

Body image dissatisfaction in patients with inflammatory bowel disease

Beese, Sophie; Harris, Isobel; Dretzke, Janine; Moore, David

DOI:

[10.1136/bmjgast-2018-000255](https://doi.org/10.1136/bmjgast-2018-000255)

License:

None: All rights reserved

Document Version

Peer reviewed version

Citation for published version (Harvard):

Beese, S, Harris, I, Dretzke, J & Moore, D 2019, 'Body image dissatisfaction in patients with inflammatory bowel disease: a systematic review', *BMJ Open Gastroenterology*, vol. 6, no. 1, e000255.
<https://doi.org/10.1136/bmjgast-2018-000255>

[Link to publication on Research at Birmingham portal](#)

Publisher Rights Statement:

Checked for eligibility 06/02/2019

This is an author-produced, peer-reviewed version of an article forthcoming in *BMJ Open Gastroenterology*.
<https://bmjopengastro.bmj.com/>

General rights

Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

- Users may freely distribute the URL that is used to identify this publication.
- Users may download and/or print one copy of the publication from the University of Birmingham research portal for the purpose of private study or non-commercial research.
- User may use extracts from the document in line with the concept of 'fair dealing' under the Copyright, Designs and Patents Act 1988 (?)
- Users may not further distribute the material nor use it for the purposes of commercial gain.

Where a licence is displayed above, please note the terms and conditions of the licence govern your use of this document.

When citing, please reference the published version.

Take down policy

While the University of Birmingham exercises care and attention in making items available there are rare occasions when an item has been uploaded in error or has been deemed to be commercially or otherwise sensitive.

If you believe that this is the case for this document, please contact UBIRA@lists.bham.ac.uk providing details and we will remove access to the work immediately and investigate.

BMJ Open Gastroenterology

Body Image Dissatisfaction in Patients with Inflammatory Bowel Disease: A Systematic Review

Journal:	<i>BMJ Open Gastroenterology</i>
Manuscript ID	bmjgast-2018-000255.R1
Article Type:	Systematic review
Date Submitted by the Author:	19-Nov-2018
Complete List of Authors:	Beese, Sophie; University of Birmingham, Institute of Applied Health Research Harris, Isobel; University of Birmingham, Institute of Applied Health Research Dretzke, Janine; University of Birmingham, Institute of Applied Health Research Moore, David; University of Birmingham, Institute of Applied Health Research
Keywords:	INFLAMMATORY BOWEL DISEASE, QUALITY OF LIFE, ULCERATIVE COLITIS, CROHN'S DISEASE
Abstract:	<p>Background and Aims: Little is known about the relationship between inflammatory bowel disease and body image. The aim of this systematic review was to summarise the evidence on body image dissatisfaction in inflammatory bowel disease patients across four areas: body image tools (i), prevalence (ii), factors associated with body image dissatisfaction in inflammatory bowel disease (iii) and association between inflammatory bowel disease and quality of life (iv).</p> <p>Methods: Two reviewers screened, selected, quality assessed and extracted data from studies in duplicate. EMBASE, MEDLINE, PsycINFO and Cochrane CENTRAL were searched to April 2018. Study design specific critical appraisal tools were used to assess risk of bias. Narrative analysis was undertaken due to heterogeneity.</p> <p>Results: Fifty-seven studies using a body image tool were included; 31 for prevalence and 16 and 8 for associated factors and association with quality of life respectively. Studies reported mainly mean or median scores. Evidence suggested female gender, age, fatigue, disease activity, and steroid use were associated with increased body image dissatisfaction, which was also associated with decreased quality of life.</p> <p>Conclusion: This is the first systematic review on body image in inflammatory bowel disease patients. The evidence suggests that body image dissatisfaction can negatively impact patients, and certain factors are associated with increased body image dissatisfaction. Greater body image dissatisfaction was also associated with poorer quality of life.</p> <p>However, the methodological and reporting quality of studies was in some cases poor with considerable heterogeneity. Future IBD research should incorporate measurement of body image dissatisfaction using validated tools.</p>

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



SCHOLARONE™
Manuscripts

1
2
3
4 1 **Body Image Dissatisfaction in Patients with Inflammatory Bowel Disease:**

5
6
7 2 **A Systematic Review**

8
9
10 3
11
12
13 4
14
15
16 5 **Sophie Elizabeth Beese¹, MPH, Isobel Marion Harris¹, MPH, Janine**
17
18 6 **Dretzke¹, MSc, David Moore¹, PhD.**

19
20
21 7
22
23 8 *¹Institute of Applied Health Research, Public Health Building, University of*
24
25 9 *Birmingham, B15 2TT. 0121 415 9107.*

26
27
28 10 **Corresponding author: Sophie Beese, s.beese@bham.ac.uk**

29
30
31 11 **Word Count: 3694**

1
2
3
4 20 **ABSTRACT**
5
6

7 21 **Background and Aims:** Little is known about the relationship between
8
9
10 22 inflammatory bowel disease and body image. The aim of this systematic review
11
12 23 was to summarise the evidence on body image dissatisfaction in inflammatory
13
14 24 bowel disease patients across four areas: body image tools (i), prevalence (ii),
15
16 25 factors associated with body image dissatisfaction in inflammatory bowel
17
18 26 disease (iii) and association between inflammatory bowel disease and quality of
19
20 27 life (iv).
21
22

23
24 28 **Methods:** Two reviewers screened, selected, quality assessed and extracted
25
26 29 data from studies in duplicate. EMBASE, MEDLINE, PsycINFO and Cochrane
27
28 30 CENTRAL were searched to April 2018. Study design specific critical appraisal
29
30 31 tools were used to assess risk of bias. Narrative analysis was undertaken due
31
32 32 to heterogeneity.
33
34

35
36 33 **Results:** Fifty-seven studies using a body image tool were included; 31 for
37
38 34 prevalence and 16 and 8 for associated factors and association with quality of
39
40 35 life respectively. Studies reported mainly mean or median scores. Evidence
41
42 36 suggested female gender, age, fatigue, disease activity, and steroid use were
43
44 37 associated with increased body image dissatisfaction, which was also
45
46 38 associated with decreased quality of life.
47
48

49
50
51 39 **Conclusion:** This is the first systematic review on body image in inflammatory
52
53 40 bowel disease patients. The evidence suggests that body image dissatisfaction
54
55 41 can negatively impact patients, and certain factors are associated with
56
57 42 increased body image dissatisfaction. Greater body image dissatisfaction was
58
59
60

1
2
3
4 43 also associated with poorer quality of life. However, the methodological and
5
6 44 reporting quality of studies was in some cases poor with considerable
7
8 45 heterogeneity. Future IBD research should incorporate measurement of body
9
10 46 image dissatisfaction using validated tools.
11
12
13
14
15
16

17 48 **Keywords:** Systematic review – inflammatory bowel disease – body image – quality of
18
19 49 life
20
21
22
23
24
25

26 51 **What is already known about this subject?**

27
28
29 52 Body image in inflammatory bowel disease (IBD) patients is relatively
30
31 53 unexplored. However, it may potentially be an issue as symptoms and other
32
33 54 factors associated with IBD could lead to body image dissatisfaction. Both of
34
35 55 these conditions may lead to an increased risk of developing mental health
36
37 56 disorders such as depression and self-harm, warranting research into the area.
38
39
40
41

42 57 **What are the new findings?**

43
44
45 58 This review highlights associations between certain factors in IBD and body
46
47 59 image dissatisfaction, as well as suggesting that increased body image
48
49 60 dissatisfaction is related to reduced quality of life. The review also highlights the
50
51 61 need for a validated, reliable tool to measure body image in IBD patients as well
52
53 62 as clearer reporting of studies.
54
55
56
57
58
59
60

1
2
3
4 **64 How might it impact on clinical practice in the foreseeable future?**
5

6
7
8 65 Body image can be considered when making clinical decisions regarding IBD
9
10 66 patients with the potential for interventions to improve body image in patients at
11
12 67 risk.
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Confidential: For Review Only

81 INTRODUCTION

82

83 Inflammatory bowel disease (IBD) is associated with a range of debilitating
84 symptoms⁽¹⁾ and affects around 300,000 people in the UK⁽²⁾, over 1 million in
85 the USA and 2.5 million across Europe⁽³⁾. A potentially overlooked issue for IBD
86 patients is body image dissatisfaction (BID). Body image (BI) is how an
87 individual perceives themselves physically⁽⁴⁾ and sufferers have a distorted and
88 negative view of themselves, feeling anxious and uncomfortable about their
89 body. Additionally, negative BI can have a serious impact on health and well-
90 being⁽⁵⁾.

91 Social media and celebrity attention contribute to pressure to adhere to an
92 “ideal” body and an obsession with appearance^(6, 7). Discontentment with
93 aspects such as body weight, shape, appearance and skin may contribute
94 toward an individual having BID⁽⁸⁾. Studies have shown patients with negative
95 BI are more likely to suffer with depression, anxiety and feel suicidal and BID
96 can impact negatively upon relationships⁽⁹⁾ and quality of life (QoL)⁽¹⁰⁾.

97 Various tools have been utilised in healthcare to measure BI including the Body
98 Image Ideals Questionnaire, the Body Image Scale and the Cash Body Image
99 Disturbance Questionnaire (BIDQ)⁽¹¹⁾. There are also condition-specific BI tools
100 such as the Body Image Scale (BIS) for IBD⁽¹²⁾.

101 Both condition-specific symptoms and treatments may contribute to BID in IBD
102 patients, particularly during periods of active disease rather than remission.

103 Symptoms can include urgent bowel movements, bloating, excess wind, fatigue,

1
2
3
4 104 skin problems and ulcers. Treatment with steroids can be associated with
5
6 105 weight gain, acne and mood swings⁽¹³⁾. Surgeries may also impact upon BI due
7
8
9 106 to scarring and implementation of a stoma⁽¹⁴⁾ ⁽¹⁵⁾. Those suffering with IBD or
10
11 107 BID are at an increased risk of mental health issues^(16, 17) ; this could be worse
12
13 108 for patients living with both conditions. Furthermore, most IBD patients are
14
15 109 diagnosed at adolescence⁽¹⁸⁾, when BI is important. Body image is currently not
16
17 110 routinely considered in the management of IBD.

18
19
20
21 111 No existing or ongoing systematic reviews on BI in IBD have been identified.
22
23 112 However multiple primary studies, mainly cross-sectional in nature assess BI as
24
25 113 an outcome in IBD patients, with disparate results. A systematic review is
26
27 114 therefore warranted to synthesise and clarify the evidence base.

28
29
30
31 115

32
33
34 116 The following four questions will be addressed:

35
36
37 117

38
39
40 118 **1.** What tools are used to measure body image in IBD patients and what are
41
42 119 their components?

43
44
45 120 **2.** What is the prevalence and severity of body image dissatisfaction in IBD
46
47 121 patients?

48
49
50 122 **3.** What factors are associated with body image dissatisfaction in IBD patients?

51
52
53 123 **4.** Is there an association between body image dissatisfaction in IBD patients
54
55 124 and quality of life?

125 **METHODS**

126 This systematic review has been reported according to the Preferred Reporting
127 Items of Systematic Reviews and Meta-Analysis (PRISMA) guidelines⁽¹⁹⁾. A
128 protocol was previously registered (PROSPERO (CRD42018060999)) and
129 submitted for publication and is currently in process⁽²⁰⁾. A summary of the
130 methods is reported below. Selection, data extraction and quality assessment
131 were carried out by two independent reviewers with disagreements resolved
132 through discussion or third reviewer.

133

134 **Search Strategy**

135 Bibliographic databases (EMBASE, MEDLINE, PsycINFO, Cochrane
136 CENTRAL) were searched to April 2018 using combinations of index and text
137 terms for IBD and BI (see Supplementary table 1 for MEDLINE strategy)
138 Strategies were adapted for each database and run without date or language
139 restrictions. Trial registries (Clinicaltrials.gov, EU Clinical Trial Register) were
140 searched for ongoing trials and reference lists of included studies were
141 checked.

142

143 **Screening and Selection Criteria**

144 Study eligibility was based on the following criteria:

145 Study design: Any primary study reporting quantitative data.

1
2
3
4 146 Population: Patients of any age diagnosed with IBD. At least 50% of population
5
6 147 must have IBD unless results are reported separately for sub-groups of
7
8
9 148 individuals with IBD.

10
11
12 149 Tools: Any tool measuring any aspect of BI (including QoL tools that had at
13
14 150 least one BI related domain or question).

15
16
17 151 Studies were also eligible (for question 2-4) where they reported: any measure
18
19 152 of prevalence/frequency and severity of BID in IBD patients; data on
20
21 153 associations between any factor in IBD patients and BID; or any association
22
23 154 between BI and QoL measures in IBD patients, including associations between
24
25 155 two separate domain measures of the same tool.

26
27
28
29 156 Exclusion criteria: Case reports, qualitative research and conference abstracts
30
31 157 published three years before the date of the searches.

32
33
34
35 158 Reasons for exclusion were recorded.

36
37
38 159

39
40
41 160 **Data Extraction**

42
43
44 161 A piloted data extraction form was used. Examples of the type of data extracted
45
46 162 are shown below:

47
48
49 163 Study characteristics:

50
51
52
53 164 Study design, aim and setting, inclusion/exclusion criteria, recruitment methods,
54
55 165 follow-up period.

56
57
58 166 Participant characteristics:

59
60

1
2
3
4 167 Number of patients, age, gender, type of IBD, disease severity and activity,
5
6 168 BMI, comorbidities, therapy/surgery.
7
8
9

10 169 Data for synthesis/analysis:

11
12 170 BI measurement tool, components of tools/scales, data on BID (e.g. body image
13
14 171 scores, prevalence, thresholds for determining BID), factors associated with BI
15
16 172 dissatisfaction and strength of association, QoL measures, strength of
17
18 173 association between BID and QoL.
19
20
21
22

23 174

24 25 26 175 **Quality Assessment**

27
28
29 176 Quality assessment was based on critical appraisal checklists for both
30
31 177 prevalence and cross-sectional analytical studies from the Joanna Briggs
32
33 178 Institute⁽²¹⁾. Studies solely included for question one were not quality assessed
34
35 179 as the objective of this question was to compile a list of body image tools.
36
37
38

39 180 Important quality items included sample selection, response rate during
40
41 181 enrolment in the study, clear inclusion criteria and measurement of outcomes in
42
43 182 a valid and reliable way.
44
45
46

47 183

48 49 50 184 **Analysis**

51
52
53 185 A narrative synthesis was carried out separately for each question, with key
54
55 186 findings tabulated. Substantial heterogeneity relating to populations, tools and
56
57 187 settings was apparent in the included studies meaning that meta-analysis was
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

188 not appropriate. Consistencies and discrepancies in findings between studies
189 were noted and discussed in the context of any likely sources of heterogeneity.
190 Quality assessment findings were used when considering the strength of
191 evidence for the latter three questions.

192

193

194

195

196

197

198

199

200

201

202

203

204

205

206

Confidential: For Review Only

1
2
3
4 207 **RESULTS**
5
6

7 208 Database searches identified 587 records and 57^(14, 22-77) studies were included,
8
9 209 with some studies eligible for multiple questions (see Figure 1 for selection
10
11 process and reasons for exclusion). All 57 papers reported using BI tools, 31<sup>(14,
12
13 22-26, 30, 31, 33-39, 42, 47, 50, 51, 53, 54, 59, 61, 62, 64-66, 68, 70, 72, 73)</sup> reported prevalence or
14
15 211 mean/median BI scores, 16^(14, 23, 24, 30, 34-36, 47, 54, 59, 61, 62, 64, 66, 68, 72) studies
16
17 212 presented factors associated with BID and 8^(14, 22-24, 34, 62, 66, 72) studies reported
18
19 213 correlations between QoL and body image.
20
21 214
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4 227 **Question 1: What tools are used to measure body image and what are**
5
6 228 **their components?**
7
8

9
10 229 Of the 57 studies measuring BI, 51 were cross-sectional whilst the others varied
11
12 230 (case-control⁽²⁵⁾, prospective cohort^(51, 66), case series⁽³⁹⁾, randomised controlled
13
14 231 trial⁽⁶⁵⁾ and non-randomised intervention study⁽⁴²⁾). Study populations included
15
16 232 adults and children in settings including outpatients, pre/post-surgery, summer
17
18 233 camps and online registries, from countries across the world. Twenty studies
19
20 234 focused on BI as one of the main outcomes but only six of these studies were
21
22
23 235 non-surgery based.

24
25
26 236 Fifteen tools were identified (Table 1). Seven tools were specifically for BI and
27
28 237 eight were QoL tools which included a BI domain or question(s). The most
29
30 238 frequently applied tool specific to BI was the Body Image Questionnaire (BIQ)
31
32 239 which was used in 14 studies. The Body Image Scale (BIS) was used in 5
33
34 240 studies and is the only tool validated in an IBD population. IMPACT-III (or earlier
35
36 241 IMPACT-II) is a validated QoL questionnaire aimed at adolescents and children
37
38 242 with IBD and includes a BI domain. It was used across 18 studies. The
39
40 243 remaining 12 tools were used in only 1-3 studies respectively.

41
42
43
44
45 244 None of the tools included had a clear cut-off point for defining BID but offered
46
47 245 an indication of increasing or decreasing likelihood of dissatisfaction. In some
48
49 246 tools, a higher score indicated better BI (BIQ, EORTC, DUX-25). In others, a
50
51 247 higher score indicated increased BID (IMPACT, BIS, RFIPC, IBDSI, Body
52
53 248 Image Self-Consciousness during Intimacy Scale, BIDQ and ASWAP).
54
55
56
57
58
59
60

249 Tools where items had similar themes were grouped to show general focus of
 250 BI questions and are shown in Table 2.
 251

Table 1. Tools identified and used across included studies

Measurement Tool	Type of Tool	Intended target population	Is tool Validated?	Scoring	No. of Studies Tool Used In
Body Image Tools					
ASWAP	Body image	Initially used in scleroderma patients	Yes but not in IBD patients	15 items rated on 7-point scale. Questions corresponding to items 4–11 were reverse scored such that higher scores reflect greater dissatisfaction	1
Askevold's Body Image Test	Body image	Unclear	Unclear	Unclear	2
Body Image and Self-Consciousness During Intimacy Scale	Body image and sexual self-consciousness	Women	No	0-75, higher scores poorer body image	1
BIA/BIA-P	Body image	Adults, no specific clinical population	Unclear	Based on body image silhouettes ranging in size. Score=difference between current body size and ideal body size.	1
BIQ	Body image	Originally caesarean or appendectomy patients, now IBD	No	5-20, higher score better body image	14

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

		patients			
BIS	Body image	Cancer patients	Yes	0-30, lower score better	5
				body image	
Cash Body Image Disturbance Questionnaire	Body image	Range of clinical groups	Yes but not in IBD patients	7-35, higher score poorer body image	2
Quality of Life Tools with a Body Image Component					
BUX-25	Quality of daily functioning. (1 of 4 domains relate to body image)	School age children	No	Higher scores, better QoL	1
EORTC-QLQ-CR38	Quality of Life questionnaire. (3 of 38 items relate to body image)	Cancer patients	Yes but not in IBD patients	38 items with 4 category responses. Functional scales: higher score higher functioning. Symptoms scales: higher score higher level of symptoms.	1
EORTC-QLQ-CR29	Quality of Life questionnaire. (3 of 29 items relate to body image)	Cancer patients	Yes but not in IBD patients	29 items with 4 category responses. Functional scales: higher score higher functioning. Symptoms scales: higher score higher level of symptoms.	1
IMPACT-III or IMPACT II	Health-related quality of life. (3 of 35 items relate to body image)	Children and adolescents with IBD	Yes	35-175, higher scores better QoL	18
Inflammatory Bowel Disease Stress Index	Assessing the extent to which IBD has caused alterations in lifestyle. (1 of 10 items relate to body image)	IBD patients	Unclear	8 scales with a score of 0-3 (no impact-a great deal of impact).	1

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

	image)				
RFIPC	Quality of life questionnaire. (1 item of 25 relate to body image)	IBD patients	Yes	0-100, higher score poorer QoL	3
Stoma Quality of Life Scale	Stoma-related. (5 items of 19 relate to body image and sexuality).	Stoma patients	Yes (in ostomy patients)	5 scales, 19 questions. Each scored 1-5 (Never-always). Average scores for each scale calculated.	3
The Karolinska Psychodynamic Profile	Assessment of stable modes of mental functioning and character traits (1 subscale and 3 of 18 items relate to body image.)	No specific clinical population	Yes	Each subscale is graded from 1-3 (Most normal-least normal).	2

Abbreviations: ASWAP: Adapted Satisfaction with Appearance scale; BI/BIA-P: Body Image Assessment/Body Image Assessment-Preadolescent; BIQ: Body Image Questionnaire; BIS: Body Image Scale; DUX-25: Dutch Children's AZL/TNO Quality of Life Questionnaire; EORT-QLQ-CR38/EORT-QLQ-CR29: European Organisation for Research and Treatment of Cancer (EORTC) Quality of Life questionnaire for Colorectal Cancer; IMPACT-II/IMPACT-III: A measure of health-related quality of life in paediatric inflammatory bowel disease; RFIPC: Rating Form of IBD Patient Concerns.

252
253
254
255
256
257
258

Table 2. Body image tools with similar questions grouped into overarching themes

Body Image Tool	Components								
	Satisfaction with appearance	Attractiveness	Socialising/Work	Avoidance of people or tasks	Feeling feminine/masculine	Effect of disease on body	Scar satisfaction	Satisfaction with body both naked and dressed	Distressing thoughts
BIS	✓	✓	✓		✓	✓		✓	
BIQ	✓	✓			✓	✓	✓	✓	
CBIDQ	✓	✓	✓	✓					✓
ASWAP	✓	✓	✓	✓				✓	

N.B. Similar components of tools were grouped into themes shown above. **BIS**=Body Image Scale. **BIQ**=Body Image Questionnaire.

1
2
3
4 **CBDIQ=Cash Body Image Disturbance Questionnaire. ASWAP=Adapted Satisfaction with Appearance Scale. Askevold's Body Image Test**
5 **(no information in paper or online), Body Image and Self-consciousness during Intimacy Scale (too specific) and the Body Image**
6 **Assessment (based on figural drawing scales) were not included.**
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46

Confidential: For Review Only

1
2
3
4 **260 What is the prevalence of body image dissatisfaction in IBD patients?**
5

6
7 261 Thirty-one studies including a total of 3,634 patients reported on prevalence or
8
9 262 severity of BID (see Table 3 for study characteristics). Seventeen studies^{(14, 22,}
10
11 263 ^{23, 25, 30, 31, 38, 42, 53, 54, 59, 61, 62, 66, 70, 72, 73)} included both ulcerative colitis (UC) and
12
13 264 Crohn's disease (CD) patients. Ages ranged from 2-71 and eighteen studies^{(22,}
14
15 265 ^{30, 38, 40-42, 51-53, 58, 60-63, 70, 71, 73, 76)} included only children/adolescents. Fourteen
16
17 266 studies^(24-26, 33-37, 39, 47, 50, 64, 65, 68) included surgery patients and one study
18
19 267 included only females⁽⁷²⁾.

20
21
22
23
24 268 Only three studies reported prevalence. Brown (2015)⁽²⁶⁾ found that 21-34% UC
25
26 269 patients reported negative impacts on BI using BIQ. McDermott (2015)⁽¹⁴⁾ found
27
28 270 that 87% patients reported some form of concern about an aspect of their BI
29
30 271 using the Cash Body Image Disturbance Questionnaire. Muller (2010)⁽⁵⁹⁾
31
32 272 reported that 66.8% IBD patients stated they had impaired BI based on a
33
34 273 researcher devised questionnaire. The other 28 studies reported mean/median
35
36 274 BI scores based on a range of tools.

37
38
39
40
41 275 In studies with populations undergoing surgery it was found that there was no
42
43 276 significant difference in BI scores (using the BIQ) after laparoscopic or
44
45 277 open/conventional surgery in IBD patients^(33-35, 64, 78). Only one study found BI
46
47 278 scores to be significantly improved after laparoscopic surgery compared to
48
49 279 conventional surgery in CD⁽³⁶⁾.

50
51
52
53 280 BI was included as an outcome across 31 studies. All but one study compared
54
55 281 results within the included IBD population e.g. UC vs CD, surgery vs no surgery,
56
57 282 males vs females. Bel (2015) found that women with IBD with disease in

1
2
3
4 283 remission scored comparably to women in a healthy population. One
5
6 284 longitudinal study by Saha (2015)⁽⁶⁶⁾ measured scores over two years and
7
8
9 285 found that BI did not change despite improvements in symptoms.
10
11
12 286
13
14
15 287
16
17
18 288
19
20
21 289
22
23
24 290
25
26
27 291
28
29
30 292
31
32
33 293
34
35
36 294
37
38
39 295
40
41
42 296
43
44
45 297
46
47
48 298
49
50
51 299
52
53
54 300
55
56
57 301
58
59
60

Confidential: For Review Only

Table 3. Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
Beld et al (2010)	Cross sectional	UC or FAP undergone restorative proctocolectomy IPAA Jan 92 to Oct 08	Netherlands	26	UC (16) FAP (10)	BIQ	Mean body image scores (SD)	Males 16.3 (3.1) Females 13.5 (4.1)
Brown et al (2015)	Cross sectional	Patients with UC who had colectomy within the past 10 years, data collected from Nov 2010 to July 2011.	Canada, Australia, UK	351	All UC	BIQ	Median body image scores (IQR) Prevalence of “quite a bit” or “extreme” negative impacts on body image as a result of colectomy.	Males 8 (IQR 6-11) Females 11 (IQR 8-14) Age group >50 years 8 (IQR 6-11) Age group <50 years 10 (IQR 7-13). 21-34% reported negative impacts on body image.
Dunker et al (1998)	Cross sectional	CD patients undergoing open or laparoscopic resection at Leiden university medical centre	Netherlands	34	All CD	BIQ	Mean body image scores	Open 16.4 (10-20) Laparoscopic 18 (13-20) (SD not reported)

Table 3. Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
Dunker et al (2001)	Cross sectional matched comparison	UC patients who underwent laparoscopic assisted IPAA and matched conventional IPAA patients.	Netherlands	32	UC (28) FAP (4)	BIQ	Mean body image scores (SD)	Laparoscopic 19 (1.3) Conventional 17.9 (SD not reported)
Eshuis et al (2008)	Repeated cross sectional	Patients who underwent ileocolic resection for Crohn's disease from 1995 until 1998 two centres.	Netherlands	71 <i>(medical file analysis)</i> 61 <i>(returned questionnaires)</i>	All CD	BIQ	Mean body image scores (range)	Open 15.63 (6-20) Laparoscopic 16.3 (7-20) (SD not reported)
Eshuis et al (2010)	Repeated cross sectional	CD patients who had ileocolic resections between September 1999 and November 2003.	Netherlands	55	All CD	BIQ	Median body image scores (IQR)	Open 18.0 (IQR 16-19) Laparoscopic 19.0 (IQR 17-20)

Table 3. Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
Giudici et al (2017)	Case series (Abstract only)	December 2014-December 2015. Consecutive patients undergoing laparoscopic proctectomy for ulcerative colitis.	Italy	10	All UC	Self-designed body image questionnaire	Mean body image score	59 (SD not reported)
Kjaer et al (2014)	Cross sectional	Adult patients treated with laparoscopy-assisted or open IPAA at Odense University Hospital during the period between October 2008 and March 2012.	Denmark	50	UC (44) FAP (4) Other (2)	BIQ	Median body image scores (range)	Laparoscopic 8 (5-18) Open 9.5 (5-20)
Polle et al (2007)	Repeated cross sectional	Patients eligible for an elective proctocolectomy with IPAA for UC or FAP were included in a randomized trial	Netherlands	53	UC (34) FAP (19)	BIQ	Mean body image scores (limited data)	Women open group: 15 Laparoscopic group: 18 (SD not reported)

Table 3. Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
Ponsioen et al (2017)	Randomised controlled trial	Eligible patients aged 18–80 years, had active Crohn's disease of the terminal ileum, and had not responded to at least 3 months of conventional therapy with glucocorticosteroids, thiopurines, or methotrexate. Patients with diseased terminal ileum longer than 40 cm or abdominal abscesses were excluded.	Netherlands and UK	70 patients Infliximab group 73 Laparoscopic ileocaecaelectomy Ileocaecal resection	All CD	BIQ	Mean body image scores (only given for resection group)	Resection group: Baseline 16. Endpoint 17.8. (SD not reported)
Scarpa et al (2009)	Prospective case series	Patients admitted for intestinal surgery for CD May 06 - July 08	Italy	47	All CD	BIQ	Median body image score (IQR)	5 (5-8)
Voermans et al (2010)	Prospective case series	A consecutive series of patients who had an indication for a laparoscopic ileocolic resection were invited to participate. CD patients.	Netherlands	10	All CD	BIQ	Median body image scores	Before surgery 17.0 After surgery 19.0
Bengtsson et al (2011)	Case-control	Patients with preoperative diagnosis of UC or CD who underwent IPAA	Sweden	101 (72 controls, 29 study group)	Controls; UC (60) CD (0) Study group;	BIS	Median body image scores.	Study group: Males 6.5 Females 10. Control group Males

Table 3. Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
				29 study group)	UC (25) CD (4)			1 Females 3
Trindade et al (2017)	Cross sectional	Female participants with ages between 18 and 40 years old who had not undergone IBD-related surgery	Portugal	96	UC (58) CD (38)	BIS	Mean body image score (SD)	10.10 (7.73) (SD not reported)
Vlahou et al (2008)	Cross sectional	Adolescents with IBD who attended clinics at two separate hospitals and a camp for children with IBD	USA	44	Breakdown not reported	BSQ (modified version of BIQ) and BIA-P	Mean body image scores (SD)	BSQ: Males 36.45 (4.88) Females 33.52 (7.77). BIA-P: Males 0.41 (0.85) Females 0.77 (0.92)
Grootenhuis (2009)	Non-randomised controlled	Adolescents with IBD who were under medical care at Emma Children's Hospital AMC and members of Crohn's and colitis association Netherlands	Netherla nds	18 controls; 22 interventi	Controls CD (11) UC (4) IBDU (3). Intervention	DUX-25	Mean body image domain scores (SD)	Intervention: baseline 55.4 (18.6) post intervention 68.9 (17.7) Control:

Table 3. Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
	study			on	CD (17) UC (5) IBDU (0)			baseline 60.0 (17.4) post intervention 59.0 (20.1)
Bel et al (2015)	Cross sectional with controls	18-70 UC or CD	Netherlands	287 (197 healthy controls)	UC (132) CD (155)	EORTC-QLQ-CR38	Mean body image domain scores (SD)	Active: Males 5.61 (2.31) Females 6.2 (2.78). Remission: Males 3.82 (1.33) Females 4.58 (1.68)
Shepanksi (2009)	Before and after study	Children attending Camp Guts and Glory in Pennsylvania	USA	61	CD:UC (2:1)	IMPACT II	Mean body image domain scores (SD, for before and after camp)	By age; Age 9-10: pre 14.6 (4.1). Post 16.4 (3.7). Age 11-12: Pre 11.4 (4.9). Post 13.2 (5.0). Age 13-14: Pre 12.9 (5.2). Post 13.8 (5.9). Age 15-16: Pre 12.3

Table 3. Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
								(5.0). Post 11.2 (5.4)
Abdovic et al (2013)	Cross sectional validation study	Children aged nine years or older with confirmed diagnosis of IBD for more than six months from inpatient and outpatient clinics at particular centres.	Croatia	104	UC (30) CD (74)	IMPACT III	Mean body image domain score (SD).	12.03 (1.96)
Chouliaras et al (2017)	Cross sectional	UC and CD patients hospitalized or followed in outpatient clinic in Athens	Greece	99	UC (37) CD (62)	IMPACT III	Mean body image domain scores (SD)	Overall 71.5 (17.9) UC 67.3 (22.4) CD 72.6 (19.3) No significant relationship between body image and assessed disease characteristics or

Table 3. Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
								prescribed medications.
Gallo et al (2014)	Cross sectional	Children between the ages of 8 and 18 years, who had been diagnosed with IBD at least 6 months before, and were being followed at the Pediatric Gastroenterology Service of the Hospital Italiano de Buenos Aires, Argentina, or at the private office of one of the co-authors (M.O.) and one of their parents.	Argentina	27	UC (17) CD (9)	IMPACT III	Mean body image domain score (SD)	76.54 (16.06)
Lee et al (2015)	Prospective observational study	Children and young adults less than 22 years of age started on EN or anti-TNF therapy for active CD at Hospital for Sick Children Toronto and Children's Hospital Philadelphia.	Canada and USA	90	All CD	IMPACT III	Median body image domain scores (range)	Baseline PEN 71 (54-75) EEN 58 (58-75) TNf 67 (50-83)

Table 3. Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
Mason et al (2015)	Prospective observational study	Adolescents >10 years old with confirmed diagnosis of IBD attending gastroenterology clinic at Royal Hospital for Sick Children, Glasgow	Scotland	63	UC/IBDU (18) CD (45)	IMPACT III	Mean body image domain score	7 (SD not reported)
Ogden et al (2011)	Cross sectional validation study	Unclear - children with IBD	UK	97	UC (12) CD (64) IBDU (21)	IMPACT III	Mean body image domain score	63.5 (95% CI 56.5 - 70.6) (SD not reported)
Perrin et al (2008)	Cross sectional	Children aged 8-17 years diagnosed with UC or CD 6 mnths before the study followed at 1 of 6 paediatric gastroenterology centres. No other chronic conditions.	USA	220	UC (59) CD (161)	IMPACT III	Mean body image domain scores (SD)	68.1 (19.6) UC 68.6 (20.8) CD 67.9 (19.2)

Table 3. Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
McDermot et al (2015)	Cross sectional	Patients with histologically confirmed IBD attending ambulatory clinics in 1 of 2 medical centres between July 2011 and November 2012	Ireland	330	UC (145) CD (194)	Modified BIS and Cash Body Image Scale (qualitative only)	Median body image score (range) Prevalence	6 (0-27) 13% patients reported no concerns about any aspect of body image
Saha et al (2015)	Prospective observational study	Patients with UC, CD or IBDU aged 18 and above enrolled in the Ocean State Crohn's and Colitis Area Registry (OSCCAR) with a minimum of 2 years of follow-up	USA	274	CD (145) UC/IBDU (129)	ASWAP	Mean body image scores (SD)	Baseline: Females 30.1 (14.4) Males 21.2 (8.4) Year 1: Females 28.2 (14.1) Males 24.5 (12.5) Year 2: Females 28.8 (13.2) Males 24.1 (13.5)

Table 3. Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
Muller et al (2010)	Cross sectional	IBD patients aged 18-50 from a database of IBD patients maintained by the Southern Adelaide IBD Service	Australia	217	UC (85) CD (127) IBDU (5)	No specific tool – range of questions regarding body image and impact of IBD on this	Prevalence (%) of body image dissatisfaction	66.8% of patients reported impaired body image
de Rooy et al (2001)	Cross sectional	Outpatients of the Inflammatory Bowel Disease Center, Mount Sinai Hospital. Subjects were a convenience sample waiting for a regularly scheduled physician appointment.	USA	241	UC (121) CD (120)	RFIPC	“Feelings about body” question mean score (SD)	42.84 (33.97)
Maunder et al (1999)	Retrospective analysis	Patients with IBD who had completed the RFIPC and a survey of demographic and disease-related variables in one of three previous studies	Unclear	343	UC (186) CD (157)	RFIPC	“Feelings about body” question mean scores	Female 52.13 (34.8) Male 38.16 (33.83)
Kuruvilla et al	Cross-sectional	Consecutive patients who had undergone IPAA or a permanent ileostomy for ulcerative colitis by a	USA	59	All UC. IPAA (35); TPC (24).	Stoma Quality of Life Scale	Mean (SD) and median (range) body	IPAA; Mean 93.1 (9.7). Median 100.

Table 3. Study characteristics of papers included for questions two, three and four.

Study	Design	Population	Country	No. patients	No. UC/CD/Other	Body Image Tool	Outcomes	Body Image Prevalence/Score
(2012)	(Abstract only)	single surgeon, presenting for their annual follow-up visit from July through September 2011, were offered participation in the study. A randomly chosen group of subjects who did not have scheduled appointments during the study period were sent a letter inviting them to participate in the study.					image/sexuality domain scores.	(65-100). TPC: Mean 76.4 (14.6) Median 80 (50-100).
<p>Abbreviations: UC: Ulcerative Colitis; CD: Crohn's disease; IBD: Inflammatory bowel disease; IBDU: Inflammatory bowel disease unclassified; FAP: Familial adenomatous polyposis; IPAA: ileal pouch-anal anastomosis; TPC: Total proctocolectomy; PEN: Partial Enteral Nutrition; EEN: Exclusive Enteral Nutrition; TNF; Tumour Necrosis Factor; TNF: Tumour necrosis factor; IQR: Interquartile range; SD; Standard deviation; ASWAP: Adapted Satisfaction with Appearance scale; BI/BIA-P: Body Image Assessment/Body Image Assessment-Preadolescent; BIQ: Body Image Questionnaire; BIS: Body Image Scale; DUX-25: Dutch Children's AZL/TNO Quality of Life Questionnaire; EORT-QLQ-CR38/EORT-QLQ-CR29: European Organisation for Research and Treatment of Cancer (EORTC) Quality of Life questionnaire for Colorectal Cancer; IMPACT-II/IMPACT-III: A measure of health-related quality of life in paediatric inflammatory bowel disease; RFIPC: Rating Form of IBD Patient Concerns; BSQ: Body Satisfaction Questionnaire.</p>								

302

303

304

1
2
3
4 305 **What factors are associated with body image dissatisfaction in IBD**
5
6 306 **patients?**
7
8

9 307 Sixteen studies^(14, 23, 24, 30, 34-36, 47, 54, 59, 61, 62, 64, 66, 68, 72) totalling 2333 IBD patients
11 308 reported the association between various factors and BID (see Table 4).
12
13 309 Factors included those related to demographics as well as disease and
14
15 310 treatment-related characteristics. Ten studies^(14, 24, 34-36, 47, 64, 66, 68, 72) utilised a
16
17 311 specific BI tool and six^(34-36, 47, 64, 68) focused on comparative surgery techniques.
18
19 312 Three studies^(30, 61, 62) included a paediatric population; the remaining studies
20
21 313 included adults. BI was one of the main outcomes in most of these studies and
22
23 314 the study by Saha (2015)⁽⁶⁶⁾ was the first longitudinal follow up of BID in IBD
24
25 315 according to the authors.

26
27
28
29
30
31 316 In 6/10 studies^(14, 23, 54, 59, 64, 66) female gender was found to be significantly
32
33 317 associated with increased BID. One study⁽⁵⁹⁾ reported the odds of BID was over
34
35 318 3 times more in females than males ($p=0.001$), with strong associations
36
37 319 reported in the other five studies. Increased disease activity was found to have
38
39 320 a significant but moderate positive association in 7/9 studies^(14, 23, 34, 62, 66, 68, 72)

40
41
42
43 321 Other factors found to be significantly associated with increased BID included
44
45 322 steroid use^(14, 61, 66, 72), age^(14, 23), increased BMI^(14, 72), smoking⁽¹⁴⁾ and
46
47 323 fatigue⁽²³⁾(Table 4). Saha (2015)⁽⁶⁶⁾ also found a significant association between
48
49 324 extraintestinal manifestations (EIM) and increased BID, but were the only study
50
51 325 to assess this. Laparoscopic surgery was found to be associated with improved
52
53 326 body image in 2/6 studies^(36, 68). Ileal pouch-anal anastomosis (IPAA) seemed to
54
55 327 result in patients being satisfied with their body image in two studies^(24, 26) but
56
57
58
59
60

1
2
3
4 328 they lacked a comparative surgery group. One study⁽⁵⁰⁾ compared IPAA and
5
6 329 ileostomy and found better body image scores in the IPAA group. No significant
7
8
9 330 associations were found between disease sub-type and increased BID.

11
12 331 **Is there an association between body image dissatisfaction and quality of**
13
14 332 **life in IBD patients?**

15
16
17 333 Eight studies^(14, 22-24, 34, 62, 66, 72) explored a potential association between BID
18
19 334 and QoL across a total of 1371 patients, with seven presenting a significant
20
21 335 association. Three studies^(22, 24, 62) (Table 4) focused on younger populations
22
23 336 with the rest including adults only. The majority of studies included populations
24
25 337 with both UC and CD whilst two^(24, 34) included only one subtype.

26
27
28
29 338 Statistically significant weak to moderately strong correlations were present in
30
31 339 five studies^(22, 23, 34, 62, 72) ranging from $r = 0.34$ to $r = 0.67$. Furthermore,
32
33 340 McDermott(2015)⁽¹⁴⁾ found that when using the BI scale there was a significant
34
35 341 difference in scores between those with good or poor QoL. Trindade(2017)⁽⁷²⁾
36
37 342 found that BI was positively correlated with psychological and physical QoL.
38
39 343 Saha(2015)⁽⁶⁶⁾ found that a one unit increase in the total ASWAP score
40
41 344 (indicating poorer body image) was associated with a 0.62 decrease in QoL
42
43 345 score ($p < 0.0001$).

44
45
46
47
48
49 346 Various QoL tools (See Table 1) were used across studies with some using
50
51 347 more than one. Four of these questionnaires used (IMPACT II and III, GIQLI
52
53 348 and WHOQOL-BREF) contain a question or domain on BI, potentially making
54
55 349 them more likely to correlate with BI questionnaires.

56
57
58 350

1
2
3
4 351
5
6
7 352
8
9 353
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Confidential: For Review Only

Table 4. Most common factors found to be significantly associated with impaired body image in IBD as reported in each study, including associations between reduced body image and reduced QoL.

	Abdovic	Bel 2015	Beld 2010	Chouliaras 2017	Dunker 1998	Eshuis 2008	Eshuis 2010	Kjaer 2014	Maurder 1999	McDermott 2015	Muller 2010	Ogden	Perrin	Polle 2007	Saha 2015	Scarpa 2009	Trindade 2017
Female gender	r= -0.18*	Difference in means p=0.08	Difference in means p>0.10	Difference in scores p=0.18	No significant association			Female	Significantly worse scores in open surgery group p=0.004*	p<0.001*	Difference in proportions p=0.007			Significantly worse scores in open surgery group p=0.004*	p<0.0001*		

Factor	Study																
	Abdovic	Bel 2015	Beld 2010	Chouliaras 2017	Dunker 1998	Eshuis 2008	Eshuis 2010	Kjaer 2014	Mauder 1999	McDermott 2015	Muller 2010	Ogden 2000	Perrin 2000	Polle 2007	Sana 2015	Scarpa 2009	Trindade 2017
Higher disease/symptom activity		r=0.38*		No significant association	r=0.5*				p<0.001*			p=0.50	p=0.003*		In UC p=0.006*	Multiple regression β=0.426 p=0.006*	Active disease r=0.18 Symptoms r=0.40*
Fatigue		r=0.55*															

Factor	Study																				
	Abdovic	Bel 2015	Beld 2010	Chouliaras 2017	1998	Dunker	2008	Eshuis 2010	Eshuis	Kjaer 2014	Maurer 1999	McDermott 2015	Muller 2010	Ogden	Perrin	Polle 2007	Sana 2015	2009	Scarpa	2017	Trindade
Disease Subtype				No significant association							p=0.63	Difference in proportions p=0.094		p=0.05		No association found					
Age		r = -0.18*			No significant association						Younger age p<0.001*										r = -0.06
Steroids				No significant association		No significant association					p=0.03*			p=0.05*			p=0.02*				r=0.22*

Factor	Study																	
	Abdovic	Bel 2015	Beld 2010	Chouliaras 2017	1998	Dunker 2008	Eshuis 2010	Eshuis	Kjaer 2014	Maurer 1999	McDermott 2015	Muller 2010	Ogden	Perrin	Polle 2007	Sana 2015	Scarpa 2009	Trindade 2017
Impaired QoL	r=0.52*	r=0.67*	r<0.41		r=0.5*					p<0.001*				r=0.51*		One unit increase in ASWAP score associated with a 0.62 decrease in IBDQ (p<0.001)*		Psychological QoL r=0.56*
*Significant association found.																		

Factor	Study
Abdovic	Trindade 2017
Bel 2015	Scarpa 2009
Beld 2010	Sana 2015
Chouliaras 2017	Polle 2007
1998	Perrin 2010
Dunker	2010
2008	Muller
Eshuis 2010	Ogden
Eshuis 2010	McDermott 2010
Kjaer 2014	2015
	Maunder 1999

N.B: With some tools, higher scores indicate better body image/QoL and in others higher scores indicate worse body image/QoL. This may result in both positive and negative correlation coefficients. Where applicable, signs have been flipped for ease of interpretation to clearly show the positive correlation between body image and quality of life.

Pre-proof
Manuscript: For Review Only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46

356 Risk of Bias

357 The 31 studies relevant for questions 2-4 were assessed using criteria from the
358 Joanna Briggs Institute critical appraisal tools for analytical cross-sectional and
359 prevalence designs (Supplementary Table 2). Only cross-sectional data was
360 relevant for the review. Poor reporting of quality criteria in many studies made
361 quality assessment difficult. Where criteria were reported, the overall quality
362 was variable. Most studies had some areas of low and higher quality. Only one
363 study, McDermott (2015)⁽¹⁴⁾, was able to demonstrate adequate response rates,
364 validated outcome measurement tools and adjustment for confounders.
365 However, Chouliaras (2017)⁽³⁰⁾, Trindade (2017)⁽⁷²⁾, Lee (2015)⁽⁵¹⁾ and Bel
366 (2015)⁽²³⁾ adjusted for confounders and used validated outcome measurement
367 tools but lacked adequate response rates.

368 Twenty studies (64.5%) used an appropriate sample frame with acquisition of
369 patients from outpatient settings, IBD registries or healthcare records. Eighteen
370 studies (58.1%) clearly reported inclusion criteria applied when recruiting
371 participants. Only twelve studies (38.7%) had response rates >75%. Fifteen
372 studies (48.4%) used a tool which had been validated using factor analysis and
373 internal consistency analysis to measure BI. The others used non-validated
374 tools. Twelve studies^(14, 35, 50, 51, 59, 65, 66, 73) adjusted for potential confounders
375 such as age, gender, BMI and previous surgery often using multiple regression
376 models. Several studies reported limited demographic data. It should also be
377 noted that sample sizes of many of the studies were small and confidence
378 intervals were mostly not presented.

379 DISCUSSION

380

381 Summary of Findings

382 Overall, fifteen different tools were used across 57 studies to measure BI in IBD
383 patients. These included QoL tools incorporating BI questions or domains, BI
384 tools and other adapted questionnaires. None offer a defining threshold for
385 presence or absence of BID, which is not commonly considered as a specific
386 psychological disorder unlike body dysmorphia.

387 It remains unclear whether IBD patients suffer with BID more so than the
388 general population as most studies reported mean values with no reference to
389 healthy population values. Three studies estimated a prevalence of a negative
390 BI based on one question and this varied between 21 and 81%. This wide
391 variation likely reflects the differences in tools and study characteristics. All
392 three studies were based on self-report questionnaires with a wide age range
393 and registry or hospital-based population.

394 Certain factors including female gender, disease activity and steroid use were
395 consistently found to be significantly associated with increased BID in IBD
396 patients. There was also a significant association between increasing BID and
397 decreasing QoL reported in eight studies. These findings are consistent with a
398 previous narrative review⁽⁷⁹⁾ assessing BID and sexual functioning in IBD
399 patients.

400

401 **Strengths and Weaknesses of the Review**

402 This is the first systematic review assessing BID in an IBD population, and a
403 robust methodology was employed to ensure that bias and errors were
404 minimised. A sensitive search strategy means that it is unlikely that relevant
405 studies were missed and over 50 studies have contributed to the evidence base
406 in an area previously unexplored by a systematic review.

407 The review has some limitations. Some of the extracted data is based on
408 abstracts only where full texts could not be obtained from the authors. This will
409 have resulted in some missing information.

410 Furthermore, qualitative studies were not included as this was considered
411 beyond the scope of this review. It's likely that there are qualitative studies
412 which could offer a deeper insight into perception of BI in IBD patients.

413

414 **Strengths and Weaknesses of the Evidence**

415 There are some weaknesses within the included evidence. All studies had some
416 areas of high risk of bias or had poorly reported methodological criteria thus
417 hampering quality assessment. Some studies had very low response rates
418 leading to possible under-representation of certain groups. Few studies
419 adjusted for confounders which could have resulted in overestimates of
420 associations.

421 A further issue is the lack of healthy control groups. Although it appears that
422 IBD patients are concerned about BI, it is difficult to determine whether they are

1
2
3
4 423 affected more than the general population. However, it has been found that
5
6 424 children and adolescents with chronic illnesses such as asthma, cystic fibrosis
7
8
9 425 and diabetes do have increased BID compared to healthy peers⁽⁸⁰⁾.

10
11
12 426 Non-validated tools were often used for measuring BI and the reliability and
13
14 427 validity of findings based on these is therefore unknown. There is also still little
15
16 428 known about potential changes in BI perception over time.

17
18
19
20 429

21 22 23 430 **Findings in Context**

24
25
26 431 This review is consistent with findings from the narrative review by Jedel
27
28 432 (2015)⁽⁷⁹⁾ which found that BI could potentially be a problem in IBD patients.

29
30 433 Whilst surgery has been found to be an important contributing factor in BID in
31
32
33 434 other research ⁽⁸¹⁾, it is unclear how it impacts upon IBD patients. An association
34
35 435 between BID and poorer QoL has been highlighted in both.

36
37
38 436 Females and adolescents are more likely to be concerned with BI and to suffer
39
40 437 with BID compared with males and older people⁽⁸²⁻⁸⁷⁾. Whilst we found
41
42
43 438 inconsistent results surrounding age, IBD is often diagnosed in adolescence
44
45 439 when BID could be more of a concern.

46
47
48 440 In oncology, BI is more widely researched. One study suggested gynaecologic
49
50 441 cancer patients suffered with BID which predicted emotional well-being⁽⁸⁸⁾.

51
52
53 442 Another study with advanced cancer patients suggested BID was associated
54
55 443 with depression, anxiety and fatigue⁽⁸⁹⁾. Qualitative research in pregnancy⁽⁹⁰⁾
56
57 444 and systematic lupus⁽⁹¹⁾ suggests BI can affect medication compliance and that

1
2
3
4 445 patients would like more support around dealing with BI issues. This could also
5
6 446 be true for IBD patients.
7
8
9

10 447 Finally, a previous systematic review found that children with chronic conditions
11
12 448 were more likely to be dissatisfied with their body than healthy peers⁽⁹²⁾.
13

14 449 Although IBD patients were not included, patients with similar chronic diseases
15
16 450 like diabetes, cancer, asthma and scoliosis were, suggesting IBD patients could
17
18
19 451 be similarly affected.
20
21

22 452

23 24 25 453 **Implications**

26
27
28 454 This evidence identified in this review suggests an association between BID and
29
30 455 poorer QoL as well as finding factors influencing BI in IBD patients. There were
31
32 456 however limitations to the evidence in terms of methodological quality and/or
33
34 457 reporting. Also, results were difficult to compare across studies. More
35
36
37 458 promisingly, BI is becoming an increasingly assessed outcome, highlighting the
38
39 459 need for continued research in this area.
40
41

42
43 460 Current research suggests that age, gender, medication and disease activity in
44
45 461 IBD may impact upon BI. These could be taken into account by clinicians and
46
47 462 patients by altering therapy or targeting comorbidities which could have a
48
49 463 beneficial effect on BID. Interventions to improve BI could be incorporated into
50
51 464 treatment strategies, which may in turn help to improve QoL. A recent
52
53 465 systematic review⁽⁹³⁾ found that stress-management, mindfulness and talking
54
55 466 therapies may offer small to moderate improvements in BI however there is a
56
57
58 467 lack of evidence from good randomised controlled trials.
59
60

468 **Future Research**

469 Future research should focus on developing a consensus around which
470 validated tool or tools are best suited to measuring BID in an IBD population.
471 Whilst we describe validity of tools such as the Body Image Scale, we have not
472 independently verified this, therefore we could not recommend a particular tool.
473 Defining thresholds may allow estimation of the prevalence of BID in this
474 population. Establishing reference values in a healthy population would allow for
475 more meaningful interpretation of BID scores across different chronic diseases.
476 Enrolling patients from diagnosis and following them over time would be useful
477 to measure how BI changes with duration, activity of disease and treatment.
478 Whilst more severe IBD symptoms or invasive treatment options may
479 exacerbate BID, BID itself and any associated anxiety or depressive symptoms
480 may in turn exacerbate IBD symptoms^(94, 95), and future research should also
481 address this association. If BID is recognised and treated early it may contribute
482 to preventing worsening disease course. It may also be useful to encourage the
483 use of BI as a patient reported outcome in future IBD studies. This would
484 increase data on BID and lead to a greater understanding of the condition.

485

486 **CONCLUSION**

487 In conclusion, the evidence suggests a detrimental effect of IBD on BI, but
488 uncertainty remains due a lack of comparison data from healthy populations.
489 Associations of BID with disease-related factors such as steroid treatment,
490 fatigue, disease activity and surgery are apparent and findings suggest a

1
2
3
4 491 correlation between impaired BI and poorer QoL. These results should be
5
6 492 cautiously interpreted due to risk of bias and/or poor reporting of methodological
7
8 493 criteria amongst included studies, and the wide variation between populations,
9
10 494 BI tools, and scoring systems. Future studies should make use of validated
11
12 495 measurement tools and include BI as a main outcome where appropriate.
13
14
15
16
17 496

19 497 **Specific Author Contributions**

21
22
23 498 SB identified the topic, undertook scoping, defined the question, developed the
24
25 499 protocol and wrote the draft of the manuscript. IH contributed to the methods
26
27 500 development and carried out second reviewer tasks as well as helping to draft,
28
29 501 comment on and approve the final version of this paper. DM provided
30
31 502 substantial methodological input to aid protocol development and assisted with
32
33 503 drafting and reading, commenting on approving the final version. JD provided
34
35 504 methodological input and read, commented on and edited the draft and
36
37 505 approved the final version.
38
39
40
41

42 506 **Financial Support**

43
44
45 507 During this research Isobel Harris was funded by a National Institute for Health
46
47 508 Research (NIHR) Research Methods - Systematic Review Fellowship and Sophie Beese
48
49 509 was a locally funded trainee in systematic reviews at the University of Birmingham
50
51 510 with agreement from the NIHR. This article presents independent research funded by
52
53 511 the NIHR. The views expressed are those of the authors and not necessarily those of
54
55 512 the NHS, the NIHR or the Department of Health.
56
57
58
59
60

1
2
3
4 513
5
6
7

8 514 **Acknowledgements**
9

10 515 Not applicable.
11
12

13
14 516 **Conflicts of Interest**
15

16
17 517 The authors have nothing to disclose.
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

518 **REFERENCES**

519

- 520 1. Centers for Disease Control and Prevention. What is inflammatory bowel disease
521 (IBD)? 2014 [cited 2017 30/01/2017]. Available from: [https://www.cdc.gov/ibd/what-is-
522 ibd.htm](https://www.cdc.gov/ibd/what-is-ibd.htm).
- 523 2. Crohn's and Colitis UK. About Inflammatory Bowel Disease [cited 2017 18/02/2017].
524 Available from: <https://www.crohnsandcolitis.org.uk/about-inflammatory-bowel-disease>.
- 525 3. Kaplan GG. The global burden of IBD: from 2015 to 2025. *Nature Reviews
526 Gastroenterology & Hepatology*. 2015;12:720-7.
- 527 4. National Eating Disorders Association. What is body image? [cited 2017 17/02/2017].
528 Available from: <https://www.nationaleatingdisorders.org/what-body-image>.
- 529 5. Griffiths S, Hay P, Mitchison D, Mond JM, McLean SA, Rodgers B, et al. Sex differences
530 in the relationships between body dissatisfaction, quality of life and psychological distress.
531 *Aust N Z J Public Health*. 2016;40:518-22.
- 532 6. Brown Z, Tiggemann M. Attractive celebrity and peer images on Instagram: Effect on
533 women's mood and body image. *Body image*. 2016;19:37-43.
- 534 7. Cohen R, Blaszczynski A. Comparative effects of Facebook and conventional media on
535 body image dissatisfaction. *Journal of eating disorders*. 2015;3:23.
- 536 8. Holland G, Tiggemann M. A systematic review of the impact of the use of social
537 networking sites on body image and disordered eating outcomes. *Body image*. 2016;17:100-
538 10.
- 539 9. Dyl J, Kittler J, Phillips KA, Hunt JI. Body Dysmorphic Disorder and Other Clinically
540 Significant Body Image Concerns in Adolescent Psychiatric Inpatients: Prevalence and Clinical
541 Characteristics. *Child Psychiatry and Human Development*. 2006;36:369-82.
- 542 10. Kim JS, Kang S. A Study on Body Image, Sexual Quality of Life, Depression, and Quality
543 of Life in Middle-aged Adults. *Asian Nurs Res (Korean Soc Nurs Sci)*. 2015;9:96-103.
- 544 11. Thomas F. Cash. Body Image Assessments [cited 2017 17/02/2017]. Available from:
545 <http://www.body-images.com/assessments/>.
- 546 12. McDermott E, Moloney J, Rafter N, Keegan D, Byrne K, Doherty GA, et al. The body
547 image scale: a simple and valid tool for assessing body image dissatisfaction in inflammatory
548 bowel disease. *Inflamm Bowel Dis*. 2014;20:286-90.
- 549 13. NHS Choices. Corticosteroids - Side effects 2015 [updated 12/03/2015; cited 2017
550 19/02/2017]. Available from: [http://www.nhs.uk/Conditions/Corticosteroid-
551 \(drugs\)/Pages/Sideeffects.aspx](http://www.nhs.uk/Conditions/Corticosteroid-(drugs)/Pages/Sideeffects.aspx).
- 552 14. McDermott E, Mullen G, Moloney J, Keegan D, Byrne K, Doherty GA, et al. Body image
553 dissatisfaction: Clinical features, and psychosocial disability in inflammatory bowel disease.
554 *Inflamm Bowel Dis*. 2015;21:353-60.
- 555 15. Zaghayan K, Ghantiwala V, Le Q, Murrell Z, Fleshner P. Is body image and cosmesis
556 better after double-port laparoscopic or open ileal pouch-anal anastomosis (IPAA)?
557 2011;54:e119.
- 558 16. Michaela MB, Dianne N-S. Body dissatisfaction: an overlooked public health concern.
559 *Journal of Public Mental Health*. 2014;13:64-9.
- 560 17. Bernstein CN, Hitchon CA, Walld R, Bolton JM, Sareen J, Walker JR, et al. Increased
561 Burden of Psychiatric Disorders in Inflammatory Bowel Disease. *Inflamm Bowel Dis*. 2018.

18. NHS Choices. Inflammatory Bowel Disease 2015 [updated 20/03/2015; cited 2017 17/02/2017]. Available from: <http://www.nhs.uk/conditions/Inflammatory-bowel-disease/Pages/Introduction.aspx>.
19. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med*. 2009;6.
20. Beese S, Harris I, Dretzke J, Moore D. Body Image Dissatisfaction in Patients with Inflammatory Bowel Disease: A Systematic Review Protocol *BMC Systematic Reviews*. 2018.
21. The Joanna Briggs Institute. Joanna Briggs Institute Reviewers' Manual: 2016 edition. . 2016.
22. Abdovic S, Mocic Pavic A, Milosevic M, Persic M, Senecic-Cala I, Kolacek S. The IMPACT-III (HR) Questionnaire: A valid measure of health-related quality of life in Croatian children with inflammatory bowel disease. *Journal of Crohn's and Colitis*. 2013;7:908-15.
23. Bel LGJ, Vollebregt AM, Van der Meulen-de Jong AE, Fidder HH, Ten Hove WR, Vliet-Vlieland CW, et al. Sexual Dysfunctions in Men and Women with Inflammatory Bowel Disease: The Influence of IBD-Related Clinical Factors and Depression on Sexual Function. *J Sex Med*. 2015;12:1557-67.
24. Beld M, Van Balkom K, Visschers R, Van Gemert W, Breukink S. Long term results after restorative proctocolectomy with ileal pouch-anal anastomosis at young age. *Colorectal Dis*. 2010;12:16.
25. Bengtsson J, Lindholm E, Nordgren S, Berndtsson I, Oresland T, Borjesson L. Sexual function after failed ileal pouch-anal anastomosis. *Journal of Crohn's and Colitis*. 2011;5:407-14.
26. Brown C, Gibson PR, Hart A, Kaplan GG, Kachroo S, Ding Q, et al. Long-term outcomes of colectomy surgery among patients with ulcerative colitis. *Springerplus*. 2015;4:573.
27. Cabras PL, Giardinelli L, la Malfa GP, Galassi F. Variations in body image during autogenic training in patients with psychosomatic gastrointestinal disorders. *Giunti Organizzazioni Speciali*. 1986;178:27-33.
28. Camilleri-Brennan J, Munro A, Steele RJ. Does an ileoanal pouch offer a better quality of life than a permanent ileostomy for patients with ulcerative colitis? *J Gastrointest Surg*. 2003;7:814-9.
29. Carlsen K, Jakobsen C, Hansen LF, Paerregaard A, Kallemose T, Riis LB, et al. Quality of life in paediatric inflammatory bowel disease patients in a self-administered telemedicine randomised clinical study. *Journal of Crohn's and Colitis*. 2016;10:S421-S2.
30. Chouliaras G, Margoni D, Dimakou K, Fessatou S, Panayiotou I, Roma-Giannikou E. Disease impact on the quality of life of children with inflammatory bowel disease. *World J Gastroenterol*. 2017;23:1067-75.
31. de Rooy EC, Toner BB, Maunder RG, Greenberg GR, Baron D, Steinhart AH, et al. Concerns of patients with inflammatory bowel disease: results from a clinical population. *Am J Gastroenterol*. 2001;96:1816-21.
32. Drossman DA, Patrick DL, Mitchell CM, Zagami EA, Appelbaum MI. Health-related quality of life in inflammatory bowel disease. Functional status and patient worries and concerns. *Dig Dis Sci*. 1989;34:1379-86.
33. Dunker MS, Bemelman WA, Slors JF, van Duijvendijk P, Gouma DJ. Functional outcome, quality of life, body image, and cosmesis in patients after laparoscopic-assisted and conventional restorative proctocolectomy: a comparative study. *Dis Colon Rectum*. 2001;44:1800-7.
34. Dunker MS, Stiggelbout AM, van Hogezaand RA, Ringers J, Griffioen G, Bemelman WA. Cosmesis and body image after laparoscopic-assisted and open ileocolic resection for Crohn's disease. *Surg Endosc*. 1998;12:1334-40.

- 1
2
3
4 611 35. Eshuis EJ, Polle SW, Slors JF, Hommes DW, Sprangers MA, Gouma DJ, et al. Long-term
5 612 surgical recurrence, morbidity, quality of life, and body image of laparoscopic-assisted vs. open
6 613 ileocolic resection for Crohn's disease: a comparative study. *Dis Colon Rectum*. 2008;51:858-
7 614 67.
- 8 615 36. Eshuis EJ, Slors JFM, Stokkers PCF, Sprangers MAG, Ubbink DT, Cuesta MA, et al. Long-
9 616 term outcomes following laparoscopically assisted versus open ileocolic resection for Crohn's
10 617 disease. *Br J Surg*. 2010;97:563-8.
- 11 618 37. Eshuis EJ, Voermans RP, Stokkers PCF, Van Berge Henegouwen MI, Fockens P,
12 619 Bemelman WA. Laparoscopic resection with transcolonic specimen extraction for ileocaecal
13 620 Crohn's disease. *Br J Surg*. 2010;97:569-74.
- 14 621 38. Gallo J, Grant A, Otley AR, Orsi M, Macintyre B, Gauvry S, et al. Do parents and children
15 622 agree? Quality-of-life assessment of children with inflammatory bowel disease and their
16 623 parents. *J Pediatr Gastroenterol Nutr*. 2014;58:481-5.
- 17 624 39. Giudici F, Scaringi S, Di Martino C, Ficari F, Bechi P. Rationalisation of the surgical
18 625 technique for minimally invasive laparoscopic ileal pouch-anal anastomosis after previous total
19 626 colectomy for ulcerative colitis. *J Minim Access Surg*. 2017;13:188-91.
- 20 627 40. Grant A, Kappelman M, Martin C, Otley A. A new domain structure for the impact-III, a
21 628 pediatric inflammatory bowel disease (IBD) health reported quality of life (HRQOL) tool.
22 629 *Inflamm Bowel Dis*. 2016;22:S7-S8.
- 23 630 41. Grant A, Otley A, Escher J, Hyams JS, Maa JF, Alperovich G, et al. Assessment of
24 631 IMPACT III emotional and social functioning domain scores in adalimumab-treated paediatric
25 632 patients with Crohn's disease. *Journal of Crohn's and Colitis*. 2016;10:S424-S5.
- 26 633 42. Grootenhuis MA, Maurice-Stam H, Derkx BH, Last BF. Evaluation of a
27 634 psychoeducational intervention for adolescents with inflammatory bowel disease. *Eur J*
28 635 *Gastroenterol Hepatol*. 2009;21:340-5.
- 29 636 43. Gudlaugsdottir K, Valsdottir EB, Stefansson TB. [Quality of Life after colectomy due to
30 637 ulcerative colitis]. *Laeknabladid*. 2016;102:482-9.
- 31 638 44. Hagan M, Jambaulikar G, Osche-Gauvin K, Schwartz D, Higginbotham T, Cross R. Sexual
32 639 function in patients with inflammatory bowel disease: Results of a web-based health survey.
33 640 *Am J Gastroenterol*. 2014;109:S516.
- 34 641 45. Joachim G, Milne B. Inflammatory bowel disease: effects on lifestyle. *J Adv Nurs*.
35 642 1987;12:483-7.
- 36 643 46. Juan L, Ricardo DLV, Mayte V, Esther T. Gender differences in stoma-related quality of
37 644 life in Puerto Ricans with IBD. *Am J Gastroenterol*. 2018;113 (Supplement 1):S14.
- 38 645 47. Kjaer MD, Laursen SB, Qvist N, Kjeldsen J, Poornorozy PH. Sexual function and body
39 646 image are similar after laparoscopy-assisted and open ileal pouch-anal anastomosis. *World J*
40 647 *Surg*. 2014;38:2460-5.
- 41 648 48. Knowles SR, Gass C, Macrae F. Illness perceptions in IBD influence psychological status,
42 649 sexual health and satisfaction, body image and relational functioning: A preliminary
43 650 exploration using Structural Equation Modeling. *Journal of Crohn's and Colitis*. 2013;7:e344-
44 651 e50.
- 45 652 49. Knowles SR, Wilson J, Wilkinson A, Connell W, Salzberg M, Castle D, et al. Psychological
46 653 well-being and quality of life in Crohn's disease patients with an ostomy: a preliminary
47 654 investigation. *Journal of Wound, Ostomy, & Continence Nursing*. 2013;40:623-9.
- 48 655 50. Kuruvilla K, Osler T, Hyman NH. A comparison of the quality of life of ulcerative colitis
49 656 patients after IPAA vs ileostomy. *Dis Colon Rectum*. 2012;55:1131-7.
- 50 657 51. Lee D, Baldassano RN, Otley AR, Albenberg L, Griffiths AM, Compher C, et al.
51 658 Comparative effectiveness of nutritional and biological therapy in North American children
52 659 with active Crohn's disease. *Inflamm Bowel Dis*. 2015;21:1786-93.
- 53
54
55
56
57
58
59
60

- 1
2
3
4 660 52. Liwanag MJ, Liu JX, Tan LN, Huang JG, Quak SH, Aw MM. Health related quality of life
5 661 in paediatric inflammatory bowel disease in a Southeast Asian population. *Journal of Crohn's*
6 662 *and Colitis*. 2014;8:S409.
- 7 663 53. Mason A, Malik S, McMillan M, McNeilly JD, Bishop J, McGrogan P, et al. A prospective
8 664 longitudinal study of growth and pubertal progress in adolescents with inflammatory bowel
9 665 disease. *Horm Res Paediatr*. 2015;83:45-54.
- 10 666 54. Maunder R, Toner B, De Rooy E, Moskovitz D. Influence of sex and disease on illness-
11 667 related concerns in inflammatory bowel disease. *Can J Gastroenterol*. 1999;13:728-32.
- 12 668 55. Mazzoccone A, et al. A study of body image in patients with chronic colon and liver
13 669 diseases. *Giunti Organizzazioni Speciali*. 1980;155-156:105-13.
- 14 670 56. McDermott E, Moloney J, Rafter N, Keegan D, Byrne K, Doherty GA, et al. The body
15 671 image scale: A simple and valid tool for assessing body image dissatisfaction in inflammatory
16 672 bowel disease. *Inflamm Bowel Dis*. 2014;20:286-90.
- 17 673 57. Mountifield R, Bampton P, Prosser R, Muller K, Andrews JM. Fear and fertility in
18 674 inflammatory bowel disease: A mismatch of perception and reality affects family planning
19 675 decisions. *Inflamm Bowel Dis*. 2009;15:720-5.
- 20 676 58. Mukhopadhyay A, Probert S, Smith C, Maville C, Renji E, Bunn S, et al. IMPACT III-
21 677 disease-specific health-related quality of life (HRQOL) for children with Crohn's disease (CD) on
22 678 infliximab-a single centre experience. *J Pediatr Gastroenterol Nutr*. 2017;64 (Supplement
23 679 1):519-20.
- 24 680 59. Muller KR, Prosser R, Bampton P, Mountifield R, Andrews JM. Female gender and
25 681 surgery impair relationships, body image, and sexuality in inflammatory bowel disease: Patient
26 682 perceptions. *Inflamm Bowel Dis*. 2010;16:657-63.
- 27 683 60. Navas-Lopez VM, Martin-De-Carpi J, Grant A, Walters TD, Ruemmele F, Mack D, et al.
28 684 Quality of life in paediatric Crohn's disease: Data from the Imagekids study. *Journal of Crohn's*
29 685 *and Colitis*. 2016;10:S145-S6.
- 30 686 61. Ogden CA, Akobeng AK, Abbott J, Aggett P, Sood MR, Thomas AG. Validation of an
31 687 instrument to measure quality of life in British children with inflammatory bowel disease. *J*
32 688 *Pediatr Gastroenterol Nutr*. 2011;53:280-6.
- 33 689 62. Perrin JM, Kuhlthau K, Chughtai A, Romm D, Kirschner BS, Ferry GD, et al. Measuring
34 690 quality of life in pediatric patients with inflammatory bowel disease: Psychometric and clinical
35 691 characteristics. *J Pediatr Gastroenterol Nutr*. 2008;46:164-71.
- 36 692 63. Plevinsky JM, Greenley RN. Exploring health-related quality of life and social
37 693 functioning in adolescents with inflammatory bowel diseases after attending camp oasis and
38 694 participating in a facebook group. *Inflamm Bowel Dis*. 2014;20:1611-7.
- 39 695 64. Polle SW, Dunker MS, Slors JF, Sprangers MA, Cuesta MA, Gouma DJ, et al. Body
40 696 image, cosmesis, quality of life, and functional outcome of hand-assisted laparoscopic versus
41 697 open restorative proctocolectomy: long-term results of a randomized trial. *Surg Endosc*.
42 698 2007;21:1301-7.
- 43 699 65. Ponsioen CY, de Groof EJ, Eshuis EJ, Gardenbroek TJ, Bossuyt PMM, Hart A, et al.
44 700 Laparoscopic ileocaecal resection versus infliximab for terminal ileitis in Crohn's disease: a
45 701 randomised controlled, open-label, multicentre trial. *The Lancet Gastroenterology &*
46 702 *Hepatology*. 2017;2:785-92.
- 47 703 66. Saha S, Zhao YQ, Shah SA, Esposti SD, Lidofsky S, Bright R, et al. Body image
48 704 dissatisfaction in patients with inflammatory bowel disease. *Inflamm Bowel Dis*. 2015;21:345-
49 705 52.
- 50 706 67. Savarino JR, Venkatesh RD, Israel EJ, Kaplan JL. Health-related quality of life in pediatric
51 707 inflammatory bowel disease patients receiving infliximab: A pilot study using the impact-III
52 708 questionnaire. *J Pediatr Gastroenterol Nutr*. 2016;63:S362-S3.

- 1
2
3
4 709 68. Scarpa M, Ruffolo C, Bassi D, Boetto R, D'Inca R, Buda A, et al. Intestinal surgery for
5 710 Crohn's disease: Predictors of recovery, quality of life, and costs. *J Gastrointest Surg.*
6 711 2009;13:2128-35.
- 7 712 69. Shah S, Urban M, Gracely E, Nandi N. Anonymous self perception survey of sexuality
8 713 and body image in inflammatory bowel disease. *Am J Gastroenterol.* 2017;112 (Supplement
9 714 1):S377-S9.
- 10 715 70. Shepanski MA, Hurd LB, Culton K, Markowitz JE, Mamula P, Baldassano RN. Health-
11 716 related quality of life improves in children and adolescents with inflammatory bowel disease
12 717 after attending a camp sponsored by the Crohn's and Colitis Foundation of America. *Inflamm*
13 718 *Bowel Dis.* 2005;11:164-70.
- 14 719 71. Swedish E, Blucker RT, Grunow J, Suorsa K, Jacobs NJ. Severity of illness and quality of
15 720 life over time in pediatric inflammatory disease patients. *Gastroenterology.* 2015;1):S635.
- 16 721 72. Trindade IA, Ferreira C, Pinto-Gouveia J. The effects of body image impairment on the
17 722 quality of life of non-operated Portuguese female IBD patients. *Qual Life Res.* 2017;26:429-36.
- 18 723 73. Vlahou CH, Cohen LL, Woods AM, Lewis JD, Gold BD. Age and body satisfaction predict
19 724 diet adherence in adolescents with inflammatory bowel disease. *J Clin Psychol Med Settings.*
20 725 2008;15:278-86.
- 21 726 74. Weinryb RM, Gustavsson JP, Barber JP. Personality predictors of dimensions of
22 727 psychosocial adjustment after surgery. *Psychosom Med.* 1997;59:626-31.
- 23 728 75. Weinryb RM, Gustavsson JP, Barber JP. Personality traits predicting long-term
24 729 adjustment after surgery for ulcerative colitis. *J Clin Psychol.* 2003;59:1015-29.
- 25 730 76. Werner H, Landolt MA, Buehr P, Koller R, Nydegger A, Spalinger J, et al. Validation of
26 731 the IMPACT-III quality of life questionnaire in Swiss children with inflammatory bowel disease.
27 732 *Journal of Crohn's and Colitis.* 2014;8:641-8.
- 28 733 77. Zambonin D, Giudici F, Ficari F, Rogai F, Scaringi S. Short-and long-term outcome of
29 734 minimally invasive approach for Crohn's disease: Comparison between single incision,
30 735 roboticassisted and conventional laparoscopy. *Journal of Crohn's and Colitis.* 2018;12
31 736 (Supplement 1):S411-S2.
- 32 737 78. Kjaer MD, Laursen SB, Poornorozy PH. Sexual function and body image is similar after
33 738 laparoscopic and open ileal pouch-anal anastomosis. *Gastroenterology.* 2014;1):S-383.
- 34 739 79. Jedel S, Hood MM, Keshavarzian A. Getting personal: a review of sexual functioning,
35 740 body image, and their impact on quality of life in patients with inflammatory bowel disease.
36 741 *Inflamm Bowel Dis.* 2015;21:923-38.
- 37 742 80. Piquart M. Body image of children and adolescents with chronic illness: A meta-
38 743 analytic comparison with healthy peers. *Body Image.* 2013;10:141-8.
- 39 744 81. Allison M, Lindsay J, Gould D, Kelly D. Surgery in young adults with inflammatory bowel
40 745 disease: a narrative account. *International journal of nursing studies.* 2013;50:1566-75.
- 41 746 82. Rosenblum GD, Lewis M. The relations among body image, physical attractiveness, and
42 747 body mass in adolescence. *Child development.* 1999;70:50-64.
- 43 748 83. Bearman SK, Martinez E, Stice E, Presnell K. The Skinny on Body Dissatisfaction: A
44 749 Longitudinal Study of Adolescent Girls and Boys. *Journal of youth and adolescence.*
45 750 2006;35:217-29.
- 46 751 84. Brennan M, Lalonde C, Bain J. Body Image Perceptions: Do Gender Differences Exist?
47 752 *Psi Chi J Undergrad Res.* 2010.
- 48 753 85. Miranda VP, Conti MA, de Carvalho PH, Bastos RR, Ferreira ME. Body image in
49 754 different periods of adolescence. *Rev Paul Pediatr.* 2014;32:63-9.
- 50 755 86. Ando S, Osada H. Age and gender differences in body image over the life span:
51 756 Relationships between physical appearance, health and functioning 2009. 1-16 p.
- 52 757 87. Pruis TA, Janowsky JS. Assessment of body image in younger and older women. *J Gen*
53 758 *Psychol.* 2010;137:225-38.
- 54
55
56
57
58
59
60

- 1
2
3
4 759 88. Teo I, Cheung YB, Lim TYK, Namuduri RP, Long V, Tewani K. The relationship between
5 760 symptom prevalence, body image, and quality of life in Asian gynecologic cancer patients.
6 761 *Psycho-oncology*. 2017.
7
8 762 89. Rhondali W, Chisholm GB, Daneshmand M, Allo J, Kang DH, Filbet M, et al. Association
9 763 between body image dissatisfaction and weight loss among patients with advanced cancer and
10 764 their caregivers: a preliminary report. *Journal of pain and symptom management*.
11 765 2013;45:1039-49.
12 766 90. Watson B, Broadbent J, Skouteris H, Fuller-Tyszkiewicz M. A qualitative exploration of
13 767 body image experiences of women progressing through pregnancy. *Women Birth*. 2016;29:72-
14 768 9.
15 769 91. Hale ED, Radvanski DC, Hassett AL. The man-in-the-moon face: a qualitative study of
16 770 body image, self-image and medication use in systemic lupus erythematosus. *Rheumatology*.
17 771 2015;54:1220-5.
18 772 92. Piquart M. Body image of children and adolescents with chronic illness: a meta-
19 773 analytic comparison with healthy peers. *Body Image*. 2013;10:141-8.
20 774 93. Alleva JM, Sheeran P, Webb TL, Martijn C, Miles E. A Meta-Analytic Review of Stand-
21 775 Alone Interventions to Improve Body Image. *PLoS One*. 2015;10:e0139177.
22 776 94. Mikocka-Walus A, Pittet V, Rossel J-B, von Känel R, Anderegg C, Bauerfeind P, et al.
23 777 Symptoms of Depression and Anxiety Are Independently Associated With Clinical Recurrence
24 778 of Inflammatory Bowel Disease. *Clin Gastroenterol Hepatol*. 2016;14:829-35.e1.
25 779 95. Kochar B, Barnes EL, Long MD, Cushing KC, Galanko J, Martin CF, et al. Depression Is
26 780 Associated With More Aggressive Inflammatory Bowel Disease. *The American Journal Of*
27 781 *Gastroenterology*. 2017;113:80.

30
31 782

32
33
34 783

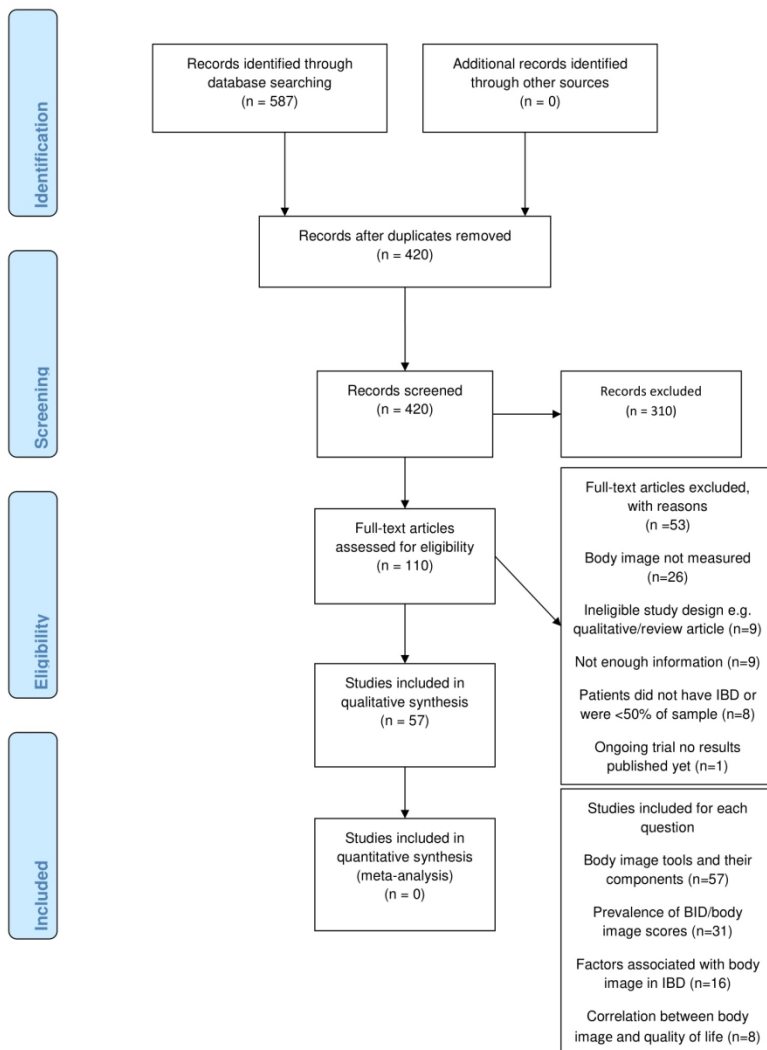
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

784 **Figures**

785 **1.** The selection process of records for inclusion/exclusion detailed in a PRISMA
786 flowchart.

Confidential: For Review Only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



437x618mm (96 x 96 DPI)

Supplementary Data Content - Table 1

MEDLINE Search Strategy – OVID MEDLINE In process & other non-indexed citations and OVID MEDLINE.

Search	Query
#1	exp inflammatory bowel diseases/
#2	inflammatory bowel disease*.mp.
#3	exp Colitis, Ulcerative/
#4	ulcerative colitis.mp.
#5	exp Crohn disease/
#6	Crohn* disease.mp.
#7	Crohn*.mp.
#8	IBD.mp.
#9	CD.mp.
#10	UC.mp.
#11	1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10
#12	exp body image/
#13	body image.mp.
#14	body dissatisfaction.mp.
#15	body awareness.mp.
#16	body concern*.mp.
#17	body attitude*.mp.
#18	body preoccupation.mp.

#19	body perception.mp.
#20	body anxiety.mp.
#21	body conscious*.mp.
#22	12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19 OR 20 OR 21
#23	11 AND 22

Confidential: For Review Only

1 **Supplementary Data Content - Table 2** Results of risk of bias assessment using Joanna Briggs Institute Tools

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
Abdovic et al (2013)	Yes	Yes	Yes	Yes	N/A	No	No	Yes	Yes	Yes
Bel et al (2015)	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	No
Beld et al (2010)	Yes	Yes	No	Yes	Yes	No	No	No	Yes	Yes

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
Bengtsson et al (2011)	Yes	No	No	Yes	Yes	Unclear	No	Yes	Yes	No
Brown et al (2015)	Yes	Yes	Yes	Yes	Yes	Unclear	No	No	Yes	No
Chouliaras et al (2017)	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Unclear
de Rooy et al (2001)	Unclear	No	Yes	No	N/A	Yes	Yes	Yes	Yes	Unclear

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the study subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
Dunker et al (1998)	No	No	Yes	Unclear	Unclear	No	No	No	Yes	Yes
Dunker et al (2001)	Unclear	No	Unclear	Yes	Unclear	Unclear	Unclear	No	Yes	Yes
Eshuis et al (2008)	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Eshuis et al	Unclear	Yes	Unclear	Yes	Yes	No	No	No	Yes	Yes

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the study subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
(2010)										
Gallo et al	Yes	Yes	Yes	Yes	N/A	No	No	Yes	Yes	Yes
(2014)										
Giudici et al	No	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear
(2017)										
Grootenhuis	Yes	Yes	Yes	N/A	Unclear	Yes	Yes	No	Yes	No
(2009)										

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
Kjaer et al (2014)	Unclear	Unclear	Yes	Yes	Unclear	No	No	No	Yes	No
Kuruvilla et al (2012)	Yes	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear
Lee et al (2015)	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Unclear
Mason et al (2015)	Yes	Yes	Yes	Yes	N/A	No	No	Yes	Yes	Unclear

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the study subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
Maunder et al (1999)	Unclear	Unclear	Yes	Yes	N/A	No	No	Yes	Yes	Unclear
McDermott et al (2015)	Yes	Yes	Unclear	Unclear	N/A	Yes	Yes	Yes	Yes	Yes
Muller et al (2010)	Yes	Yes	Unclear	Unclear	N/A	Yes	Yes	No	Yes	Unclear
Ogden et al	Unclear	Unclear	Unclear	Unclear	N/A	N/A	N/A	Yes	Yes	Yes

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the study subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
(2011)										
Perrin et al (2008)	Yes	Yes	Yes	Unclear	N/A	N/A	N/A	Yes	Yes	No
Polle et al (2007)	Unclear	Unclear	Unclear	Yes	Unclear	Yes	No	No	Yes	Yes
Ponsioen et al (2017)	Yes	Yes	Yes	Yes	Unclear	Unclear	Unclear	Yes	Unclear	No

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
Saha et al (2015)	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Unclear	Yes	No
Scarpa et al (2009)	Unclear	Yes	Unclear	Yes	Yes	Yes	Yes	No	Yes	Yes
Shepanksi (2005)	Yes	Unclear	Unclear	Yes	Unclear	Unclear	No	Yes	Yes	No
Trindade et al (2017)	Yes	Yes	Yes	Unclear	N/A	Yes	Yes	Yes	Yes	Unclear

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47

Study	Was the sample frame appropriate to address the target population?	Were the criteria for inclusion in the sample clearly defined?	Were the subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?	Was the response rate adequate, and if not, was the low response rate managed appropriately? (>75%)
-------	--	--	--	--	--	--------------------------------------	--	---	--	---

Vlahou et al (2008)	Yes	Unclear	No	Unclear	N/A	Yes	Yes	No	Yes	Unclear
Voermans et al (2010)	Unclear	Yes	Unclear	Yes	N/A	No	No	No	Yes	Yes

Confidential: For Review Only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60