42	0.327
Residence n (%)		
Urban	37 (52.85%)	0.867
Rural	33 (47.14%)	

Table 2. Parity, gravidity and mode of delivery.

	Study group (n = 70) - n(%)	Range	P value
Parity	3 ± 1.08	1–6	0.159
Gravidity	3.67 ± 1.13	1–7	0.074
Mode of delivery			
CS	35 (50%)		0.503
Vaginal	35 (50%)		

CS, Cesarean Section.

Table 3. Fetal characteristics.

	Study group (n = 70)	Range	P value
GA (Week) Mean ± SD	38.36 ± 1.09	37–40	0.653
BW (Kg) Mean ± SD	3.6 ± 0.53	2.93–5.51	0.127
Neonatal Gender n (%)			
Male	33 (47.14%)		0.257
Female	37 (52.86%)		

BW, Birth Weight; GA, Gestational age.

Table 4. Amniotic fluid characteristics in included studied cases.

	Echogenic amniotic fluid (n = 70) n (%)
Clear	25 (35.71%)
Meconium-stained	5 (7.14%)
With vernix caseosa	40 (57.14%)

Table 5. Relationship among Echogenic ultrasound, meconium staining and Apgar score neonatal outcome.

	Echogenic ultrasound	
Meconium	Correlation	0.216
	P Value	0.220
APGAR	Correlation	−0.265
	P Value	0.058

Pearson Correlation *P < 0.05 important association.

Table 6. Severity of meconium staining in meconium stained group.

	Meconium stained (N = 5) N (%)
Thin MSAF	3 (60%)
Thick MSAF	2 (40%)

MSAF, Meconium-stained amniotic fluid.

4. Discussion

Presence of meconium in amniotic fluid increases concerns about foetal well-being, labour tolerance, &, most importantly, risk of foetal neonatal death.[7]

In this study regarding Maternal Basal Characteristics, Mean age of included subjects was (32.46 ± 3.98) years, many of them was older than 32 years old. Mean BMI reached (27.98 ± 1.42) Kg/m^2 and most participants were urbans.

Regarding obstetric data, Parity mean was (3 ± 1.08) and Gravidity mean was (3.67 ± 1.13).Cesarean section to Vaginal delivery ratio was 1:1.

Regarding Fetal Characteristics Gestational age mean reached (38.36 ± 1.09) and mean of birth weight was (3.6 ± 0.53) Kg. 52.85% were females.

In present study, Regarding amniotic fluid characteristics in patients with echogenic amniotic fluid on ultrasound, clear amniotic fluid was found in 25 cases (35.71%), meconium-stained amniotic fluid was only found in 5 cases (7.14%) and amniotic fluid with vernix caseosa reached 40 cases (57.14%).Thin meconium-stained amniotic fluid represented 60%, while thick meconium-stained amniotic fluid was only 40%.

Our results agreed with **Balci *et al.*,**[8] they concluded that, When 9 of 278 studied cases' amniotic fluid was found to be echogenic on ultrasound, they discovered sensitivity & specificity of 13.79 & 97.99%, as well as positive & negative predictive value of 44.44% & 90.7%, for echogenic amniotic fluid seen on ultrasound in identifying meconium-stained amniotic fluid. Consistent with

our results, Vernix caseosa is the most common findings in the study of **Tam** ***et al.***,[9] who deduced that in sixty percent to ninety five percent of cases, echogenic amniotic fluid on ultrasound most probably represents existence of vernix instead of meconium. After examining literature, it was determined that decision to influence first case at thirty nine weeks with reassuring heart rate should not have been impacted by discovery of thick echogenic amniotic fluid on sonography.

Existence of echogenic amniotic fluid on sonography at term is unusual. Echogenicity can be caused by existince of meconium, blood, & vernix caseosa in amniotic fluid. Presence of meconium in amniotic fluid increses concerns about foetal well-being, foetus' ability to tolerate labour, &, most importantly, risk of fetal/neonatal death.[8]

Balci ***et al.***,[8] concluded that when amniotic fluid was evaluated using ultrasound, 9 of 278 studied cases had echogenic amniotic fluid. Rates of meconium-stained amniotic fluid in females with & without echogenic amniotic fluid were 44.44% & 9.3%, when amniotic fluid was evaluated at delivery; distinction was important ($P = 0.035$). We discovered that echogenic amniotic fluid seen on ultrasound had sensitivity & specificity of 13.79 & 97.99%, as well as positive & negative predictive value of 44.44 & 90.7% in recognising meconium-stained amniotic fluid. They deduced that occurrence of echogenic amniotic fluid at term gestation was 3.2, with 44.4% of cases associated with meconium, which is consistent with our findings. Fact that meaning of echogenic amniotic fluid varies from researcher to researcher could explain differences in prevalence rate; even so, we & used same description. When echogenicity of amniotic fluid was similar to that of placenta, myometrium, & foetal parts, we categorised it as echogenic. Further study with larger research groups appears to be required to determine exact occurrence of echogenic amniotic fluid at term gestation.

In a case report by **Kaluarachchi** ***et al.***,[10] they found hyperechogenic AF on ultrasound in late third trimester with no negative effects on neonate. At thirty seven weeks, hyper echogenic AF was discovered, & pregnancy was handled cautiously with close monitoring until thirty nine weeks. Due to decreased foetal movements, labour induction was attempted.

Meconium-stained amniotic fluid was found in 5/70 of studied cases with echogenic amniotic fluid in research. While **Balci** ***et al.***,[8] concluded that meconium was present in 4/9 of studied cases with echogenic amniotic fluid on ultrasound at term.

Stimulated labour & meconium stained amniotic fluid were found to have important connection in this research. This discovery was consistent with previous research by **Osava** ***et al.***,[11] This could be due to tetanic uterine contraction after oxytocin administration, which could outcome in intrauterine foetal hypoxia due to insufficient placental perfusion. When foetus suffers from hypoxia & asphyxia, enhanced parasympathetic stimulation by vagus results in meconium passage.

Age of females was found to be significantly related to advancement of meconium stained amniotic fluid. Result was in line with results from Indira Gandhi Medical College research.[12] This could be attributed to fact that as female ages, she is more likely to experience gradual loss of cardiovascular vessel compliance, which is commonly linked with uterine blood vessel ageing & arterial stiffness, which may outcome in insufficient placental perfusion & in utero foetal hypoxia. This eventually results in meconium passing into amniotic fluid.

Consistent with our results, **Addisu** ***et al.***,[13] concluded that longer labour duration was associated with meconium-stained amniotic fluid in statistically significant way. This result was in line with results of SRM Medical College research. This could be owing to foetus being exposed to stressful environment for extended period of time, which may cause greater peristalsis of foetal gastrointestinal tract & relaxation of anal sphincter, allowing meconium to pass.

Also **Gul** ***et al.***,[14] concluded that females with particulate amnion had greater rate of primary caesarean section. Meconium was not found in echogenic particles in amniotic fluid in 3rd trimester; even so, increased costs of primary caesarean section may necessitate further investigation.

To summarise, there are few studies that have been published on prevalence of echogenic amniotic fluid; consequently, more study is required. According to literature, when amniotic fluid is evaluated medically using amniocentesis & during delivery, only five-elevenpercent of echogenic amniotic fluid contains meconium, which is near results (7.14%). However (57.14%) of cases with echogenic amniotic.

5. Conclusion

Existence of greatly echogenic amniotic fluid is unusual, & its existence generates quandary for clinician. Meconium, blood, & vernix caseosa have all been linked to echogenic AF. In current research,

meconium was found in 7.14% of cases of echogenic amniotic fluid.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article.

Conflicts of interest

There are no conflicts of interest.

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