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# Pregnancy With a Stoma is Feasible, Though Associated With Manageable Complications

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**Background:** Inflammatory bowel disease (IBD) is often diagnosed in young adults, and therefore frequently coincides with pregnancy. Patients may require surgery that includes (temporary) stoma placement. Literature on the occurrence of stoma-complications during pregnancy and the effect on pregnancy outcomes is limited. To evaluate stoma-complications peri- and postpartum, a retrospective study was performed in women who were pregnant while having a stoma.

**Methods:** This multicentre cohort and survey study included all pregnant patients with IBD and a stoma who delivered between 2016 and 2023 from 5 Dutch university hospitals. Stoma-complications and pregnancy outcomes were retrospectively collected from electronic patient files. A questionnaire assessed patient-reported complications and long-term stoma-related complaints.

**Results:** In total, 50 patients were included (median age at conception 31.0 years; 55.2% Crohn's disease and 44.8% ulcerative colitis), comprising 67 pregnancies, 5 of which ended in pregnancy loss. Stoma complications occurred in 44 full-term pregnancies (71.0%), most commonly obstruction (35.5%) and decreased output (29.0%). Surgery was required in four pregnancies due to obstruction ( $n = 3$ ) and prolapse ( $n = 2$ ). In the first-year postpartum, 7 patients required surgery for stoma-complications. Amongst 29 women who completed the questionnaire, 10 (34.5%) reported unresolved complications 6 months postpartum. Cesarean sections were performed in 31 (50.0%) pregnancies. Adverse pregnancy outcomes included prematurity ( $n = 9$ , 14.5%), low birth weight ( $n = 9$ , 14.5%), and dysmaturity ( $n = 5$ , 8.1%).

**Conclusions:** Pregnancy with a stoma is feasible, though manageable complications often occur. Counseling before pregnancy and close monitoring of symptoms during pregnancy and postpartum are essential for women with IBD and a stoma.

## Lay Summary

The treatment of inflammatory bowel disease may include stoma-formation. In this cohort of pregnant patients with a stoma, 71.0% experienced a stoma-related complication. Obstruction was the most common problem. Most symptoms could be successfully managed conservatively.

**Key Words:** inflammatory bowel disease, clinical trials, surgery, stoma, pregnancy

## Introduction

As inflammatory bowel disease (IBD) is frequently diagnosed in young adults, the disease often coincides with family planning and pregnancy. About one in 4 female patients will have their first pregnancy after diagnosis.<sup>1</sup> In general, the treatment of IBD is focused on inducing and maintaining a state of remission. Up to 25% of patients with ulcerative colitis (UC) and

over half of the patients with Crohn's disease (CD) will require one or more surgical procedures during their lifetime,<sup>2</sup> though these numbers are decreasing in the era of biologic therapies<sup>3</sup>

There are several indications for ostomy surgery in the treatment of IBD. A temporary stoma can be created to increase the quality of life in patients with severe fistulizing perianal disease

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### Key Messages

#### What is already known?

Previous studies have described fecundity and fertility after pelvic inflammatory bowel disease (IBD)-surgery, but there is limited literature on pregnancy in the presence of a stoma.

#### What is new here?

In this study, 71.0% of pregnancies in patients with a stoma were affected by stoma complications, obstruction being the most common. Most complications were successfully managed through conservative treatment. Patients with IBD and a stoma in this cohort had a higher rate of cesarean sections (50.0%) compared to the known rates in those without a stoma (29.1%-32.5%).

#### How can this help patient care?

Knowledge on stoma-complications that are likely to occur during pregnancy will improve preconception counseling and help guide multidisciplinary management during pregnancy.

and fecal incontinence, to protect a high-risk anastomosis or to treat postoperative complications. Permanent ostomies can be performed after (sub)total colectomies, which is the preferred procedure for patients with refractory pancolitis and proctitis.<sup>4,5</sup> The decision to construct a permanent end ileostomy or an ileal pouch-anal anastomosis is discussed with the patient.

Numbers on the incidence of stoma-related complications in the overall population with a stoma vary greatly,<sup>6</sup> ranging from 9% to 63% with a pooled incidence of 35% according to a systematic review.<sup>7</sup> The most common stoma-related complications are parastomal herniation and prolapse. Risk factors for these complications include smoking, corticosteroid therapy, and conditions that lead to an increased intraabdominal pressure.<sup>8,9</sup> Mode of delivery in patients with a stoma is to be guided by obstetric considerations: having a stoma is not an absolute indication for a cesarean section (CS).<sup>10</sup>

While previous studies have focused on fecundity and fertility after pelvic IBD surgery,<sup>1</sup> literature on pregnancy in the presence of a stoma remains scarce. The occurrence of stoma-related complications and the effectiveness of conventional treatment methods during pregnancy is therefore still unclear. Knowledge on stoma- and pregnancy outcomes will serve as a first step toward better decision making in the treatment of stoma-related complications during pregnancy.

In this study, we assessed the incidence and the treatment of stoma-related complications during pregnancy and in the postpartum period in patients with IBD and a stoma.

## Materials and Methods

### Study Design

An observational retrospective cohort study was performed. Data were gathered from the electronic medical records (EMR) and questionnaires were sent out to participants. Five university medical centers in The Netherlands participated, including the Amsterdam University Medical Center in Amsterdam, the Erasmus University Medical Center in Rotterdam, the University Medical Center Groningen in Groningen, the

Radboud University Medical Center in Nijmegen, and the Utrecht University Medical Center in Utrecht.

This study was approved by the ethics committee of the University Medical Center Groningen (Groningen, The Netherlands, METc2022/401 and CTc11050).

### Participants

All adult patients with a confirmed IBD diagnosis (Crohn's disease, UC, and IBD unclassified (IBD-U)) who were pregnant while having a stoma between 2016 and 2023 were included. To minimize selection bias, a systematic approach to patient selection was used.

In all participating hospitals, a list of all female patients with an IBD diagnosis and a mention of a stoma at any point in their medical history was established by searching the EMR. Excluded were: patients who were deceased at time of search, patients without a confirmed IBD diagnosis, and patients who were not of childbearing age in the study period (ie, above 50 years of age). Possibly eligible patients were then screened by physician researcher DGB, who determined whether the patient had been pregnant while also having a stoma during the study period. Eligible patients were invited by e-mail to participate in this study, with a link to the questionnaire. Invitations were sent out in January 2024.

### Outcomes

#### Patient and disease characteristics

The following patient characteristics were collected: year of birth, height, weight within 6 months prior to conception, and smoking status at conception. As for disease characteristics, the Montreal classification, age at diagnosis and medication use at conception were documented.

#### Stoma-related complications

All stoma-related complications during pregnancy and the first year postpartum were recorded for pregnancies not ending in pregnancy loss before 16 weeks. These complications were divided into major and minor complications, based on their risk for emergency surgery. Major complications included parastomal herniation, prolapse (exceeding 4 cm protrusion), and obstruction.<sup>11</sup> All other complaints (eg, leakage, decreased stoma-output, non-fitting appliances, skin abnormalities, pain) were categorized as minor complications.

A distinction was made between decreased stoma-output and obstruction. Decreased output was defined as less output than usual. Obstruction was defined as a newly occurring, intermittent, complete stop of stoma-output, accompanied by stoma-related pain and potentially nausea or vomiting.

All complications that occurred prior to pregnancy in primigravida women were logged and reported in the baseline characteristics. For each complication that arose during any included pregnancy, it was evaluated and reported whether the issue already existed prior to pregnancy or if it arose as a new problem during pregnancy.

#### Disease activity

A high number of patients with an ileostomy rather than a colostomy is expected to be included for this study. Small bowel disease only moderately elevates calprotectin levels. Though not thoroughly researched, fecal calprotectin concentrations are reported to become sensitive and specific for predicting disease activity in patients with an ileostomy when a lower

threshold is applied.<sup>12,13</sup> Therefore, disease activity was defined as a fecal calprotectin concentration above 50  $\mu\text{g g}^{-1}$ ; and/or an increased activity score (Harvey Bradshaw Index or Simple Clinical Colitis Activity Index for CD and UC, respectively); and/or endoscopic activity. Disease activity was assessed in the 6 months prior to conception and during pregnancy, with the frequency of assessments determined by the treating physician.

### Pregnancy outcomes

Pregnancy outcomes included: pregnancy loss before 16 weeks, preterm birth (duration of less than 37 weeks), low birthweight (birthweight of less than 2500 grams), dysmaturity (birthweight below the tenth percentile of expected weight with regard to the duration of pregnancy), mode of delivery, and APGAR scores after 5 min.

### Questionnaire

To assess patient-reported complications, a digital questionnaire was sent out (see [Supplementary Data Content 1](#), which includes the complete questionnaire in Dutch).

In the absence of a validated instrument to assess stoma-related complications during pregnancy, a questionnaire was developed by a multidisciplinary team, including gastroenterologists (GD, CJvdW, MCV), a surgeon (FJH), a gynecologist (JRP), and a patient who has been pregnant while having a stoma. The questionnaire was digitalized using the REDCap electronic data capture tool.

### Statistical Analyses

All analyses were performed using IBM SPSS statistics (V.28.0). Patient and disease characteristics were depicted as frequencies and percentages for categorical variables, means with standard deviations (SD) for normally distributed continuous variables, and medians with interquartile ranges (IQR) for non-normally distributed continuous variables. All outcomes were presented per pregnancy, instead of per patient.

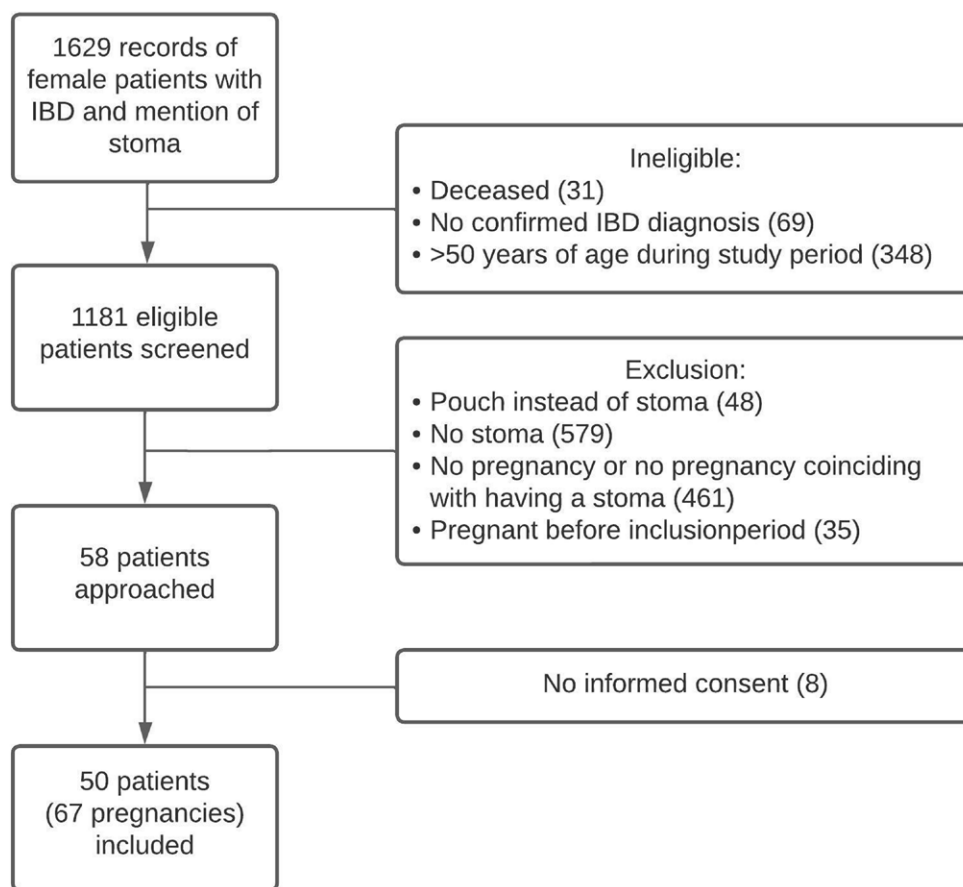
Comparative analyses were performed on the categorical data only, using Pearson's Chi-Square test. The tests were performed two-tailed and a significance level of 0.05 was used.

## Results

### Participants

The EMR search yielded 1629 women with IBD. In total, 50 patients were included (67 pregnancies, including one gemelli pregnancy) (see [Figure 1](#)). Of the included patients, 44.8% had UC and 55.2% had CD. The most common stoma type was the end ileostomy, which was present in 52 (77.6%) of pregnancies. The median duration between stoma-surgery and pregnancy was 4.7 years. Disease activity within 6 months prior to conception was reported in 5 cases (7.5%).

The median age at conception in primigravida patients was 31.0 years; the mean disease duration at conception was 12.2 years. In 42 cases (62.7%), the patient had been pregnant



**Figure 1.** Flowchart depicting the selection- and inclusion process of patients.

before. This included pregnancies that were preceded by pregnancies in which the mother did not have a stoma ( $n = 11$ ); pregnancies in the presence of a stoma before the study period ( $n = 14$ ); and pregnancies in mothers who had an earlier pregnancy also included in this dataset ( $n = 17$ ). In 22.4% of pregnancies, the use of assisted reproductive technology was necessary. In 5 pregnancies (7.5%), the mother was an active smoker at conception (Table 1).

Out of 25 primigravida women, 20 (80.0%) had experienced a complication prior to conception. These complications primarily consisted of leakage ( $n = 12$ , 48.0%), skin abnormalities ( $n = 9$ , 36.0%), and decreased output ( $n = 5$ , 20.0%). All other pre-conceptual complications occurred in less than 5 women, and are not reported separately.

### Stoma-Related Complications

Stoma-related complications were reported in 71.0% of the 62 pregnancies ending in a live birth (Table 2). Of all complications, 50.6% first occurred in the second trimester.

### Major complications

In 53.2% of pregnancies, a major complication occurred. Obstruction was present in 22 pregnancies (35.5%), most often in the second trimester ( $n = 14$ , 63.6%). Causes of obstruction were unspecified ( $n = 7$ , 31.8%), mechanical problems related to pregnancy ( $n = 8$ , 36.4%), parastomal herniation ( $n = 3$ , 13.6%), adhesions ( $n = 2$ , 9.1%), stenosis at skin-level ( $n = 1$ , 4.5%), and small bowel stenosis ( $n = 1$ , 4.5%). Two women had experienced an episode of obstruction in the year prior to conception, which resolved spontaneously in 1 woman and by dilating a stenosis at skin-level in the other. One patient had a history of recurrent ileus due to adhesions, for which she was surgically treated twice prior to her first pregnancy. Her first pregnancy was uneventful, during the second she developed obstruction for which she underwent emergency adhesiolysis. Finally, 1 patient developed obstruction 4 days after giving birth through a CS, which was attributed to adhesions. The patient underwent emergency open adhesiolysis.

Parastomal herniation was diagnosed in 12 pregnancies (19.4%), including 3 hernias in the first 6 months postpartum (4.8%). Patients who had a preexisting parastomal hernia ( $n = 2$ , 3.2%) or a history of resolved parastomal herniation ( $n = 2$ , 3.2%), experienced worsening of complaints during pregnancy necessitating multiple presentations in the emergency room and admissions to the hospital. These 4 patients all required surgery postpartum.

Prolapse was diagnosed in eleven pregnancies (17.7%). Three of these patients had experienced prolapse before pregnancy. Two patients underwent treatment involving stapling and local revision of the stoma prior to pregnancy, yet developed a recurrent prolapse. One patient who remained untreated before pregnancy, experienced worsening of prolapse symptoms starting from the eighth week of gestation.

### Minor complications

In 28 pregnancies (45.2%), a minor complication was reported. These consisted of decreased stoma-output ( $n = 18$ ,

**Table 1.** Patient characteristics.

Characteristics per pregnancy	N = 67
Age at conception in years, median (IQR) <sup>a</sup>	31.0 (6.0)
Disease duration at conception in years, mean (SD) <sup>a</sup>	12.2 (7.2)
Inflammatory bowel disease subtype, <i>n</i> (% of cases):	
Ulcerative colitis	30 (44.8)
Crohn's disease	37 (55.2)
Montreal classification UC, <i>n</i> (% of cases):	
E: extension of colitis:	
E2: left-sided colitis	9 (30.0)
E3: extensive colitis	21 (70.0)
S: severity of colitis	
S1: mild colitis	2 (6.7)
S2: moderate colitis	3 (10.0)
S3: severe colitis	4 (13.3)
Unknown	21 (70.0)
Montreal classification CD, <i>n</i> (% of cases):	
A: age at diagnosis	
A1: ( $\leq 16$ years)	13 (35.1)
A2: (17-40 years)	24 (64.9)
L: disease location	
L1: terminal ileum only	4 (10.8)
L2: colon only	9 (24.3)
L3: ileum and colon	23 (62.2)
+L4: locations proximal to ileum	3 (8.1)
+P: perianal disease	13 (35.1)
Unknown	1 (2.7)
B: behavior	
B1: nonstricturing, nonpenetrating	25 (67.6)
B2: stricturing	7 (18.9)
B3: penetrating	3 (8.1)
Unknown	1 (2.7)
Stoma type, <i>n</i> (% of cases)	
End ileostomy	52 (77.6)
Loop ileostomy	6 (9.0)
End colostomy	8 (11.9)
Loop colostomy	1 (1.5)
Interval between stoma-surgery and pregnancy in years (median, IQR)	4.7 (6.4)
Smoking status at conception, <i>n</i> (% of cases)	
Current	5 (7.5)
Former (before pregnancy)	14 (20.9)
Never	47 (70.1)
Unknown	1 (1.5)
BMI at conception, <i>n</i> (% of cases)	
BMI $< 18.5$	3 (4.5)
BMI 18.5-25.0	39 (58.2)
BMI $\geq 25.0$	22 (35.8)
Unknown	1 (1.5)
Gravidity $> 1$ , <i>n</i> (% of cases)	42 (62.7)
Assisted reproductive technology, <i>n</i> (% of cases)	15 (22.4)
Ovarian stimulation	5 (7.5)
IUI	1 (1.5)
IVF/ICSI	9 (13.5)

Table 1. Continued

Characteristics per pregnancy	N = 67
Activity <6 months prior to conception, <i>n</i> (% of cases)	5 (7.5)
Medication at conception, <i>n</i> (% of cases)	33 (49.3)
Aminosalicylates	3 (4.5)
Thiopurines	10 (14.9)
TNF alpha inhibitors	11 (16.4)
Corticosteroids, nonsystemic	2 (3.0)
Corticosteroids, systemic	4 (6.0)
Interleukin inhibitor	10 (14.9)
Integrin inhibitor	3 (4.5)
Calcineurin-inhibitors	1 (1.5)

<sup>a</sup>Primigravida patients only, *n* = 25.

29.0%), skin abnormalities (*n* = 8, 12.9%), non-fitting appliances (*n* = 7, 11.3%), and leakage (*n* = 5, 8.1%). Five out of the 10 women (50.0%) who reported decreased stoma-output in the first 2 trimesters, developed obstruction later on.

### Risk factors

In univariate analysis, the relationship between potential risk factors and major complications was explored (Table 3). No significant association could be established between any of the major complications and having been pregnant before the current pregnancy, the ostomy surgery being less than a year ago, and active smoking. Parastomal herniations occurred significantly more often in patients who were overweight at conception (36.4% vs 10.0%, *P* = .012).

Non-significant differences in complication occurrence per stoma type existed (see [Supplementary Data Content 2](#), which includes the complete overview of complications categorized per stoma type). Leakage occurred significantly more often in patients with loop ostomies compared to patients with end ostomies (28.6% vs 5.5%, *P* = .034). It is important to note that end ileostomies are mainly represented in the overall results, being present in 3 quarters of included pregnancies.

### Treatment of complications

For most major complications, no treatment was documented in the patient file (*n* = 23, 51.1%). In case of obstruction, cannulas were used (*n* = 4, 18.2%) and laxatives were prescribed (*n* = 7, 31.8%), often leading to sufficient alleviation of complaints (in 75.0% and 85.7% of treated patients, respectively). In one case, labor was induced in the 39th week to alleviate a mechanical obstruction that was presumed to be caused by the growing uterus. In another case, an already planned CS was rescheduled to be performed earlier for the same reason. For parastomal herniation and prolapse, support belts were sometimes recommended (*n* = 6). In addition, 1 prolapse was manually reduced, and in 2 cases, the hernia was manually reduced. Surgical treatment of prolapse was indicated but refused during one pregnancy. However, in 4 patients, 5 surgical interventions were performed during pregnancy.

In 2 pregnancies, the fascial opening was enlarged to alleviate obstruction. One of these 2 patients developed a

symptomatic prolapse during labor. The vaginal birth was converted to a CS, and simultaneously a local revision of the prolapse was performed. A third patient underwent emergency open adhesiolysis because of obstruction. The last patient developed a painful prolapse at the 38th week of gestation. As the prolapse could not be reduced manually, it was decided to perform a CS, during which the loop ileostomy was converted to an end ileostomy.

In the first year postpartum, 6 patients underwent surgery because of complications that had developed or worsened during pregnancy, including parastomal herniation (*n* = 5) and prolapse (*n* = 1).

### Patient-reported complications

The questionnaire was completed by 33 patients (response rate 67.3%; 40 pregnancies). The complication rate as judged by the patient was comparable to the one observed in the EMR (67.5% vs 71.0%,) (Table 2). The questionnaire yielded 5 additional pregnancies in which a complication was experienced, but not reported in the EMR, bringing the total to 27 out of 40 pregnancies (67.5%) affected by complications. Seven pregnancies were affected by a major complication that was not recorded in the EMR, and in another 7 pregnancies, a minor complication was experienced which was also not documented in the EMR.

Parastomal herniation and prolapse were both reported in 17.5% of pregnancies. Obstruction was reported in 45.0% of pregnancies, whereas this complaint was recorded in the EMR for 35.5% of pregnancies. As for the minor complications, decreased output (12.5% vs 29.0%) and skin abnormalities (2.5% vs 12.9%) were reported less often by patients. Higher rates of leakage (22.5% vs 8.1%) and pain (12.5% vs 0.0%) were reported in the questionnaire compared to EMR-reported complications. Problems with fitting the material coincided with leakage and skin abnormalities.

Out of the 29 women who answered the question about long-term complaints, 10 (34.5%) reported stoma-related symptoms at least 6 months after giving birth. Five of them reported parastomal hernias that were eventually surgically treated between 1 and 2 years after delivery. Five women (17.2%) reported pain surrounding the stoma since pregnancy; one of whom reported diastasis recti.

### Pregnancy Outcomes

#### Mode of delivery

In this cohort, 30 (48.4%) of the 62 included pregnancies ended in a vaginal birth, whereas in 31 pregnancies (50.0%) a CS was performed. Indications for CS were commonly obstetric (*n* = 10), including fetal distress, previous CS, or a history of postpartum hemorrhage. Active perianal fistula was the reason for 6 CSs, a history of perianal fistula led to a decision for CS in 3 pregnancies.

Stoma-related complications such as prolapse, parastomal herniation, and obstruction were also mentioned as a reason for CS in 3, 2, and 1 pregnancies, respectively. Furthermore, 1 CS was performed in order to prevent prolapse, according to the patient file. Finally, CS was performed twice in one patient, because she had both a pouch and a stoma. For 2 patients, pouch-surgery was considered a potential treatment option in the future, prompting the decision to opt for a CS instead of a vaginal birth.

**Table 2.** Complications reported in the electronic medical records and questionnaire.

Complications during pregnancy and postpartum <sup>a</sup>	Affected pregnancies, <i>n</i> (% of cases)		Affected pregnancies, <i>n</i> (% of cases)
			Questionnaire ( <i>n</i> = 40)
	EMR <sup>b</sup> ( <i>n</i> = 62)		
Any complication	44 (71.0)		27 (67.5)
Major complications	33 (53.2)		26 (65.0)
Obstruction	22 (35.5)		18 (45.0)
Parastomal hernia	12 (19.4)		7 (17.5)
Prolapse	11 (17.7)		7 (17.5)
Minor complications	28 (45.2)		17 (42.5)
Decreased output	18 (29.0)		5 (12.5)
Skin abnormalities	8 (12.9)		Suppressed
Non-fitting material	7 (11.3)		7 (17.5)
Leakage	5 (8.1)		9 (22.5)
Pain	0 (0.0)		5 (12.5)

<sup>a</sup>Within the first year after giving birth.<sup>b</sup>All complaints found in the electronic medical records (EMR).**Table 3.** Association between stoma-related complications and potential risk factors.

Risk factor	Obstruction ( <i>n</i> = 22)			Parastomal hernia ( <i>n</i> = 12)			Prolapse ( <i>n</i> = 11)		
	Yes	No	<i>P</i> value <sup>a</sup>	Yes	No	<i>P</i> value <sup>a</sup>	Yes	No	<i>P</i> value <sup>a</sup>
Overweight at conception <sup>b</sup>	31.8% (7/22)	37.5% (15/40)	.655	36.4% (8/22)	10.0% (4/40)	.012	22.7% (5/22)	15.0% (6/40)	.446
Stomasurgery <1 year ago	42.9% (3/7)	34.5% (19/55)	.665	28.6% (2/7)	18.2% (10/55)	.512	14.3% (1/7)	18.2% (10/55)	.799
Gravidity >1	31.6% (12/38)	41.7% (10/24)	.419	23.7% (9/38)	12.5% (3/24)	.278	21.1% (8/38)	12.5% (3/24)	.391
Mother currently smoking	0.0% (0/5)	38.6% (22/57)	.084	20.0% (1/5)	19.3% (11/57)	.970	40.0% (2/5)	15.8% (9/57)	.174

<sup>a</sup>Pearson's chi-square test.<sup>b</sup>Weight measured within six months prior to conception, overweight was defined as a Body Mass Index (BMI) of  $\geq 25$ .

### Adverse pregnancy outcomes

Four out of 67 pregnancies in this cohort (6.0%) ended in pregnancy loss before 16 weeks, 1 ended in an ectopic pregnancy (1.5%). These pregnancies were not included in the analysis. In 14 pregnancies (22.3%), adverse outcomes were reported. These outcomes included prematurity (*n* = 9, 14.5%), low birth weight (*n* = 9, 14.5%), and dysmaturity (*n* = 5, 8.1%). Three patients delivered prematurely via induction of labor or CS because of maternal morbidity: sepsis in 2 women and intrahepatic cholestasis of pregnancy in another. In 51 (80.9%) children, APGAR scores were reported. Of them, 50 (98.0%) newborns scored an APGAR score over 7 after 5 min.

In univariate analyses, the associations between adverse pregnancy outcomes and both known and potential risk factors were explored (Table 4). The occurrence of stoma-complications during pregnancy was not associated with adverse pregnancy outcomes. In 5 pregnancies (8.1%), disease activity was recorded in the 6 months prior to conception. In 20 pregnancies (32.3%), disease activity was documented during pregnancy. Disease activity either during 6 months prior to conception or during pregnancy itself was not significantly associated with adverse pregnancy outcomes in this cohort.

### Discussion

This retrospective study shows that though pregnancy with stoma is feasible, the majority of women will experience stoma-related complications, most often first diagnosed in the second trimester. Stoma-related complications were not significantly associated with adverse pregnancy outcomes. One third of the patients who responded to the questionnaire about long-term complaints reported stoma-related symptoms lasting over 6 months after giving birth. In our cohort, most complications were successfully managed through conservative treatment. A small number of women required surgery during their pregnancy or in the first year postpartum due to complications that developed during pregnancy.

In previous smaller survey- and cohort-studies in both IBD and nonIBD patients, various numbers on major stoma-related complications are reported.<sup>14-16</sup> In a recent retrospective audit in 15 hospitals in the United Kingdom, major stoma-related complications were identified in a quarter of pregnancies in patients with IBD.<sup>17</sup> Much lower rates of parastomal herniation (4%) and obstruction (9%) were reported in this cohort. However, data were incomplete for some patients in this cohort. Furthermore, some participating hospitals relied on the personal recollection of physicians for case selection, which

**Table 4.** Association between adverse pregnancy outcomes and known and potential risk factors.

Risk factor	Prematurity ( <i>n</i> = 9)			Low birth weight ( <i>n</i> = 9)			Small for gestational age ( <i>n</i> = 5)		
	Yes	No	<i>P</i> value <sup>a</sup>	Yes	No	<i>P</i> value <sup>a</sup>	Yes	No	<i>P</i> value <sup>a</sup>
Disease activity <6 months prior to conception	20.0% (1/5)	14.0% (8/57)	.717	20.0% (1/5)	14.0% (8/57)	.717	0.0% (0/5)	8.8% (5/57)	.490
Disease activity during pregnancy <sup>b</sup>	10.0% (2/20)	16.7% (7/42)	.486	10.0% (2/20)	16.7% (7/42)	.486	0.0% (0/20)	11.9% (5/42)	.108
Any stoma-complication	13.6% (6/44)	16.7% (3/18)	.758	15.9% (7/44)	11.1% (2/18)	.626	6.8% (3/44)	11.1% (2/18)	.573
Major stoma-complication <sup>c</sup>	15.2% (5/33)	13.8% (4/29)	.880	15.2% (5/33)	13.8% (4/29)	.880	6.1% (2/33)	10.3% (3/29)	.536
Mother underweight <sup>d</sup>	33.3% (1/3)	13.6% (8/59)	.343	33.3% (1/3)	13.6% (8/59)	.343	0.0% (0/3)	8.5% (5/59)	.599
Mother overweight <sup>e</sup>	13.6% (3/22)	15.0% (6/40)	.884	9.1% (2/22)	17.5% (7/40)	.368	9.1% (2/22)	7.5% (3/40)	.826
Maternal age >35 years	8.3% (1/12)	16.0% (8/50)	.498	0.0% (0/12)	18.0% (9/50)	.112	0.0% (0/12)	10.0% (5/50)	.253
Mother currently smoking	40.0% (2/5)	12.3% (7/57)	.092	20.0% (1/5)	14.0% (8/57)	.717	0.0% (0/5)	8.8% (5/57)	.490
Conceived with ART	7.7% (1/13)	16.3% (8/49)	.432	15.4% (2/13)	14.3% (7/49)	.920	15.4% (2/13)	6.1% (3/49)	.276

<sup>a</sup>Pearson's chi-square test.

<sup>b</sup>Disease activity at any timepoint during pregnancy. Disease activity was defined as a fecal calprotectin measurement of 50 µg g<sup>-1</sup> or higher and/or an increased activity score (Harvey-Bradshaw Index or Simple Clinical Colitis Activity Index for CD and UC, respectively).

<sup>c</sup>Major stoma-related complications consisted of obstruction, parastomal hernia, prolapse.

<sup>d</sup>Underweight is defined as Body Mass Index (BMI) <18.5.

<sup>e</sup>Overweight is defined as BMI >25.

may have resulted in less serious complications—such as brief obstructive episodes and minor parastomal hernias—and uneventful pregnancies having been missed.<sup>17</sup>

The underlying pathophysiology of stoma-complications during pregnancy is unknown. Yet, hypothetically, normal pregnancy-related changes may play a role in the development of these complications. Several studies have identified risk factors for stoma-related complications, including obesity and smoking.<sup>7,9</sup> In the current study, an elevated BMI (>25 kg m<sup>-2</sup>) was significantly related to parastomal hernia during pregnancy. A weakened abdominal wall in patients with a higher BMI, further exacerbated by the growing uterus during pregnancy, could explain this difference. All patients with a history of resolved or unresolved parastomal hernia before pregnancy required frequent hospital visits or even hospitalization during pregnancy.

Minor differences between patient-reported complications and symptoms that were recorded in the EMR were seen. This may be due to underreporting of symptoms. However, early recognition of complications and timely treatment may prevent further morbidity and even hospitalization later on, especially in the case of obstruction.

Previous studies in primigravida IBD patients have found a mean age at conception of 27–30 years.<sup>18,19</sup> In our population, the median age at conception of first pregnancies was 31.0 years. This difference may be a consequence of a severe disease course in these patients prior to pregnancy. In our cohort, adverse pregnancy outcomes were reported more frequently than in patients with IBD who are pregnant without a stoma. This included higher rates of preterm birth (14.5% vs 8.6%), low birth weight (14.5% vs 8.9%), and dysmaturity (8.1% vs 5.2%).<sup>20</sup> A significant association between these outcomes and disease activity or other known risk factors could not be established, though the small sample size and the infrequency of disease activity likely reduced the statistical power of the analysis. Stoma complications were not significantly associated with adverse pregnancy outcomes.

In this cohort, half of the patients underwent a CS. In literature, 32.5% of pregnancies in patients with IBD worldwide end in a CS,<sup>21</sup> and a study on pregnancy outcomes in Dutch patients with IBD revealed a CS rate of 29.1%.<sup>22</sup> This means that in our small cohort of patients with a stoma, a higher rate of CS was seen than has been reported in the general population with IBD. Despite the small size of our cohort, this finding is supported in the literature. One study reported a CS rate of 73.0% in patients with IBD and a stoma, another study reported odds ratios for CS of 8.55 and 38.96 for patients with UC and a functional ileostomy and diverting ileostomy, respectively.<sup>17,23</sup> Indications for CS in our cohort included perianal fistulas, the need to preserve sphincter function for future pouch formation, and stoma-related complications. When indicated, a CS may be considered a prudent and beneficial treatment option for pregnant women with a stoma.

This study adds to urgently needed knowledge on stoma-related complications and corresponding treatments during pregnancy. Although patient-reported symptoms were included and a systematic approach was used in patient selection, this study also has some limitations.

To accommodate for the different standards of participating hospitals in the retrospective design, the definition of disease activity included subjective measures as the clinical activity scores. Preferably, only objective methods such as biochemical markers (fecal calprotectin, C-reactive protein) are used to assess disease activity. Furthermore, our study was limited in statistical power due to the small sample size. Finally, careful consideration was given to defining an appropriate study period for including pregnancies, aiming to balance the maximization of potential sample size with reducing risk of recall bias—though this can never be entirely prevented when utilizing retrospective questionnaires.

Future research should implement a prospective design, use standardized definitions for both stoma complications and disease activity, systematically document response to treatment and aim for a larger included population. As the number



of pregnancies in the presence of a stoma is limited, a prospective registry is recommended.

## Conclusion

Patients suffering from IBD with a stoma are at risk for stoma complications during pregnancy. Therefore, thorough counseling before pregnancy and close monitoring throughout pregnancy in a multidisciplinary team including a surgeon and a stoma nurse is warranted. Special attention should be given to patients with a preexisting hernia, as their symptoms may worsen during pregnancy. In case of decreased output, treatment should prioritize maintaining smooth and regular bowel movements, including advice on sufficient fluid intake and staying active. Laxatives should be prescribed readily if the problem persists. Cesarean sections are common in this population due to the occurrence of several contraindications for vaginal delivery. In conclusion, pregnancy is feasible for women with a stoma.

## Supplementary Data

Supplementary data is available at *Inflammatory Bowel Diseases* online.

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## Author Contribution

D.G.B.: study design; planning; conducting the study; collecting and interpreting data; statistical analysis; drafting the manuscript; and approval of the final manuscript. A.H.C.v.d.W.: conducting the study; collecting and interpreting data; and approval of the final manuscript. G.D.: study concept and design; critical revision; study supervision; and approval of the final manuscript. R.L.G.: collecting data; critical revision; and approval of the final manuscript. L.O.: collecting data; critical revision; and approval of the final manuscript. W.A. v. D.: collecting data; critical revision; and approval of the final manuscript. M.M.C.H.: collecting data; critical revision; and approval of the final manuscript. J.R.P.: study design; critical revision; and approval of the final manuscript. F.J.H.: study design; critical revision; and approval of the final manuscript. C.J.v.d.W.: study concept and design; critical revision; study supervision; and approval of the final manuscript. M.C.V.: study concept and design; critical revision; study supervision; and approval of the final manuscript.

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## Conflicts of Interest

G.D. received a grant from Royal DSM, advisory board fee from Pharmacosmos and ASTRA-ZENECA, and speakers fee

from Abbvie. R.L.G. received a speakers fee from Janssen-Cilag. C.J.v.d.W. received grants from ZonMW, Falk, and Pfizer and has received consulting fees from Janssen, Galapagos, and Pfizer, has received payment or honoraria for lectures, presentations, speakers bureaus, manuscript writing, or educational events from Ferring and AbbVie, and had leadership roles in the European Crohn's & Colitis organization, United European Gastroenterology council and the Dutch Association for Gastroenterology (NVGE). M.C.V. received speaker fees from Janssen-Cilag, Galapagos, and Ferring B.V. All other authors had none to declare.

## Data Availability

The data underlying this article cannot be shared publicly in order to protect the privacy of individuals who participated in the study. The data will be shared on reasonable request to the corresponding author.

## Conference Presentation

Part of the results were shown in an oral presentation at the European Crohn's and Colitis Organisation Congress in 2024, which was awarded a Top Ten Digital Oral Presentation.

## Ethical Considerations

This study was approved by the ethics committee of the University Medical Center Groningen (Groningen, The Netherlands, METc2022/401 and CTc11050). Participation was voluntary. All participants provided informed consent prior to enrollment. All participant data were pseudonymized using study ID codes and handled with strict confidentiality.

## References

- Ban L, Tata LJ, Humes DJ, Fiaschi L, Card T. Decreased fertility rates in 9639 women diagnosed with inflammatory bowel disease: a United Kingdom population-based cohort study. *Aliment Pharmacol Ther*. 2015;42(7):855-866. doi:10.1111/apt.13354
- Frolkis AD, Dykeman J, Negrón ME, et al. Risk of surgery for inflammatory bowel diseases has decreased over time: a systematic review and meta-analysis of population-based studies. *Gastroenterology*. 2013;145(5):996-1006. doi:10.1053/j.gastro.2013.07.041
- Lowe SC, Sauk JS, Limketkai BN, Kwaan MR. Declining rates of surgery for inflammatory bowel disease in the era of biologic therapy. *J Gastrointest Surg*. 2020;25(1):211-219. doi:10.1007/s11605-020-04832-y
- Plasencia A, Bahna H. Diverting ostomy: for whom, when, what, where, and why. *Clin Colon Rectal Surg*. 2019;32(3):171-175. doi:10.1055/s-0038-1677004
- Seifarth C, Kreis ME, Gröne J. Indications and specific surgical techniques in Crohn's disease. *Viszeralmedizin*. 2015;31(4):273-279. doi:10.1159/000438955
- Parini D, Bondurri A, Ferrara F, et al.; Multidisciplinary Italian Study group for STOMas (MISSTO). Surgical management of ostomy complications: a MISSTO-WSES mapping review. *World J Emerg Surg*. 2023;18(1):48. doi:10.1186/s13017-023-00516-5
- Dellafiore F, Caruso R, Bonavina L, et al. Risk factors and pooled incidence of intestinal stoma complications: systematic review and Meta-analysis. *Curr Med Res Opin*. 2022;38(7):1103-1113. doi:10.1080/03007995.2022.2081455
- Babakhanlou R, Larkin K, Hita AG, Stroh J, Yeung SC. Stoma-related complications and emergencies. *Int J Emerg Med*. 2022;15(1):17. doi:10.1186/s12245-022-00421-9

9. Niu N, Du S, Yang D, et al. Risk factors for the development of a parastomal hernia in patients with enterostomy: a systematic review and meta-analysis. *Int J Colorectal Dis.* 2022;37(3):507-519. doi:10.1007/s00384-021-04068-5
10. Torres J, Chaparro M, Julsgaard M, et al. European Crohn's and Colitis Guidelines on sexuality, fertility, pregnancy, and lactation. *J Crohns Colitis.* 2022;17(1):1-27. doi:10.1093/ecco-jcc/jjac115
11. Bafford AC, Irani JL. Management and complications of stomas. *Surg Clin North Am.* 2013;93(1):145-166. doi:10.1016/j.suc.2012.09.015
12. Daoud ND, Hashash JG, Picco MF, Farraye FA. Faecal calprotectin from ileostomy output is sensitive and specific for the prediction of small bowel inflammation in patients with Crohn's disease. *J Crohns Colitis.* 2022;16(4):601-605. doi:10.1093/ecco-jcc/jjab182
13. Bouri S, Segal J, Oke S, Gabe S, Hart A. The accuracy of faecal calprotectin measurement from stoma effluent in predicting Crohn's disease activity. *Gut.* 2018;67(Suppl 1):A72. doi:10.1136/gutjnl-2018-BSGAbstracts.141
14. Van Horn C, Barrett P. Pregnancy delivery and postpartum experiences of fifty-four women with ostomies. *J Wound Ostomy Continence Nurs.* 1997;24(3):151-162.
15. Whiteley I, Gullick J. The embodied experience of pregnancy with an ileostomy. *J Clin Nurs.* 2018;27(21-22):3931-3944. doi:10.1111/jocn.14601
16. Takahashi K, Funayama Y, Fukushima K, et al. Pregnancy and delivery in patients with enterostomy due to anorectal complications from Crohn's disease. *Int J Colorectal Dis.* 2007;22(3):313-318. doi:10.1007/s00384-006-0148-z
17. The PAPooSE Study Group. Pregnancy outcomes after stoma surgery for inflammatory bowel disease: the results of a retrospective multicentre audit. *Colorectal Dis.* 2022;24(7):838-844. doi:10.1111/codi.16098
18. van der Giessen J, Fuhler GM, van der Woude CJ. A first pregnancy seems associated with a positive effect on the course of inflammatory bowel disease: data from a prospective pregnancy cohort. *Scand J Gastroenterol.* 2021;56(6):693-698. doi:10.1080/00365521.2021.1910996
19. De Lima A, Zelinkova Z, Mulders AGMGJ, Van der Woude CJ. Preconception care reduces relapse of inflammatory bowel disease during pregnancy. *Clin Gastroenterol Hepatol.* 2016;14(9):1285-1292.e1. doi:10.1016/j.cgh.2016.03.018
20. Leung KK, Tandon P, Govardhanam V, Maxwell C, Huang V. The risk of adverse neonatal outcomes with maternal inflammatory bowel disease: a systematic review and meta-analysis. *Inflamm Bowel Dis.* 2021;27(4):550-562. doi:10.1093/ibd/izaa122
21. Tandon P, Govardhanam V, Leung K, Maxwell C, Huang V. Systematic review with meta-analysis: risk of adverse pregnancy-related outcomes in inflammatory bowel disease. *Aliment Pharmacol Ther.* 2020;51(3):320-333. doi:10.1111/apt.15587
22. Kanis SL, Modderman S, Escher JC, et al.; Initiative on Crohns and Colitis (ICC). Health outcomes of 1000 children born to mothers with inflammatory bowel disease in their first 5 years of life. *Gut.* 2021;70(7):1266-1274. doi:10.1136/gutjnl-2019-319129
23. Friedman S, Nielsen J, Qvist N, et al. Does surgery prior to pregnancy in women with inflammatory bowel disease increase the risk of adverse maternal and fetal outcomes? A Danish national cohort study. *Am J Gastroenterol.* 2024;119(9):1875-1884. doi:10.14309/ajg.0000000000002732