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Pancreatitis in Pregnancy: a 10 year retrospective of 15 Midwest hospitals

Jennifer J. Eddy, MD[a], **Mark D. Gideonsen, MD**[a], **Jonathan Y. Song, MD**[b], **William A. Grobman, MD, MBA**[c], and **Peggy O'Halloran, MPH**[a]

[a]University of Wisconsin School of Medicine and Public Health, Eau Claire, WI

[b]Rush Medical College, Chicago, IL

[c]Northwestern University Medical School, Chicago, IL

Abstract

Objective—To estimate the incidence, etiology and complications of pancreatitis in pregnancy and identify factors associated with adverse outcomes.

Methods—Chart review of all patients diagnosed with pancreatitis and pregnancy from 1992–2001 at 15 participating hospitals. Information was collected on presentation, management and outcome, along with the number of deliveries at each hospital.

Results—During the 10 years of the study, 101 cases of pancreatitis occurred among 305,101 deliveries, yielding an incidence of one in 3,021 (.03%). There were no maternal deaths; perinatal mortality was 3.6%. Eighty-nine women had acute pancreatitis and twelve women had chronic pancreatitis. The majority (66%) of cases of acute pancreatitis were biliary in origin, and they were associated with better outcomes than non-biliary etiologies. Cases of gallstone pancreatitis that received surgical or endoscopic intervention during pregnancy had lower rates of preterm delivery and recurrence than those that were conservatively managed, but this difference was not significant (p=0.2). Alcohol was responsible for 12.3% of acute pancreatitis and 58% of chronic pancreatitis and was associated with increased rates of recurrence and preterm delivery. A calcium level, triglycerides or both was not obtained in half of cases identified as idiopathic.

Conclusion—Pancreatitis is a rare event in pregnancy, occurring in approximately 3 in 10,000 pregnancies. While it is most often acute and related to gallstones, non-biliary causes should be sought, as they are associated with worse outcomes.

Introduction

Pancreatitis in pregnancy is a rare condition estimated to occur in 1 in 1,000 to 1 in 12,000 pregnancies (1). There is a wide range of outcomes reported in the literature. Reports through 1980 estimated maternal and perinatal mortality rates at 0–37% and 11–37% (2–6) while later multi-year single-institution reviews demonstrate better outcomes, with no maternal mortality and perinatal mortality of 0–18% (1,7–12).

Generalization from these later reviews is difficult because they span different decades and countries. Some include all cases of pancreatitis (8,9) while others report only acute or biliary pancreatitis (1,7,10–12); some include only cases occurring during pregnancy (9–11) while others also include postpartum cases (1,7–8). Furthermore, due to the rarity of this condition,

Corresponding author address : 617 W. Clairemont Avenue Eau Claire WI 54703 (phone) 715-855-2037; (fax) 715-839-5176, jjemdg@sbcglobal.net.

the number of cases in these reviews is typically small. Using a Medline search with key words 'pancreatitis' and 'pregnancy,' we determined that the largest study since 1980 included 43 women (1). Since gallstone pancreatitis accounts for the majority of acute pancreatitis in pregnancy, non-gallstone pancreatitis has not been well characterized in these reviews although it has been associated with poor outcomes in case reports (13–17).

Equally uncertain are the actual and the optimal techniques for managing gallstone pancreatitis in pregnancy. Expectant management during pregnancy, once the norm (2,7), has been challenged by case reports and series documenting high recurrence rates among patients receiving conservative management (10,19) and, conversely, good outcomes with laparoscopic cholecystectomy (18–24), endoscopic retrograde cholangiopancreatography and endoscopic sphincterotomy during pregnancy (25–27). Some authors recommend intervening only for worsening or recurrent pancreatitis; others suggest intervening in the second trimester for cases presenting in the first or second trimesters, and postpartum for cases presenting in the third trimester (7,9); while still others advocate intervening in all trimesters (10,19).

Given the current uncertainty regarding incidence, management and outcome of pancreatitis in pregnancy, it is important to establish accurate generalizable information, so that patients can be counseled and managed appropriately. To this end, we have analyzed all cases of pancreatitis that occurred in pregnant women at 15 hospitals over 10 years. This study describes the incidence, etiology and complications of both acute and chronic pancreatitis in this population, and identifies factors associated with adverse health outcomes.

Methods

Fifteen tertiary care and community hospitals in urban and suburban settings were identified in three Midwestern states and agreed to participate in this study. Institutional Review Board approval was obtained from the University of Wisconsin and from each of the participating hospitals. We reviewed all charts from 1992–2001 with an International Classification of Disease-9 (ICD-9) code for pancreatitis (577.0–577.9) during pregnancy, and extracted information on maternal age, gravidy/parity, gestational age at presentation and delivery, etiology and diagnostic testing (amylase/lipase, ultrasound/MRI, triglycerides, calcium, etc); interventions (open or laparoscopic cholecystectomy, endoscopic retrograde cholangiopancreatography and/or endoscopic sphinterotomy); and health outcomes. Each hospital provided information on the number of deliveries performed during the study period.

Categorization of the etiology of pancreatitis was done based on diagnosis by the managing physician in concert with imaging and laboratory studies. Cases charted as "gallstone pancreatitis" were categorized as gallstone pancreatitis, including four cases in which no ultrasound was obtained or referenced. Cases charted as "idiopathic" were analyzed as such, although in half of them a calcium or triglyceride level or both was not checked. All cases involving alcohol abuse were analyzed as alcoholic pancreatitis, including 4 cases that also had gallstones. Chronic pancreatitis was diagnosed when episodes of pancreatitis occurred over many years, accompanied by a diagnosis of chronic pancreatitis or with evidence of pancreatic insufficiency (diabetes) or surgical intervention (Roux-en-Y).

Analysis was performed using SAS version 9.1. Differences between the groups in categorical data were evaluated using chi square analysis and the Student t-test was used to discern differences between the groups in continuous data. All tests were two-tailed and P values <. 05 were considered significant. The health outcomes of women whose pregnancies resulted in elective abortions were excluded from all analyses except those of maternal age and gestation at presentation, pseudocyst, etiology, and management. Gallstone pancreatitis with a second

etiology (alcohol, tumor, or post-endoscopic retrograde cholangiopancreatography) was excluded from the analysis of both simple gallstone pancreatitis and non-gallstone pancreatitis.

Results

Over the study period, 305,101 women delivered at the 15 institutions. One hundred and one cases of pancreatitis (89 acute and 12 chronic) occurred among this population, for a frequency of 1 in 3,021 pregnant women (0.033%, 95% confidence interval 0.027% – 0.040%). The majority (66.3%) of acute pancreatitis was due to gallstones, and most of these cases were simple gallstone pancreatitis. Of the acute cases, 15 (16.5%) were considered idiopathic and 11 (12.3%) were due to alcohol. The other causes of acute pancreatitis were varied, and are listed in Table 1. The etiologies of chronic pancreatitis are listed in Table 2. As can be seen, the majority were related to alcohol abuse.

The initial occurrence of pancreatitis was distributed across a range of gestational ages, with significantly more cases presenting later in gestation: 24% presented in the first trimester, 33% presented in the second trimester and 43% presented in the third trimester. Thirty-seven percent of women were nulliparous, 27% had had one child, 15% had had two children, and 22% had had three or more children. The average maternal age at presentation was 26.2 years, and was higher among women with alcoholic (32.1 years) ($p<.05$) and chronic pancreatitis (30.1 years) ($p<.05$).

Eight patients (8.9% of 90 women who received an ultrasound of the right upper quadrant) had documented pseudocysts, with an average length of 5.1 cm. No pseudocyst was drained antenatally and 5 women had successful vaginal deliveries despite the pseudocyst, including 2 in whom the pseudocysts measured over 6 cm.

Maternal morbidity was determined for 84 women with pancreatitis for whom documentation was available for the entirety of their pregnancy. Parenteral nutrition was required in 20 women (24%), for an average of 20 days (range 3 to 77). Five women required admission to an intensive care unit. Only one of these was directly due to pancreatitis, a case of hyperlipidemic pancreatitis with phlegmon. Two intensive care unit admissions resulted from complications of parenteral nutrition (atrial fibrillation and line sepsis), while the other two were for unrelated medical conditions.

For patients with chronic pancreatitis, two had previously undergone Roux-en-Y operations; four had diabetes as a consequence of chronic pancreatitis; one developed diabetic ketoacidosis during pregnancy but did not require intensive care treatment. Symptoms recurred during the same pregnancy in 36% of cases, more commonly for women with chronic pancreatitis than those with acute pancreatitis (82% vs 29%, $P<.05$). There were no maternal deaths.

With regard to pregnancy outcomes, 27 women (32.1%) delivered a preterm neonate with 10 (11.9%) delivering prior to 35 weeks. Of the severely preterm deliveries, four of these cases (two with chronic pancreatitis) underwent emergent cesarean delivery because of non-reassuring fetal tracing, while in two others labor was induced or augmented because of worsening pancreatitis. In at least four cases severely premature delivery was due to factors not directly related to pancreatitis, such as placental abruption or chorioamnionitis.

There were three intrauterine deaths (3.6%), comprising one case of traumatic abruption at 27 weeks secondary to a motor vehicle accident (which caused the patient's pancreatitis); chorioamnionitis and failed cerclage in a twin gestation at 22 weeks occurring 6 weeks after an episode of simple gallstone pancreatitis; and a spontaneous abortion at 15 weeks at initial presentation of acute gallstone pancreatitis. There were also three cases of elective abortion in the first trimester.

Table 3 demonstrates selected patient outcomes stratified by the etiology of pancreatitis. In general biliary pancreatitis had better outcomes than all-cause pancreatitis. Patients with non-gallstone pancreatitis were significantly more likely to have preterm delivery (51.4% vs 18.6%, p<.05) and pseudocyst (16.2% vs. 0%, p<.05) than patients with simple gallstone pancreatitis. Patients with alcoholic pancreatitis were more likely to have recurrence of pancreatitis during pregnancy (75.0% vs 29.2%, p<.05) and preterm delivery (66.7% vs 26.4%, p<.05) compared to cases where alcohol was not a factor. Although the numbers were small, hyperlipidemic pancreatitis had particularly poor outcomes compared to other etiologies, and significantly increased rates of preterm delivery (100% vs 28.8%, p<.05) and pseudoocyst (50.0% vs. 6.3%, p<.05).

In 52 of 59 women with gallstone pancreatitis, management could be determined. Nine of 14 women presenting in the first trimester (64.3%) received antepartum surgical or endoscopic treatment, as did 10 of 16 women presenting in the second trimester (62.5%), and 2 of 21 women presenting in the third trimester (9.5%). Of women who presented in the first trimester and received intervention, 2 had cholecystectomy deferred until the second trimester while 7 had intervention in the first trimester (4 underwent endoscopic retrograde cholangiopancreatography and 3 laparoscpoic cholecystectomy--2 of whom had abortions). Of women who presented in the second trimester and received intervention, all were treated in the second trimester (2 with open cholecystectomy, 6 with laparoscopic cholecystectomy alone, 3 with endoscopic retrograde cholangiopancreatography alone and one with endoscopic retrograde cholangiopancreatography and laparoscopic cholecystectomy). Of the two women receiving intervention who presented in the third trimester, one underwent laparoscopic cholecystectomy and the other had endoscopic retrograde cholangiopancreatography.

Outcomes among the subgroup of women with simple gallstone pancreatitis were stratified according to whether they underwent intervention or conservative management. Forty-six cases had complete information on both management and outcome (Table 4). Excluding two cases of elective abortion, among the 14 women receiving antepartum cholecystectomy or endoscopic retrograde cholangiopancreatography there was one fetal demise (7.1%) at 22 weeks and one preterm delivery (7.1%) at 36 weeks. Among the 30 cases that were conservatively managed there was one demise (3.3%) at 15 weeks and 7 preterm deliveries (23.3%). Symptoms of pancreatitis recurred in 1 (14.3%) woman after laparoscopic cholecystectomy and in 8 women managed conservatively (26.7%) Three other cases of pancreatitis were the *result* of endoscopic retrograde cholangiopancreatography for gallstones, one at 8 weeks and two at 27 weeks, and all three delivered at term without further recurrences.

Discussion

This large multi-institution review confirms many findings from prior reports of pancreatitis in pregnancy. The incidence of 1 in 3,428 for acute pancreatitis in pregnancy is comparable to 1 in 3,333 observed in the largest single-institution study by Ramin and colleagues (1). Increasing incidence with gestational age has been noted in other studies (1,28,29). The biliary predominance of our cases (58% overall, 65.2% of acute pancreatitis), is similar to 65–100% noted in earlier studies (1,6,7,9). Maternal mortality in this study (<1%) is comparable to others' findings for this condition (1,7–12).

The overall rate of preterm delivery (32.1%) in this study is significantly higher than the 15–19% observed elsewhere (1,9,10). However, among women with simple gallstone pancreatitis, the frequency of preterm delivery (18.6%) is more consistent with previous data. Despite the higher rate of preterm delivery, the rate of perinatal demise (3.6%) in this study is less than the 10.5% found by Ramin et al. (1) and the 10–20% reported in the literature (28,29). This is surprising since our study includes cases of chronic pancreatitis which should presumably

increase the rate of fetal wastage. Our good outcomes most likely reflect improvements in neonatal intensive and supportive care which have occurred even over the past decades in this country, a hypothesis supported by a perinatal death rate of 4.8% in the most recent review by Hernandez (10).

No unified approach to the management of gallstone pancreatitis was discernable in this study, perhaps reflecting controversies in management of biliary disease in pregnancy, or specialist availability and expertise across a variety of institutions. For women with gallstone pancreatitis not choosing termination (n=50), surgical intervention occurred less frequently in the first (8.3%) and third trimesters (4.5%) compared to the second trimester (47%) (7,9) and laparoscopic cholecystectomy occurred more frequently than open cholecystectomy (11 vs. 2). Endoscopic retrograde cholangiopancreatography occurred almost as frequently as surgical intervention (9 vs. 13). Two women with pancreatitits in their first trimester had cholecystecomy deferred until the second trimester, while no cases of endoscopic retrograde cholangiopancreatography were deferred until the second trimester. In fact, endoscopic intervention was more common in the first (33.3%) than in the second (23.5%) or third (4.5%) trimesters in this study.

Based on our findings, we are unable determine the optimal management of simple gallstone pancreatitis occurring during pregnancy. While patients receiving antepartum surgical or endoscopic intervention had lower rates of premature delivery and recurrence than those receiving conservative care, these differences were not statistically significant (p=.2). A sample larger than our 44 cases of simple gallstone pancreatitis would be needed to identify significant differences in outcome based on management, if they exist.

Parenteral nutrition is considered safe in pregnancy and necessary when adequate oral nutrition is not possible, although the frequency of complications from centrally inserted catheters is higher than in nonpregnant patients (30). Almost a quarter of cases in the study received parenteral nutrition, and 9% of those receiving it required intensive care unit admission as a result. Pancreatitis caused by alcohol had much lower rates of parenteral nutrition in this study, which is surprising since malnutrition is a common complication of alcoholism. Lower rates of parenteral nutrition in this population could reflect provider bias or concern about parenteral substance abuse or unreliable follow-up.

Alcoholic pancreatitis was more prevalent in this study than in other reviews of pancreatitis in pregnancy (17.8% overall; 12.3% of 89 acute pancreatitis cases vs. ≤7% in other studies of acute pancreatitis) (7,9,10), due to our inclusion of chronic pancreatitis and perhaps also to our selection of Midwestern states with a high prevalence of alcohol use (31). Alcohol was responsible for over half of cases of chronic pancreatitis, and chronic pancreatitis complicated more than a third of all cases where alcohol was involved. Alcoholic pancreatitis was associated with significantly higher rates of preterm delivery and recurrence than all-cause pancreatitis in this study.

Non-gallstone pancreatitis as a whole had worse outcomes than simple gallstone pancreatitis in this study. Traumatic, hyperlipidemic and alcohol-induced pancreatitis had particularly poor outcomes. Pseudocysts were almost exclusively associated with non-gallstone pancreatitis, which has been reported elsewhere (32).

Symptomatic hyperparathyroidism in pregnancy is rare and most often due to parathyroid adenoma (33). Pancreatitis occurs as a result of hypercalcemia, which also can cause hyperemesis gravidarum, nephrolithiasis, muscle weakness, mental status changes and even hypercalcemic crisis (calcium >14mg/dl) which may progress to uremia, coma and death (33). Fetal complications include postpartum neonatal hypocalcemia, intrauterine growth restriction, low birth weight, preterm delivery and fetal death. Prompt diagnosis and treatment

has been shown to improve outcomes. Our single case of hyperparathyroidism-induced pancreatitis was diagnosed with parathyroid adenoma, underwent parathyroidectomy in the second trimester without complication and delivered uneventfully at term.

Plasma triglycerides increase 2–4-fold in pregnancy (34), principally in the third trimester (35), due to increased triglyceride-rich lipoprotein production and decreased lipoprotein lipase activity (36). In women with abnormal lipoprotein metabolism, this can lead to severe hypertriglyceridemia and chylomicronemic syndrome, precipitating pancreatitis (35). Delivery, which causes an abrupt drop in triglycerides, may be necessary to optimize maternal health in some cases (36). Published reports estimate that hyperlipidemic pancreatitis accounts for 4–6% of acute pancreatitis in pregnancy and is associated with particularly poor outcomes (13,34). Our findings confirm this characterization: four patients (4.4% of acute pancreatitis) with hyperlipidemic pancreatitis presented at a mean gestational age of 32 weeks (range 30–34 weeks) and an average triglyceride level of 5,000mg/dL; all delivered prematurely, one at <35 weeks; half of these patients had pseudocysts, half required parenteral nutrition, and one required intensive care because of worsening pancreatitis with phlegmon.

The worse outcomes observed for non-gallstone pancreatitis emphasize the importance of evaluating women with pancreatitis for evidence of hyperparathyroidism, hyperlipidemia or alcohol abuse by obtaining calcium and triglyceride levels, and by questioning them about their alcohol use.

Even with appropriate screening, the etiology of pancreatitis may be elusive. Patients may be reluctant to reveal a history of alcohol use during pregnancy given the potential for stigmatization; in one case report, an elevated gamma-glumatyl transpeptidase prompted further questioning by a patient's physician before the history of alcohol use, and the correct diagnosis, was obtained (37). Triglyceride levels over 1000mg/dl are necessary to cause pancreatitis (34) but have been reported to decline with bowel rest and hydration. The hypercalcemia of hyperparathyroidism may be suppressed by magnesium tocolysis (16) or factitiously lowered by hypoalbuminemia (39). Our findings demonstrate that a comprehensive search for etiology is not always undertaken, even when the cause of pancreatitis is obscure.

This large multi-institution review confirms prior reports regarding the incidence, biliary predominance and overall good outcomes for pancreatitis in pregnancy. Despite the large number of cases, however, no single management strategy for gallstone pancreatitis was observed in this study nor can be recommended as a result of its findings. Due to the rarity of pancreatitis in pregnancy (fewer than 1 in 3,000 pregnancies), any geographic or ethnic variation would be expected to significantly impact its characterization. Our study of Midwestern patients found higher rates of alcohol-associated pancreatitis than those in prior reports. This review adds substantially to our understanding of pancreatitis in pregnancy, in particular affirming the increased risks for mother and fetus associated with chronic and non-biliary pancreatitis (particularly from alcohol and hypertriglyceridemia) and thus the importance of identifying non-biliary etiologies.

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Table 1

Etiology of Acute Pancreatitis

Cause	N = 89	%
Gallstone pancreatitis (GP)	59	66.3
Simple	51	
Post ERCP[1]	3	
With alcohol[2]	4	
With tumor[2]	1	
Alcohol	11	12.3
Idiopathic	15	16.8
Hyperlipidemia	4	4.4
Hyperparathyroidism	1	1.1
Traumatic	1	1.1
Mucinous cystadenoma (gallstones also present)	1	1.1
Medication (D4T, 3TC)	1	1.1
Fatty Liver of Pregnancy	1	1.1

[1] ERCP=Endoscopic Retrograde Cholangiopancreatography

[2] Numbers do not add up because 5 cases have more than one cause (gallstones +alcohol, gallstones +tumor)

Table 2

Etiology of Chronic Pancreatitis

Cause	N = 12	%
Alcohol	7	58.3
Idiopathic	3	25.0
Traumatic	1	8.3
Anatomic (pancreas divisum)	1	8.3

Table 3

Selected pregnancy outcomes stratified by pancreatitis type

	All cases n=84	Chronic n=11	Acute n=73	SGP[3]* n=43	NGP[4]* n=37	Alcohol* n=12	Not alcohol related* n=72	Lipid n=4	Not lipid related n=80
% **Preterm Delivery**	32.1	45.5	30.1	18.6	51.4	66.7	26.4	100.0	28.8
35–36 weeks	20.2	27.3	19.2	14.0	29.7	50.0	15.3	75.0	17.5
<35 weeks	14.3	18.2	11.0	4.7	21.6	16.7	11.1	25.0	11.3
% **Fetal demise**	3.6	0.0	4.1	4.7	2.8	0.0	4.2	0.0	3.8
% **Maternal demise**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% **Maternal ICU**[5]	6.0	9.1	5.6	2.3	8.3	0.0	7.0	33.3	5.0
% **Pseudocyst**	8.3	18.2	6.9	0.0	16.2	25.0	5.6	50.0	6.3
% **TPN**[6]	23.8	0	27.4	20.9	18.9	0.0	27.8	50.0	22.5
% **Recurrence**	35.7	81.8	28.8	27.9	46.0	75.0	29.2	25.0	36.3

* Includes acute and chronic cases

Shaded cells: p <.05

4 cases with a secondary etiology eliminated from the analysis of gallstone pancreatitis

[3] Simple Gallstone Pancreatitis

[4] Non-gallstone Pancreatitis

[5] Intensive Care Unit

[6] Total Parenteral Nutrition

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Table 4

Management and Outcome of Gallstone Pancreatitis

Trimester	Intervention while pregnant	Outcome
1	5 no intervention	4 FTD[7] s
		1 36-wk delivery
	4 LC[8], three in first trimester & one in second trimester	2 abortions, 1 FTD
		1 FTD
	2 ERCPs[9]	2 FTDs
2	6 no intervention	3 FTDs
		2 35-wk delivery
		15 wk IUFD[10] *(at presentation)*
	2 ERCP alone	2 FTDs
	2 LC after ERCP	1 FTD, 1 36-wk delivery
	1 OC[11] without ERCP	1 FTD
	4 LC without ERCP	3 FTDs
		22-wk failed cerclage *(twin gestation)*
3	19 no intervention	15 FTD
		1 36-wk delivery
		1 35-wk delivery
		1 34-wk delivery
		1 33-wk delivery
	1 LC at 36 wk	1 FTD

[7] Full Term Delivery

[8] Laparoscopic Cholecystectomy

[9] Endoscopic Retrograde Cholangiopancreatography

[10] Intrauterine Fetal Demise

[11] Open Cholecystectomy