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OUTCOME OF ISOLATED FETAL ASCITES AND ETIOLOGY: A SYSTEMATIC REVIEW

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ABSTRACT

Background: *Isolated fetal ascites is defined as fluid accumulation in the abdominal cavity without fluid accumulation in any other serosal cavities or subcutaneous tissues, being therefore a distinct entity from hydrops fetalis. It is a rare ultrasound (US) finding that is always considered abnormal and should be thoroughly investigated.*

The aim: *This study aims to show about etiology and outcome of isolated fetal ascites.*

Methods: *By comparing itself to the standards set by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, this study was able to show that it met all of the requirements. So, the experts were able to make sure that the study was as up-to-date as it was possible to be. For this search approach, publications that came out between 2013 and 2023 were taken into account. Several different online reference sources, like Pubmed and SagePub, were used to do this. It was decided not to take into account review pieces, works that had already been published, or works that were only half done.*

Result: *In the PubMed database, the results of our search brought up 115 articles, whereas the results of our search on SagePub brought up 156 articles. The results of the search conducted for the last year of 2013 yielded a total 42 articles for PubMed and 78 articles for SagePub. The result from title screening, a total 3 articles for PubMed and 14 articles for SagePub. In the end, we compiled a total of 7 papers. We included five research that met the criteria.*

Conclusion: *The natural history of this condition remains unclear, despite the fact that immune and nonimmune hydrops are well described and documented. Reported causes of isolated fetal ascites are cardiac, renal, gastrointestinal, pulmonary, and metabolic disorders. Infectious diseases may be related to fetal ascites.*

Keyword: *Isolated fetal ascites, Accumulation fluid, Ultrasound.*

INTRODUCTION

Fetal ascites is commonly considered as a part or precursor of fetal hydrops, which has various etiologies. Fetal ascites can also occur as an isolated disease without fluid accumulation in any other serosal cavities or subcutaneous tissues. Overall prognosis is poor, but better with those with late gestational onset. Here, antenatal fetal sonography in mid third trimester detected isolated fetal ascites and was followed-up postnatally. The neonate at birth was diagnosed to have chylous ascites, which was managed successfully medically.[1]

Isolated ascites is defined as abnormal fluid collection in the abdominal cavity without fluid accumulation in any other serosal cavities or subcutaneous tissue. The prevalence of fetal hydrops ranges from one in 800 to 3500 live births, whereas true prevalence of isolated fetal ascites is not known. A myriad of maternal, fetal and placental problems which are known to cause hydrops fetalis or fetal ascites can be identified in 70-90% of cases by extensive prenatal and postnatal evaluation. The disease is associated with high mortality (30-95%) and significant morbidity. Conventionally are divided into immune and nonimmune hydrops fetalis. The maternal causes commonly include blood group and Rh incompatibilities and viral infections (TORCH, adenovirus, parvovirus, syphilis) in mother. The most common demonstrable causes of this disorder in the fetus are cardiovascular ([congenital heart diseases and arrhythmias] 15-26%), fetal anemia (fetomaternal hemorrhage, G6PD deficiency, α-thalessemia), chromosomal disorders ([trisomy 21, trisomy 18 and monosomy X] 8-16%), congenital infections ([TORCH, adenovirus, parvovirus, syphilis] 2-4%), twinning, hepatic causes, metabolic storage disorders, thoracic causes (2.5-13%) urinary, gastrointestinal, lymphatic malformations, tumors, twin-twin transfusion syndrome and rest idiopathic (7-30%).[1,2]

Numerous mechanisms have been implicated in the generation of ascites, including abnormal lymphatic drainage, obstruction of venous return due to any space occupying lesion in the thorax, cardiac failure, decreased plasma oncotic pressure seen in fetal anemia, hepatic insufficiency (storage disease) or congenital nephrosis, increased capillary permeability, urinary tract obstruction, and meconium peritonitis. Chromosomal anomalies and intrauterine infections are uncommon causes of fetal ascites.[3]

Possible fatal complications of isolated fetal ascites include the development of lung hypoplasia and hydrops. Pulmonary hypoplasia leading to respiratory distress following birth can develop as a result of the ascites moving the diaphragm upwards, thereby compressing the lungs. Seeds et al. were the first ones to report in utero abdomino-amniotic shunting as useful in managing fetal ascites. Nevertheless, the procedure is not a prerequisite in cases of simple isolated ascites, as such an intervention might predispose a fetus to preterm delivery. Abdominal paracentesis performed prenatally has been recommended as helpful in improving the outcome of pulmonary function and preventing abdominal dystocia if done prior to a vaginal delivery. On the other hand, the ascitic fluid generally reaccumulates quickly following the procedure. Seeds and Fung et al. recommended abdominoperitoneal shunting to avoid recurrent paracentesis.[4]

METHODS

Protocol

By following the rules provided by Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, the author of this study made certain that it was up to par with the requirements. This is done to ensure that the conclusions drawn from the inquiry are accurate.

Criteria for Eligibility

For the purpose of this literature review, we compare and contrast of etiology and outcome of isolated fetal ascites. It is possible to accomplish this by researching or investigating the etiology and outcome of isolated fetal ascites. As the primary purpose of this piece of writing, demonstrating the relevance of the difficulties that have been identified will take place throughout its entirety.

In order for researchers to take part in the study, it was necessary for them to fulfil the following requirements: 1) The paper needs to be written in English, and it needs to determine about etiology and outcome of isolated fetal ascites. In order for the manuscript to be considered for publication, it needs to meet both of these requirements. 2) The studied papers include several that were published after 2013, but before the time period that this systematic review deems to be relevant. Examples of studies that are not permitted include editorials, submissions that do not have a DOI, review articles that have already been published, and entries that are essentially identical to journal papers that have already been published.

Search Strategy

We used " Etiology of Isolated Fetal Ascites"; "Outcome of Isolated Fetal Ascites" as keywords. The search for studies to be included in the systematic review was carried out using the PubMed and SagePub databases by inputting the words: (("Fetal Ascites"[MeSH Subheading] OR "Isolated Fetal Ascites"[All Fields] OR "Etiology of Fetal Ascites"[All Fields]) AND ("Incident of Fetal Ascites"[All Fields] OR "Outcome of Fetal Ascites"[All Fields]) AND ("Prevalence of Isolated

Fetal Ascites"[MeSH Terms] OR ("The Impact of Isolated Fetal Ascites"[All Fields]) OR ("Prognosis of Isolated Fetal Ascites [All Fields])) used in searching the literature.

Data retrieval

After reading the abstract and the title of each study, the writers performed an examination to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilise as sources for their article and selected those studies. After looking at a number of different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in English and can't have been seen anywhere else.

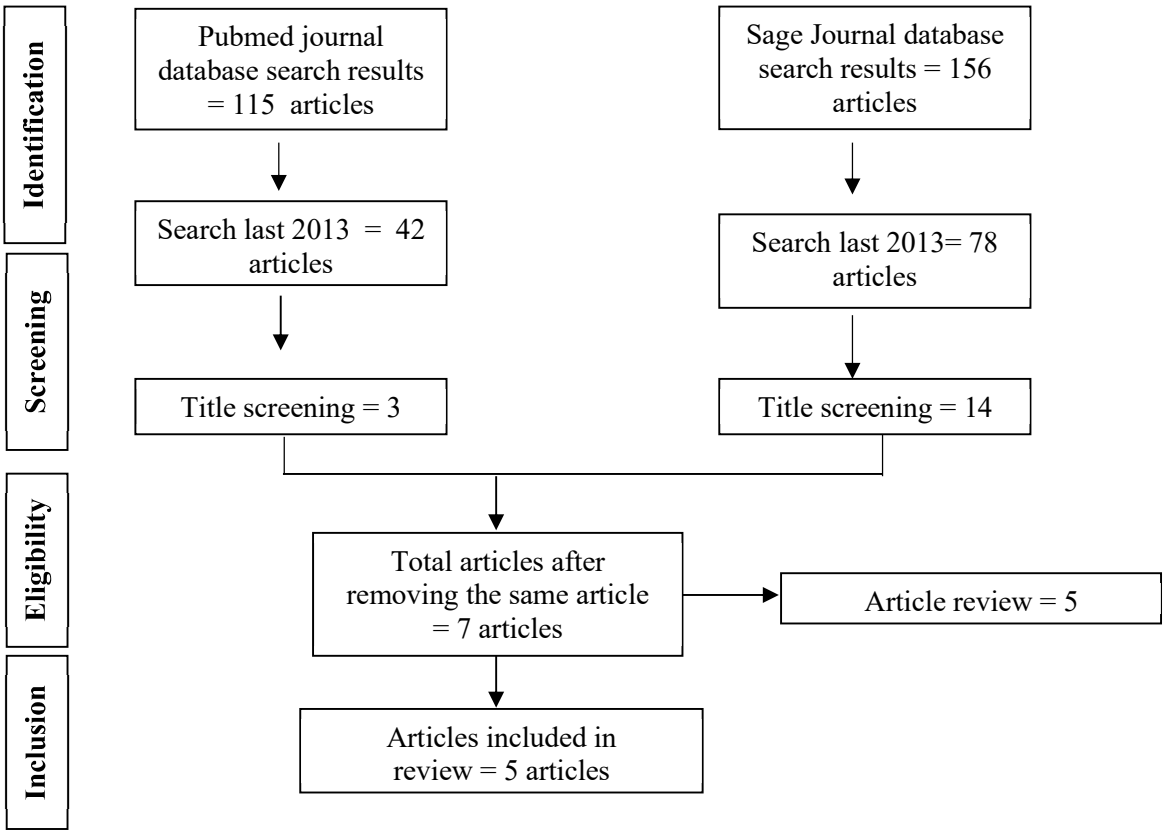

Figure 1. Article search flowchart

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

Quality Assessment and Data Synthesis

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. in order to simplify the process as much as feasible when selecting papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

RESULT

In the PubMed database, the results of our search brought up 115 articles, whereas the results of our search on SagePub brought up 156 articles. The results of the search conducted for the last year of 2013 yielded a total 42 articles for PubMed and 78 articles for SagePub. The result from title screening, a total 3 articles for PubMed and 14 articles for SagePub. In the end, we compiled a total of 7 papers. We included five research that met the criteria.

Iizuka, T *et al* (2021)[5] showed a fetal greater omentum was not confirmed in all three cases of meconium peritonitis. It was suggested that the finding of the greater omentum can be an important clue for estimating the pathophysiological etiology of fetal ascites and helping with postnatal management. It should be reasonable to add the finding of the greater omentum to the detailed ultrasound examination checklist.

Catania, VD *et al* (2016)[6] showed that systematic fetal medicine investigation of fetal ascites should be followed to ensure reaching a proper diagnosis, as most of the cases are associated with other abnormalities. It may be possible to estimate the optimal management for these fetuses both in utero and after birth based on GA at the time of diagnosis. They recommend that all cases of fetal ascites be urgently referred to a fetal medicine center for investigation and multidisciplinary evaluation to improve the outcome. Parents should be adequately counseled regarding the risk of associated malformation and adverse pregnancy and neonatal outcome. Fetal magnetic resonance imaging should be evaluated for further investigation of those fetuses presenting with isolated ascites and, when available, may lead to a more accurate prenatal diagnosis.

Table 1. The litelature include in this study

Author	Origin	Method	Sample Size	Result
Iizuka, T *et al*., 2021[5]	Japan	A retrospective study	20 patient	Ultrasound findings of fetal omentum were defined as follows: (1) a cyst-like shape with a thin membrane observed as wavy in the ascites, (2) beside the stomach and below the liver, and (3) no blood flow noted on color Doppler. Eleven pregnancies had fetal ascites. A fetal greater omentum was confirmed in eight cases in which ascites were caused by non-peritonitis: fetal hydrops (n = 4), congenital cytomegalovirus infection (n = 2), idiopathic chylous ascites (n = 1), and unknown cause (n = 1). Of these eight cases, no abdominal surgical management was required in three live babies.
Catania, VD *et al*., 2016[6]	Italy	Prospective study	51 fetuses	During the study period, 51 fetuses were included. Among them, 28 in group I and 23 in group II. An associated anomaly was prenatally identified in 84% of the fetuses. Prenatal demise occurred only in patients belonging to group I for an overall incidence of 10%. An associated disease was confirmed after birth in 61% of cases in group I and in 74% in group II (p ¼ ns). There was a higher incidence of gastrointestinal pathology in group II than in group I (47 vs. 10%, p ¼ 0.004); with a significant prevalence of meconium peritonitis (32 vs. 4%, p ¼ 0.016). Nine patients (17.6%) died after birth, all in

				group I, because of major systemic malformations. Overall, the postnatal outcome was good in 63% (n ¼ 32) of the cases, and more than half of them belonged to group II (p ¼ 0.003).
Sablok, A *et al* .,2021[7]	India	A retrospective study	23 cases	The mean age at diagnosis was 26 gestational weeks. Structural abnormalities without any underlying chromosomal or genetic cause were identified in 10/23 (43.4%) cases with the most common structural abnormality related to the gastrointestinal tract where ultrasound proved to the most useful tool. The overall good prognosis was seen in 13/23 (56.5%) cases.
Dreux, S *et al*., 2014[8]	France	A retrospective study	100 respondences	Final etiologies of ascites, outcome of pregnancies, and association or not with fetal hydrops are presented (etiologies suspected at ultrasound scan and confirmed postnatally) and (no etiology found for ascites at ultrasound scan). Termination of pregnancy was performed in 48 cases (48%) because of the presence of severe associated malformations. In utero or neonatal death occurred in 12 cases (12%), and a live birth infant was observed in 40 (40%). Ascites was associated with fetal hydrops in 31 cases (31%) and not in 69 cases (69%). When no fetal hydrops was observed, whatever the volume of amniotic fluid, live births were observed in 31/69 (45%) versus 9/31 (29%) when fetal ascites was associated with hydrops, a nonsignificant difference (P = 0.31). In those cases where the etiology was felt to be cardiac in origin (three rhythm anomalies, one Bourneville tuberous sclerosis, one hypoplastic left heart syndrome, one fibroelastosis, one atrioventricular canal defect, and one hypertrophic Eustachian valve), fetal hydrops was present in 100% of the cases but was present in only 4/10 (40%) of the cases with metabolic storage diseases. Eleven different groups of etiologies were

				observed, urinary tract obstruction being the most frequent (31% for isolated urinary tract obstruction and 38% if urogenital malformations are included). Digestive causes represent 14% of cases. Storage diseases represented 10% of cases.
Baccega, F., 2015[9]	Brazil	A retrospective cohort study	154 participants	A total of 154 pregnancies were included in the study. In 8 (5.19%) cases, ascites was an isolated finding, and in 146 cases, other alterations were observed during the ultrasound evaluation. Death before hospital discharge occurred in 117 cases (76.00%). The following ultrasonographic findings were significantly associated with death: gestational age at diagnosis < 24 weeks (P <0.0001); stable / progressive ascites evolution (P = 0.004); the presence of hydrops (P < 0.0001); and the presence of cystic hygroma (P < 0.0001). The presence of hydrops, the presence of respiratory tract malformations, and stable/progressive ascites evolution were significantly associated with the prediction of death.

Sablok, A *et al* (2021)[7] showed Appropriate perinatal care, timely referral, and delivery at tertiary care setup are other measures which can improve the outcome for most of the cases and can help achieve at least 75%–80% survival rate. Ascites presenting after 24 gestational weeks has a better prognosis as they are more likely to be associated with correctable structural causes. The results of the present study also showed that detailed ultrasound and serial scans can be a very effective tool for investigating cases with isolated fetal ascites.

Dreux, S *et al* (2014)[8] showed that because of the variety of etiologies of fetal ascites and to its poor prognosis, it is of importance to optimize patient management. We propose a two-step management, the first including ultrasound scan, maternal serum sampling, and fetal karyotyping and the second consisting in ascites fluid sampling for laboratory assays. After these two steps, the residual unknown etiologies are mainly genetic diseases for which adequate management can be discussed with a geneticist.

Baccega, F *et al* (2015)[9] showed A large spectrum of causes may be related to ascites, and even when ascites appears to be isolated based on the ultrasound evaluation, structural abnormalities, such as intestinal perforations and abnormal biliary ductus, may be detected after birth. Therefore, for better counseling, these cases require a prenatal work-up to investigate the causes of ascites. The current study presents guidance for counseling based on the ultrasound findings in fetal ascites and provides guidance for counseling cases after the cause of the ascites has been determined.

DISCUSSION

Fetal ascites is an abnormal fluid collection in the fetal peritoneal cavity, and it is often the first finding in hydrops fetalis. Ascites is present in 85% of cases of nonimmune hydrops fetalis. Isolated ascites is defined as fluid accumulation in the abdominal cavity without the involvement of fluid accumulation in other body cavities or subcutaneous tissue. It is a rare condition but can be diagnosed easily by ultrasound scanning. Some 30%-75% of cases of isolated fetal ascites resolve spontaneously. The etiology of fetal ascites or associated disorder can be identified in 92% cases, if we follow a systematic protocol for diagnostic workup. The prognosis of isolated fetal ascites depends on the underlying pathology, but generally has been reported to be better than that of hydrops fetalis.[3]

The aetiology of isolated fetal ascites can be idiopathic or may occur as a result of many conditions, including fetomaternal haemorrhage, glucose-6-phosphate dehydrogenase deficiency, and thalassaemia affecting the mother. In the fetus, chromosomal abnormalities tend to occur mostly due to congenital heart disease, congenital infections, hepatic and metabolic storage disorders, and lymphatic disorders of the peritoneum. It is essential to differentiate hydrops from fetal ascites, as fetal hydrops is more commonly caused by systemic diseases, whereas the latter occurs more frequently due to local intra-abdominal causes. Despite the fact that hydrops is usually considered a serious condition, fetal ascites is not necessarily considered thus.[4]

Isolated fetal ascites presents antenatally with fluid around the "spleen, liver, bowel, bladder, extrahepatic portion of the umbilical vein, falciform ligament, and/or greater omentum", usually discovered by ultrasonography. Other features of hydrops, including skin oedema, and pleural and pericardial effusion, are not present. After the diagnosis of fetal ascites, a follow-up ultrasound after one week is required to establish if there has been progression to fetal hydrops. The development of hydrops is not likely to occur if the ascites remains localised to the abdominal cavity.[4]

Fetal ascites is generally caused by immune and non-immune hydrops fetalis, congenital infections, cardiac malformations, gastrointestinal and genitourinary anomalies.1 Here, we present a case of fetal ascites with hydrometrocolpos secondary to persistent urogenital sinus and cloaca. The early prenatal diagnosis gives a good prognosis for this condition. Serial ultrasound, with appropriate viral screen and exclusion of chromosomal abnormalities, is essential to make a diagnosis.[10]

CONCLUSION

The natural history of this condition remains unclear, despite the fact that immune and nonimmune hydrops are well described and documented. Reported causes of isolated fetal ascites are cardiac, renal, gastrointestinal, pulmonary, and metabolic disorders. Infectious diseases may be related to fetal ascites.

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