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The impact of constipation on quality of life

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Abstract

Background

Comparison of quality of life (QOL) across disease areas requires the use of appropriate tools. Although many studies have investigated QOL in constipation, most used disease-specific tools that are inappropriate for cross-comparisons.

Aims

This review aimed to identify studies of QOL in constipation and to compare these results with other chronic conditions

Methods

A comprehensive literature search identified studies in constipation that used a generic QOL tool. Results were statistically pooled where possible, and compared to published results using the same tools in other chronic conditions.

Results

13 qualifying studies were identified, 10 in adults and 3 in children. Results from 8 studies using the SF-36/12 tools were pooled; the remaining 5 were narratively reported. Mental and physical components of QOL scores were consistently impaired in both adult and child populations, with greatest impact being seen in secondary care studies. Mental health effects predominated over physical domains. The magnitude of impact was comparable to that seen in patients with allergies, musculoskeletal conditions and inflammatory bowel disease.

Conclusion

The impact of constipation on QOL is significant and comparable to other common chronic conditions. Improving management may prove offer an effective way of improving QOL for a substantial number of patients.

Background

Chronic functional constipation is a common condition, with around 15-17% of adults [1,2] reporting symptoms consistent with the Rome I or II diagnostic criteria. Studies in children yield considerable variation in prevalence estimates, with a range of estimates from 1% – 30% (median 10.4%) being identified in the literature [3]. Although rarely associated with life-threatening complications, the impact of constipation on sufferers may be considerable: a recent review [4] identified a growing evidence base that these patients have significantly impaired health related quality of life (HRQoL) compared to unaffected populations, as assessed by objective questionnaires.

Measurement of HRQoL requires the application of an objective and reproducible series of measures, in order to characterise physical, mental, social and functional aspects of an individual's life. The information this yields may be used to inform individual patient management [5] or, more commonly, to provide insight into the typical impact of one or more related conditions within a defined group of patients [6]. More challenging to achieve, but potentially more useful, is the comparison of HRQoL across several unrelated conditions [7]. This process is not only clinically valuable, but also increasingly underlies the decision making process for resource allocations within health care systems.

Meaningful comparison of HRQoL across differing disease areas requires careful selection of the assessment tool to be used. Many of the questionnaires used in quality of life research are specific to individual diseases, or groups of diseases. For example, when considering constipation, one may choose to investigate using a very specific tool, such as the Patient Assessment of Constipation – Quality of Life (PAC-QOL) questionnaire [8], which has been shown to be internally consistent, reproducible, valid, and responsive to improvements over time. This makes the tool especially valuable for tracking individual patients longitudinally, but of limited value when comparing a group of patients with constipation with a similar group with irritable bowel syndrome. In this circumstance, a broader tool such as the Elderly Bowel Symptom Questionnaire (EBSQ) would be more appropriate [9].

However, if the intention is to compare the impact of constipation with a non-gastrointestinal problem, then neither of these approaches would be helpful. In this circumstance, a generic HRQoL tools is required – some of the most commonly used being the Short Form 36 version 2 (SF-36v2) [10], the Health Utilities Index mark 3 (HUI3) [11] or the EuroQol 5D (EQ-5D) [12].

These generic tools are relatively insensitive to specific clinical issues in any given medical condition and are therefore not ideal for following up individual patients. Their strength, however, lies in their ability to detect the global impact of illness and/or disability on a multidimensional construct of psychological, social and physical aspects of quality of life. For this reason, they are ideally placed to give meaning to questions on the relative impact of disparate diseases on HRQoL.

Aims

The aim of this review was to identify published studies that used generic HRQoL tools in the field of adult or child constipation; to extract data allowing a rational assessment of the impact of constipation on quality of life; to pool these results where appropriate and to carry out a narrative review otherwise; to compare these results to those arrived at using the same tools in other chronic, non life-threatening conditions.

Methods

Literature Search

A primary search for quality of life studies was carried out in PubMed, using the following terms:

Laxatives [MeSH] **OR Constipation** [MeSH]
AND
Quality-of-life [MeSH] OR **HRQL** [TW] OR **HRQOL** [TW]

Additional electronic searches using similar strategies were carried out using EMBASE and Cochrane Library.

All abstracts that appeared likely to comply with the inclusion criteria were obtained as full text, together with relevant review articles. Reference lists of all sourced papers were scrutinised to identify any missed studies.

Studies were appraised to determine whether they complied with the following inclusion criteria:

- Study applying a generic HRQOL tool to patients with constipation
- Patients with diagnosis of constipation consistent with Rome II/III criteria
- Detailed results of HRQOL scores presented in the paper
- Reference to healthy comparator group scores in the paper

Studies were specifically excluded if:

- Only disease-specific assessment tools were used
- Constipation was secondary to other diagnoses
- The study had not been fully published in a peer-reviewed journal

No limitations were placed on language of publication or age of participants

Data extraction and analysis

In studies which used the SF-36 or SF-36v2 tools, mean scores for each of the eight domains were extracted (see table 1). These were transformed into norm-based scores, using appropriate national reference values [13-16]. Norm-based scoring standardises the raw results for each domain to a consistent scale with mean of 50 and standard deviation of 10 when applied to a healthy population. This allows cross-comparisons between domains [13]. These eight results were then aggregated using published weighting factors to yield two composite scores for each study – the Physical Component Score (PCS) and the Mental Component Score (MCS). This facilitates the comparison of results across disease entities [13]. In addition to calculating these values for each study and patient group individually, we also calculated a mean value for all studies combined. This mean value included results from one study carried out using the SF-12. This comprises a subset of the SF-36

that yields the same two composite measures (PCS + MCS). This is scored using the same normalizing metric as the SF-36, which therefore allows meaningful inclusion of these results into the pooled estimates of MCS and PCS [13].

In addition to the results for the total dataset, pooled values were also separately estimated for community-based and hospital-based studies.

As most studies did not supply figures for standard deviations, we were unable to undertake a formal random effects meta-analysis and these mean estimates were simply derived by study-size weighting. Equally, the absence of variance data from individual studies precluded the significance testing for differences in aggregate PCS and MCS scores for constipated and healthy populations.

For studies that did not use SF-36, data on comparative scores for each patient group were extracted from the text and used to inform a narrative review.

Results

The primary PubMed search yielded 174 hits, of which 13 fulfilled the inclusion criteria [17-28] (see figure 1). Subsidiary searches identified one additional study [6].

10 studies were carried out in adult populations: 7 using SF-36 [17-23], 1 using SF-12 [6] and two using the Psychological General Well Being index (PGWB) [24,25]. None used the EQ-5D or HUI3. Three studies were carried out in children, two using the Pediatric Quality of Life Inventory (PedsQL) [26,27] and one using the Child Health Questionnaire – Parent Form 50 (CHQ-PF50) [28] (table 1).

Studies using SF-36/SF-12

The studies using SF-36 [17-23] yielded scores for each of the eight domains tested that were, with few exceptions, significantly lower in individuals with

constipation than in the unaffected comparator groups. When normalized to the relevant reference population and pooled to arrive at a weighted mean for each, it is apparent that the greatest differences are seen in the domains: General Health, Social Functioning and Mental Health (figure 2).

This result is reflected in the pooled results for the Physical and Mental composite scores, which demonstrate greater absolute impact on the domains reflecting mental health status than those connected with physical aspects of QoL (figure 3).

All studies

- Mean normalized scores for constipated patients: PCS = 47.5, MCS = 45.8.
- Mean normalized scores for healthy controls: PCS = 51.3, MCS = 48.8.
- Nominal population mean normalized scores: PCS = 49.97, MCS = 49.90.

Community based studies

- Mean normalized scores for constipated patients: PCS = 48.0, MCS = 48.5.
- Mean normalized scores for healthy controls: PCS = 51.3, MCS = 49.2.

Hospital based studies

- Mean normalized scores for constipated patients: PCS = 41.9, MCS = 43.9.
- Mean normalized scores for healthy controls: PCS = 50.5, MCS = 48.4.

Studies using PGWB

Two studies carried out in Swedish populations used the PGWP [24,25]. This index evaluates HRQoL across six domains - anxiety, depressed mood,

positive well-being, self control, general health and vitality – which are then combined to yield an overall score.

In the first study [24] 102 consecutive adult patients who had been referred to a hospital clinic for evaluation of severe chronic constipation underwent assessment with the PGWP questionnaire. Data for 84 patients were available. This was a mixed group of patients who were classified according to both fecal transit time and stool frequency. The overall mean score achieved was 85.5 compared with an average score for the Swedish population of 102.9 (maximum possible score 110). Somewhat surprisingly, patients with slow-transit constipation scored significantly better than those with normal transit constipation (median 94 vs 82) while those with fewer than 3 stools per week score higher than those with more (median 96 vs 80)

In the second study [25], 86 women with chronic constipation complying with Rome II criteria were recruited for a clinical trial of laxative treatment. Baseline results for PGWB are presented, broken down by the type of treatment the women were using prior to randomisation. Amongst 35 women taking sodium picosulphate at baseline, mean score was 92.8, compared with a female average of 101.4. Amongst 51 women using other treatments, the mean score was 85.2.

Paediatric studies

Three studies were identified that evaluated quality of life in children with constipation, all carried out in a hospital setting; two used the PedsQL [26, 27] and one the CHQ-PF50 [28].

The PedsQL is a generic questionnaire that is completed by both children and their parent and has been validated in patients aged 5 and over. It encompasses physical, emotional, social and school functioning domains, which are then aggregated to yield an overall score ranging from 0-100. Parental and child scores are separately recorded.

In the first study [26], carried out in the USA, 178 children (age 5-18) referred to a paediatric gastroenterology department and 42 healthy controls attending primary care for routine checks or minor problems were screened using the PedsQL. In the patient group, 80 had constipation, 42 inflammatory bowel disease (IBD) and 56 gastroesophageal reflux (GORD). The mean aggregate score for constipation was significantly reduced compared with healthy controls (children 70.4 vs 87.7; $p<0.05$; parents 60.6 vs 80.7; $p<0.001$) (figure 4). Both children and parents scored constipation as having a greater impact on quality of life than either GERD (children 70.4 vs 79.9; $p<0.05$; parents 60.6 vs 76.6; $p<0.05$) or IBD (children 70.4 vs 83.8; $p<0.05$; parents 60.6 vs 77.4; $p<0.05$). Amongst children, the impact on quality of life was evenly distributed throughout all domains, while parents identified school and emotional issues as being the major drivers. Parents consistently rated the impact on quality of life as being greater than their children's own ratings.

In the second study [27], carried out in Australia, PedsQL scores for 51 children (aged 8-18) attending surgical and gastrointestinal clinics in for chronic slow transit constipation were compared with 79 healthy controls recruited from a Scout jamboree. Total quality of life scores in children with constipation were significantly lower than those of controls (children 72.9 vs 86.0; $p<0.0001$; parents 64.4 vs 84.3; $p<0.0001$). Although decreases in both physical and psychosocial domains were reported, psychosocial factors were impacted to a greater extent. As in the previous study, mean parental scores were lower than those reported by children for the constipated group, although no such difference was observed in the control group.

The reported results of this study correlate well with those of the other study using PedsQL, both in magnitude and trend:

Constipated children:

- Mean child score: 72.9 vs 70.4 in Youssef et al [26]
- Mean parent score: 64.4 vs 60.6 in Youssef et al [26]

Healthy controls:

- Mean child score: 86.0 vs 87.7 in Youssef et al [26]
- Mean parent score: 84.3 vs 80.7 in Youssef et al [26]

The third paediatric study [28] evaluated 100 consecutive children attending a gastroenterology clinic in Brazil with functional defecation disorders. Using the Rome II criteria, 57 children had a diagnosis of functional constipation, 29 had functional fecal retention and 14 had non-retentive fecal incontinence. Scores on the CHQ-PF50 were compared with documented norms for healthy children in brazil. The CHQ-PF50 is a 50-item questionnaire completed by the parents of the affected child. It assesses 15 separate domains, which are then aggregated into physical and psychosocial composite scores.

Mean scores amongst all children any functional defecation disorder were 26.3 for the physical component and 36.0 for the psychological domains. This compares with healthy control values for Brazilian children of 55.0 and 53.0 respectively. The difference is quoted as statistically significant, although no p-value is given. Subanalysis across the three diagnostic subgroups showed no significant differences, although the physical component for children with non-retentive fecal incontinence was numerically lower than for the other diagnoses.

Discussion

Main results

Our literature search identified an extensive evidence base relating to the QoL impact of chronic constipation using a range of validated questionnaires. The results of these studies demonstrated a consistent effect of constipation on both mental and physical components of quality of life. Amongst population recruited within secondary care, the magnitude of QoL impairment was substantially greater across all domains than that seen in community-recruited cohorts, reflected the more intractable nature of the problem in these patients. This different was most marked in the mental and emotional aspect of the scores.

The generic tools identified in these studies have also been used in other disease areas. The SF36 has been extensively used. Table 2 compares the results of our analysis with those from both a US community reference population with a range of chronic diseases and results of individual hospital-based studies [29-33]. The scores found in community studies were comparable to those seen with chronic allergies, dermatitis, diabetes and stable ulcerative colitis, whilst the scores seen in hospital studies were similar to those found in patients with unstable inflammatory bowel disease, functional dyspepsia and a range of chronic rheumatological conditions. Similarly, the PGWB studies yielded scores at least as severe as those seen in untreated peptic ulcer [34], GORD [35] and patients with mild asthma [36].

As reported above, in one of the paediatric studies, the scores achieved in the PedsQL were worse for children with constipation than those with GERD and inflammatory bowel disease [26]. The paediatric data are of interest in that they provide a measure of the impact of constipation on the patients' families. As judged by the ratios of QoL of children with constipation, their parents and controls, there was a greater impact on the parental QoL (ratios 0.75-0.76 vs controls) than children (ratios 0.80-0.85 vs controls) When set against results from other disease are, the QoL impact of constipation is seen to be comparable to results obtained from children attending hospital for a wide range of chronic conditions [5,37,38](table 3).

Interpretation of the data in tables 2 and 3 requires a degree of caution, as the exact extent to which a generic tool captures the impact of an individual disease on quality of life may vary. Nonetheless, it is probably reasonable to conclude that the impact of constipation is at least comparable to that seen across a wide range of conditions that might normally be considered more "serious".

Clinical relevance

The threshold for diagnosis of constipation varies substantially between patients and doctors and also to some extent between individual clinicians [39]. These studies show, however, that regardless of the criteria used the impact on patients' perceived quality of life is significant and comparable to that seen with other more recognised causes of impaired health.

In a US survey of 557 constipation patients of all ages [40], 52% reported an impact on quality of life, while 69% reported that constipation affected their performance at work or at school. 12% reported that constipation had resulted in absence from work or school in the preceding month, with a mean non-attendance period of 2.4 days. This figure relates to a selected subgroup of patients; however, amongst constipated patients as a whole it been estimated that a mean period of work absence of 0.4 days per year will be seen, equating to 13.7 million days of restricted activity annually in the USA [41].

The extent to which the results of this study reflect the impact of constipation per se, rather than associated symptoms such as abdominal pain is difficult to ascertain. Examination of the detailed results of the SF-36 studies (figure 2) does not suggest that pain is a major driver of the results, with emotional and mental factors seeming to be of greater importance. In the PGWB studies, the reduction in score was uniform across all domains (data not shown) with no evidence of physical parameters dominating. Similar results were seen in the paediatric PedsQL studies (figure 4). In one study [26] scores were explicitly assessed for those with and without abdominal pain: no significant difference was seen. A contrary result was seen in the Brazilian CHQ-PF50 study, where there was a bias towards physical components, with General Global Health and Bodily Pain & Discomfort being particularly affected.

To some extent, this distinction is moot, as constipation constitutes a combination of symptoms that will vary from one patient to another – attempting to distinguish the impact of the individual components has the potential to distract from the more general impact of the syndrome as a whole.

Whilst it is clearly useful to understand the impact of constipation on individuals and groups of patients, these data are of greatest value if there is evidence to show that effective treatment can improve quality of life. This has been investigated in a number of studies, which have demonstrated that QoL measures do indeed improve after relief of constipation [42-45]. These studies do not necessarily relate to therapies in common use and there are none that have been carried out in children. However, whilst there is a clear need to carry out further studies in this area, the apparent impact of treatment on QoL, coupled with the generally low cost of medication, suggest that this is likely to be a cost-effective intervention.

Study limitations

In common with all systematic reviews of the literature, our results are potentially subject to selection bias. Whilst we made every effort to include all published studies in the field, we were obviously unaware of data that was not in the public domain.

Secondly, the studies identified were carried out in populations of differing ages and geographical locations and the diagnosis of chronic constipation was not always made according to consistent criteria. Traditionally one would deal with this kind of between-studies variation by carrying out a random effects pooling – in this analysis, however, there was insufficient information given in the published papers to allow this to be carried out. Consequently, our aggregate assessment of the SF-36 score was carried out using a simple study-size weighting method. It is therefore possible that our pooled result gives undue weight to individual studies with wide between-subjects variation.

Amongst the community-based SF-36 studies one paper [17] was considerably larger than all the others and therefore had the major influence on the estimate of pooled effect. However, this study was carried out to a high standard in seven centres in different countries and yielded results that were comparable to those seen in the smaller studies. Although we were unable to

formally assess heterogeneity owing to the lack of variance data, we believe the potential for this study to bias our result was low.

One of the population-based SF-36 studies was carried out exclusively in a population aged 65+ [22]. Both constipated and healthy patients showed a reduced PCS compared to a multinational study across all adults [17]: PCS = 38.7 in elderly constipated vs 49.1 in constipated adults of all ages; 46.8 in elderly healthy vs 51.2 in healthy adults of all ages. This finding is perhaps not surprising, given the likelihood of increased co-morbidity in an older age group. Less easy to explain was the observation that the MCS score in the elderly was considerably higher than that seen in adults of all ages: 54.3 vs 46.2 and 54.1 vs 48.8 respectively. This study, which was the earliest identified in the review, used an early version of the SF-36 (the Medical Outcomes Survey), which only output results in 6 of the eight dimensions of later versions. If these results are excluded from the analysis, the pooled estimate of PCS increases to 48.3, while MCS drops to 48.3.

In general, however, the SF-36 has been designed for scores to be compatible over time, with norm-based scoring allowing direct comparison between the results of all versions. A further issue relates to the geographical spread of included studies. Although the breadth of countries represented in this review offers robustness to the analysis, it also presents potential limitations, as Quality of Life is population-dependent. For the SF-36 studies, this is not an issue: national-specific versions of the questionnaire have been developed and validated for all countries in the identified studies. By then correcting the derived scores using national norms, the overall PCS and MCS results may legitimately be compared internationally [13]. For the two PGWB studies [24,25], the issue does not arise, as both studies were carried out in Sweden. Differences in the recruited populations of these studies, however (hospital vs community setting), meant that the results could not be meaningfully combined. The paediatric studies were carried out in three different countries (USA [26], Australia [27] and Brazil [28]) using two different

questionnaires, with no published means of correcting for these differences. Numerical comparison of these studies was therefore not possible.

Finally, the comparator groups in the studies were not necessarily age-matched healthy individuals – in some cases they were non-constipated individuals who had other gastrointestinal problems. Although the country-specific normalization of scores carried out for the SF-36 studies helps to mitigate this bias, it is possible that the magnitude of difference between constipated and healthy individuals has been under-estimated.

Conclusions

Published studies are consistent in showing impairment in HRQOL in adults and children with constipation. This impairment is particularly significant compared to healthy adults in the domains of general health, social functioning and mental health. In children it is notable that parents rate HRQOL lower than their children, particularly in the domains of emotional and social functioning. This may be because there is often a degree of denial amongst children that they have a problem at all with constipation, In paediatrics the brunt of concordance with treatment, effecting a behavioural change in the child, dealing with the educational problems of poor school attendance and ensuring attendance at follow-up appointments falls upon the parents. Further studies are required to measure the change in parent and child QoL with successful treatment of childhood constipation. Clinical experience suggest that these will be substantial as a result of the improvement in parent-child relationships which occur following resolution of symptoms of constipation..

The impairment in HRQOL observed in adults with constipation is comparable to that seen in conditions that might be regarded as more “serious”, such as osteoarthritis, rheumatoid arthritis, chronic allergies and diabetes. In children, the level of impairment seen is greater than with GORD and IBD. Constipation should therefore not be dismissed as a trivial condition in adults or children.

Given that the population prevalence of constipation is high, the adoption of active strategies to improve its management may be expected to yield significant gains in quality of life. Focussing on improving the management of constipation can therefore be an effective way of improving the quality of life for a substantial number of adults and children.

Competing interests

JB has received payments from Norgine Pharmaceuticals Ltd for data analyses and publications in the field of laxative use

SG has acted as a medical adviser for Norgine Pharmaceuticals Ltd

DC has received research grants from Norgine Pharmaceuticals Ltd, and Yakult Ltd. He has received fees from Nutricia Ltd and Heinz Ltd for review articles on constipation

MG is an employee of Norgine Pharmaceuticals Ltd

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Figures and tables

Figure 1 – Results of literature search

Figure 2. Mean normalized score for the eight domains of the SF-36 for constipated patients versus healthy controls.

Figure 3. Figure 3. Mean normalized score for physical and mental composite scores (PCS & MCS).

Figure 4. Mean PedsQL scores in 80 children with constipation (boxes) vs 42 healthy controls.

Table 1 – Literature search results: characteristics of qualifying studies using generic HRQoL tools in patients with constipation.

Table 2. Mean normalised results for PCS and MCS for a range of chronic disease from a US reference population and the corresponding results for constipation from this analysis

Table 3. Mean child and parent scores using the PedsQL questionnaire from a range of paediatric studies

Figure 1 – Results of literature search

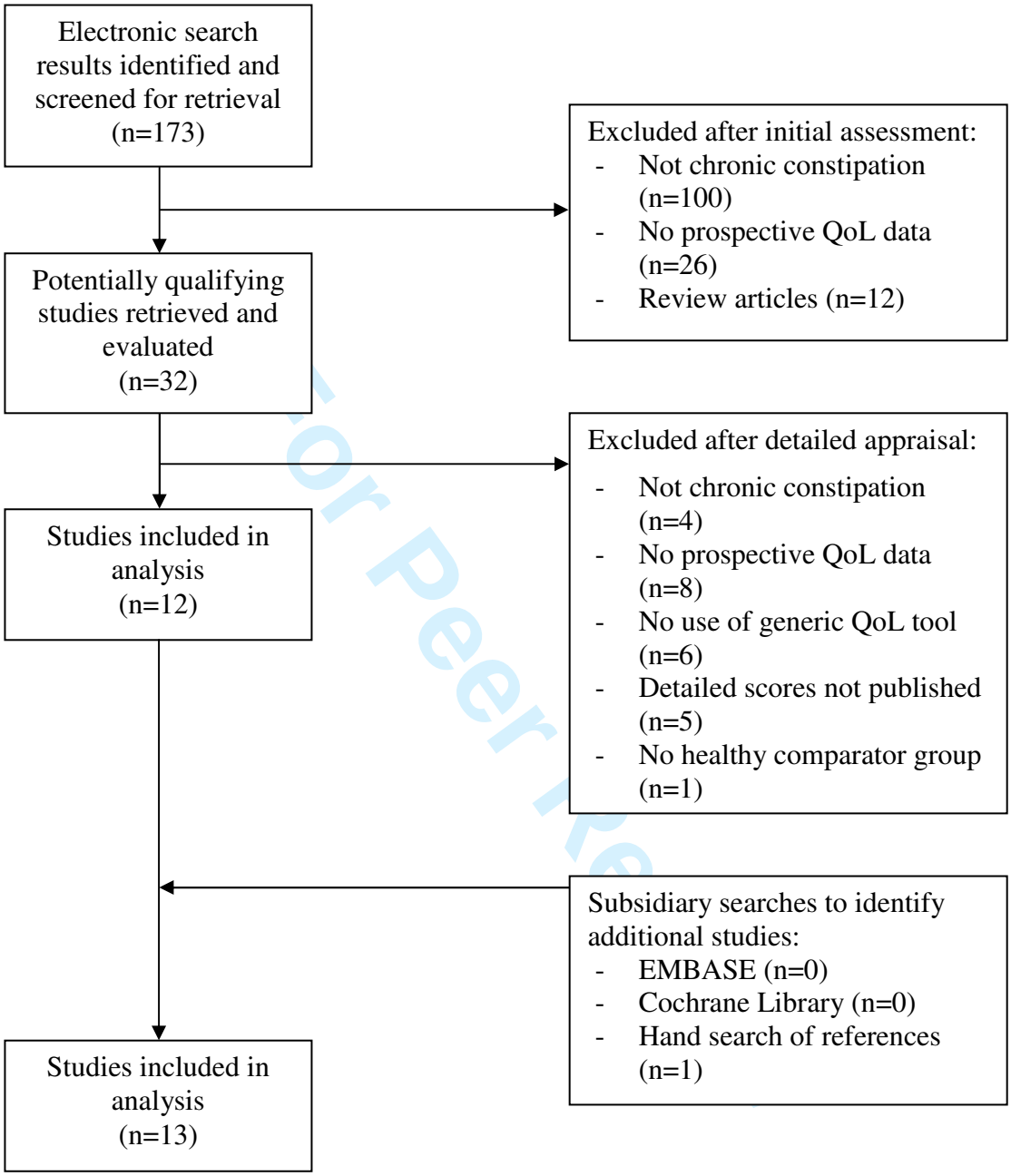
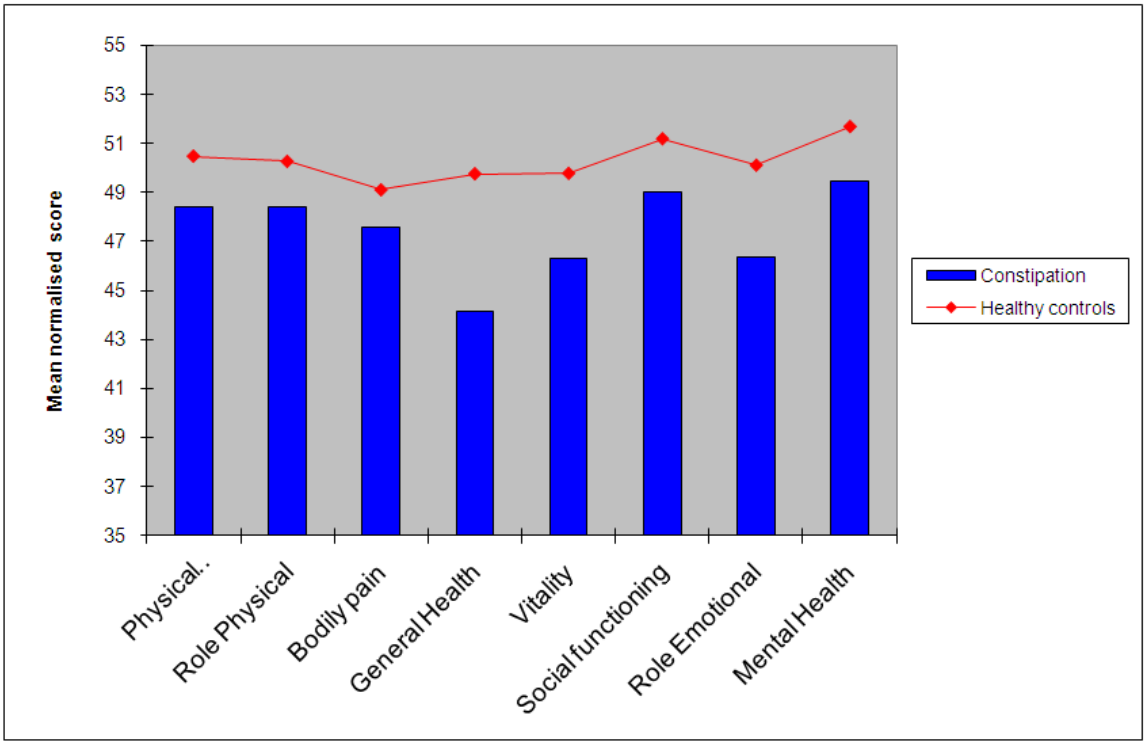


Figure 2. Mean normalized score for the eight domains of the SF-36 for constipated patients versus healthy controls.

A. Pooled results from 4 studies carried out in a community setting [17,18,20,22]



B. Pooled results from 3 studies carried out in a hospital setting [19,21,23]

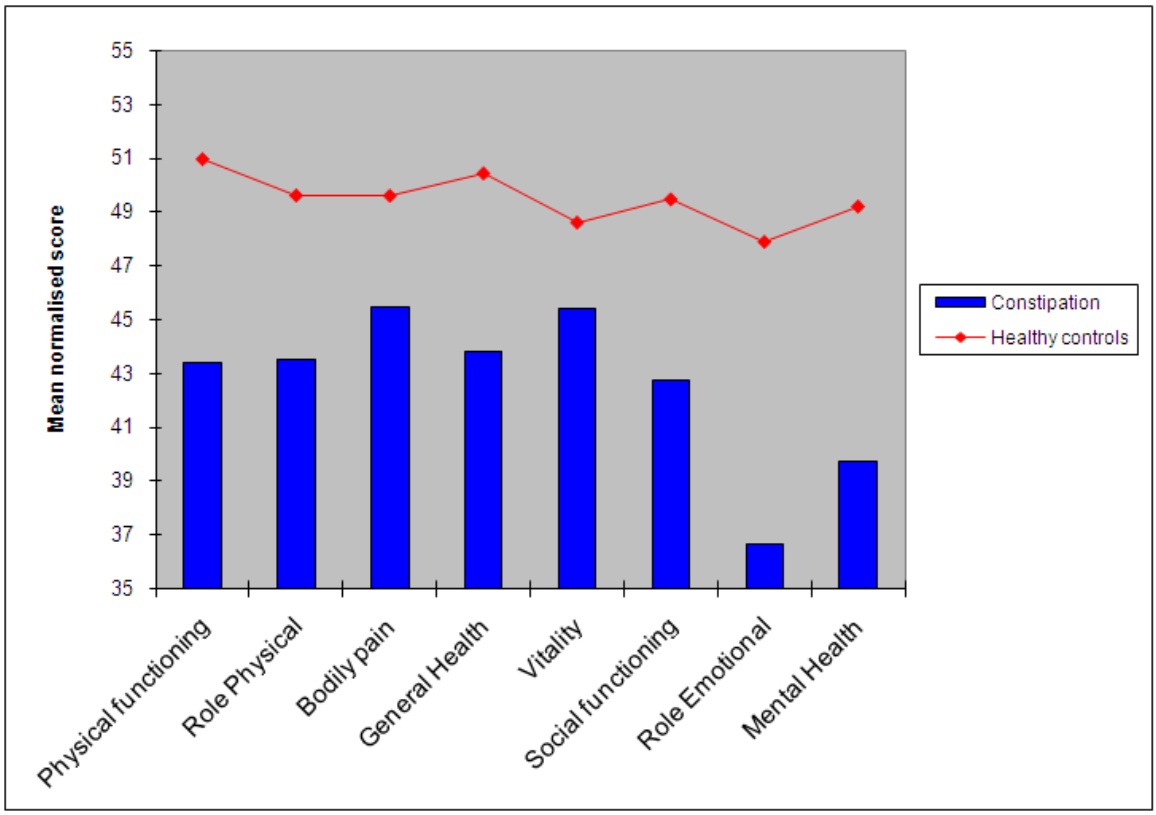
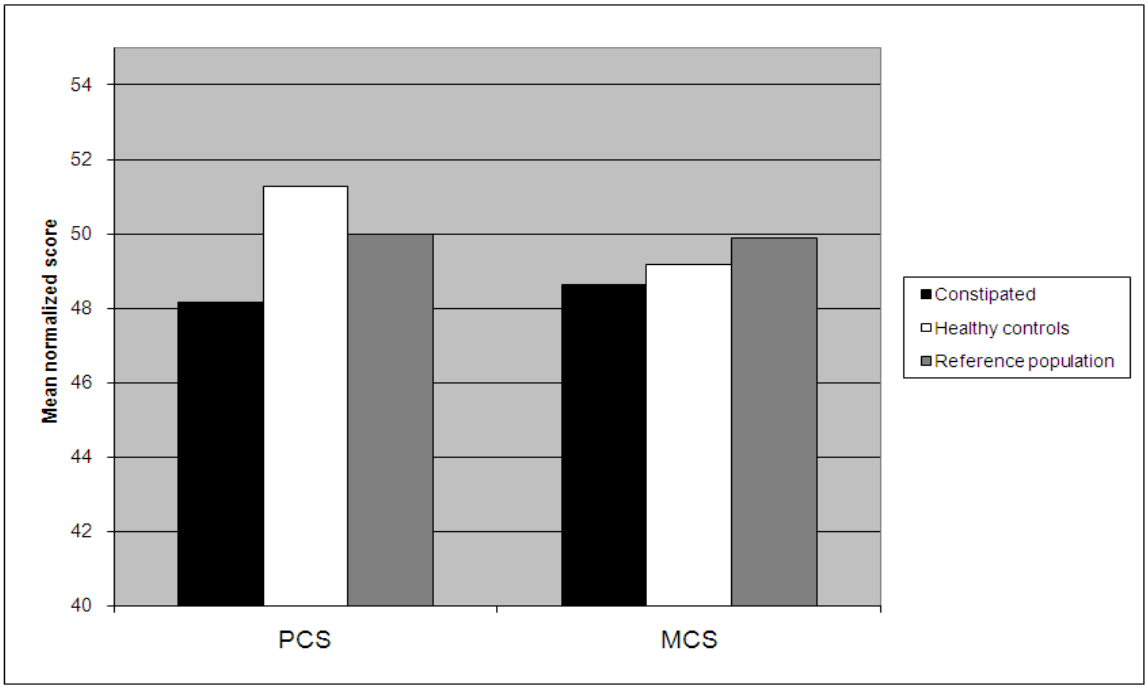


Figure 3. Mean normalized score for physical and mental composite scores (PCS & MCS).

A. Pooled results from 5 studies carried out in a community setting [6,17,18,20,22] and US reference population



B. Pooled results from 3 studies carried out in a hospital setting [19,21,23] and US reference population

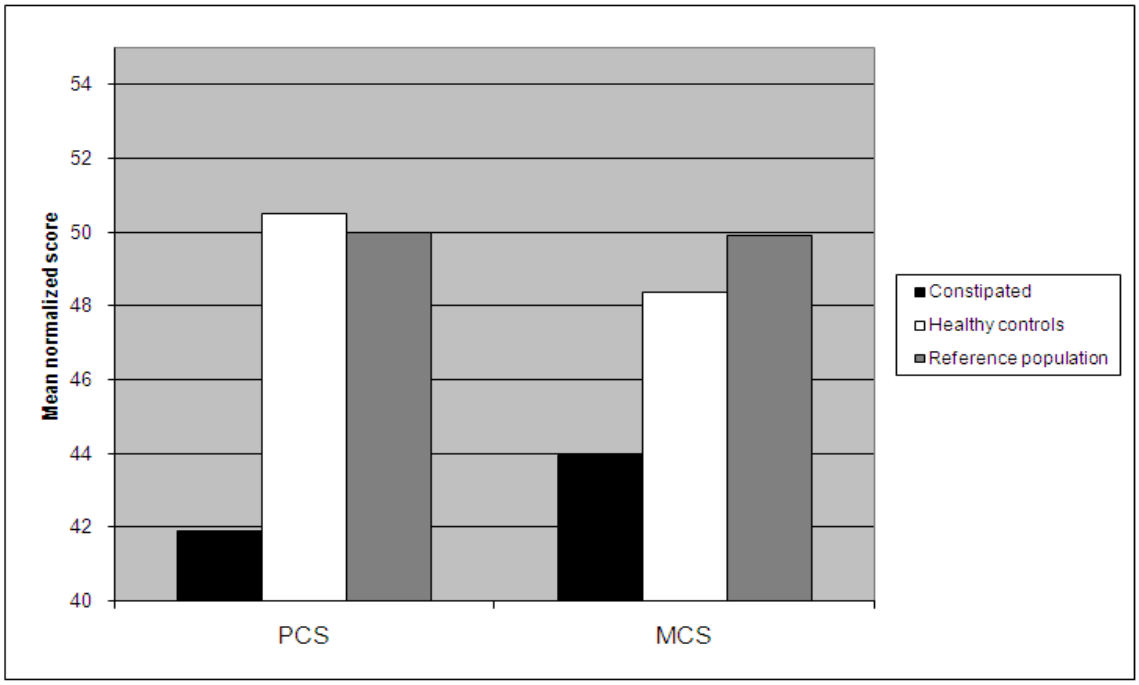
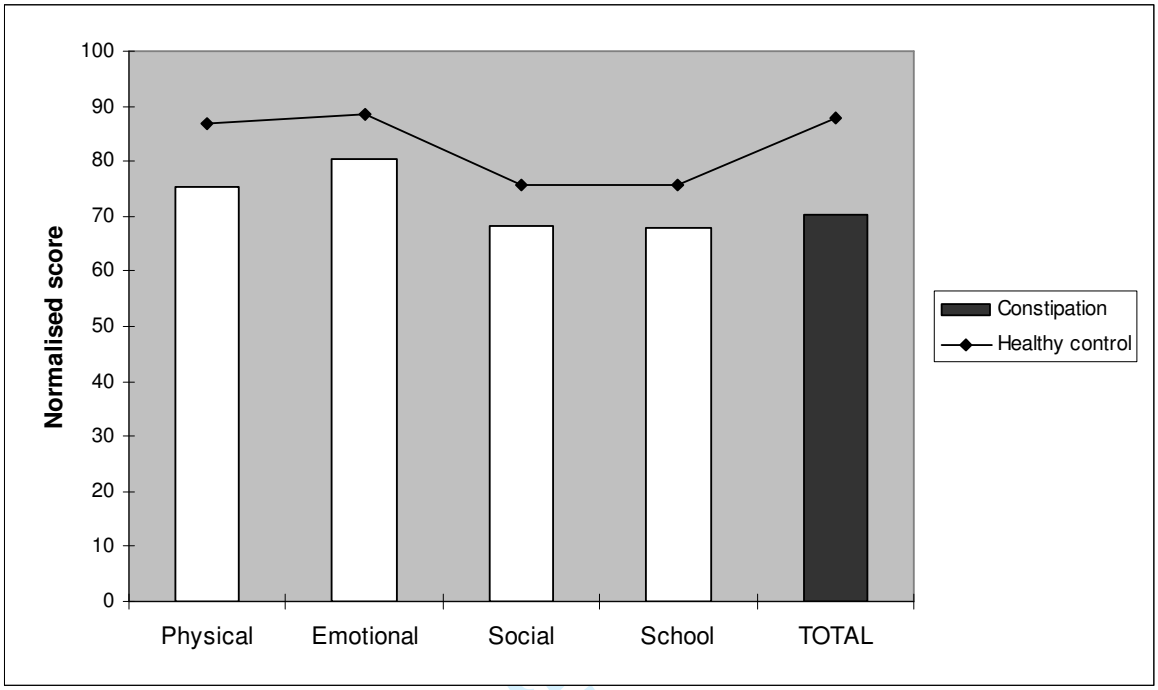


Figure 4. Mean PedsQL scores in 80 children with constipation (boxes) vs 42 healthy controls. A: Child responses. B: Parent responses [26]

A: Child responses



B: Parent responses

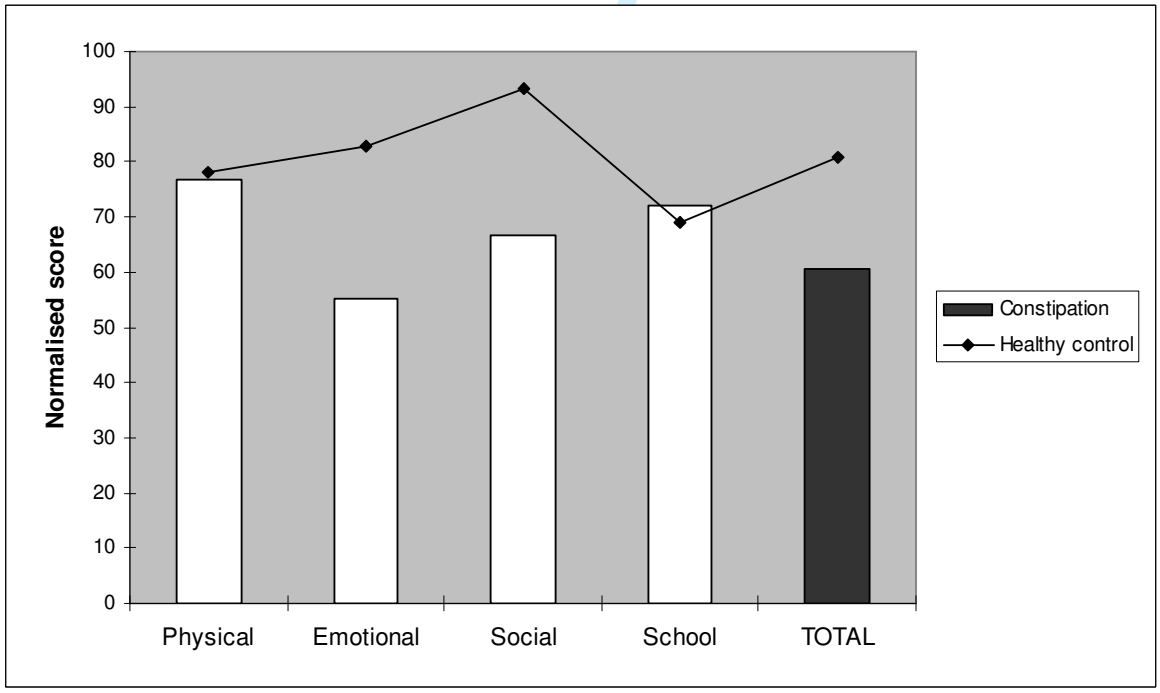


Table 1 – Literature search results: characteristics of qualifying studies using generic HRQoL tools in patients with constipation.

Study	Study population	Control group	HRQoL tool used	N (constipated)	N (control)
Wald 2007 [17]	Multi-national population sample aged 16+ with constipation on questionnaire	Multi-national population sample aged 16+ with no constipation on questionnaire	SF-36	1435	1435
Tuteja 2005 [18]	Workforce survey aged 24-77 with constipation on questionnaire	Workforce survey aged 24-77 with no constipation on questionnaire	SF-36	140	583
Rao 2007 [19]	Patients aged 19+ referred to hospital clinic with slow transit constipation	Healthy control group with no bowel symptoms on questionnaire	SF-36	38	44
	Patients aged 19+ referred to hospital clinic with dyssynergic defecation			76	
Irvine 2002 [20]	National population sample aged 18+ with constipation on questionnaire	National population sample aged 18+ with no constipation on questionnaire	SF-36	163	705
Chan 2005 [21]	Patients aged 18+ referred to hospital for assessment of constipation	Healthy volunteers recruited through advertisement	SF-36	80	18
O'Keefe 1995 [22]	Local population sample aged 65+ with constipation on questionnaire	Local population sample aged 65+ with no GI symptoms on questionnaire	SF-36	126	173
Mason 2002 [23]	Women aged 21-67 with constipation attending hospital clinic for biofeedback training	Sample of UK age-matched population	SF-36	22	298
Koloski 2000 [6]	Local population sample aged 18+ with constipation on questionnaire	Local population sample aged 18+ with no GI disorders on questionnaire	SF-12	227	2683
Glia 1997 [24]	Patients aged 17+ referred to hospital clinic with constipation	Sample of Swedish population	PGWB	84	4624
Bengtsson 2005 [25]	Women aged 18-65 recruited for a clinical trial: constipated & treated with Na Picosulphate	Sample of sex-matched Swedish population	PGWB	35	2300
	Women aged 18-65 recruited for a clinical trial: constipated & treated with other laxatives			51	
Youssef 2005 [26]	Patients aged 5-18 referred to hospital clinic with constipation	Healthy controls recruited through community health clinics	PedsQL	80	46
Clarke 2008 [27]	Patients aged 8-18 referred to hospital clinic with constipation	Healthy controls recruited at Scout jamboree	PedsQL	51	79
Faleiros 2006 [28]	Patients aged 5-12 referred to hospital clinic with constipation	Sample of Brazilian age-matched population	CHQ-PF50	57	314

Table 2. Mean normalised results for PCS and MCS for a range of chronic diseases and the corresponding results for adult constipation from this analysis (in bold)

A - PCS

Population	*Setting*	*N*	*Mean PCS*
Healthy individuals only	Community	1300	55.4
Total population	Community	7003	50.0
Chronic allergies	Community	2967	49.5
Ulcerative colitis (stable)	Hospital	193	49.7
Constipation	**Community**	**2091**	**48.1**
Dermatitis	Community	731	47.7
Ulcerative colitis (unstable)	Hospital	88	47.4
Back pain/sciatica	Community	2635	45.7
Depression	Community	933	45.4
Anaemia	Community	310	45.3
Crohn's disease (stable)	Hospital	114	45.0
Functional dyspepsia	Hospital	864	42.3
Constipation	**Hospital**	**216**	**41.9**
Crohn's disease (unstable)	Hospital	84	41.2
Diabetes	Community	537	41.1
Coronary heart disease	Hospital	186	40.1
Rheumatoid arthritis	Community	510	39.1
Osteoarthritis	Community	1006	38.3
Haemodialysis	Hospital	1047	36.9
Systemic Lupus	Hospital	1316	36.3

B - MCS

Population	*Setting*	*N*	*Mean MCS*
Healthy individuals only	Community	1300	52.9
Total population	Community	7003	49.9
Chronic allergies	Community	2967	49.1
Ulcerative colitis (stable)	Hospital	193	48.7
Diabetes	Community	537	48.7
Constipation	**Community**	**2091**	**48.6**
Coronary heart disease	Hospital	186	47.8
Osteoarthritis	Community	1006	47.8
Dermatitis	Community	731	47.6
Back pain/sciatica	Community	2635	47.6
Rheumatoid arthritis	Community	510	47.3
Crohn's disease (stable)	Hospital	114	47.1
Functional dyspepsia	Hospital	864	46.8
Systemic Lupus	Hospital	1316	44.3
Haemodialysis	Hospital	1047	44.2
Anaemia	Community	310	43.5
Ulcerative colitis (unstable)	Hospital	88	42.0
Constipation	**Hospital**	**216**	**41.9**
Crohn's disease (unstable)	Hospital	84	40.3
Depression	Community	933	36.1

Table 3. Mean child and parent scores using the PedsQL questionnaire from a range of paediatric studies

A – Child scores

Population	*N*	*Mean score*
Healthy controls [5,26,27]	522	83.0 – 87.7
Cardiac disease (NYHA class I*) [5]	26	83.6
Acute orthopaedic clinic [5]	30	78.1
Cardiac disease (NYHA class II*) [5]	26	75.9
Constipation [27]	51	72.9
Rheumatological clinic [5]	29	71.1
Constipation [26]	80	70.4
ADHD [37]	72	70.2
Cardiac disease (NYHA class III-IV*) [5]	8	60.9

B – Adult scores

Population	*N*	*Mean score*
Healthy controls [5, 26,27]	838	80.7 – 87.6
Cardiac disease (NYHA class I*) [5]	47	86.5
Cardiac disease (NYHA class II*) [5]	49	80.1
Acute orthopedic clinic [5]	43	73.7
Rheumatological clinic [5]	22	72.3
Constipation [26]	80	70.4
ADHD [37]	72	69.5
Cardiac disease (NYHA class III-IV*) [5]	18	67.9
Constipation [27]	51	60.6

*NYHA classification [38]:

- Class I: No limitation of activities; no symptoms from ordinary activities.
- Class II: Mild limitation of activity; comfortable at rest or with mild exertion.
- Class III: Marked limitation of activity; comfortable only at rest.
- Class IV: Severe limitation of activity; symptomatic at rest

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	3-4
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	4
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	n/a
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	4-5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	4-5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	4-5
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	4-5
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	6
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	6
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	n/a
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	6
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	6

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	n/a
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	n/a
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	6 + fig 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Table 1
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	n/a
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	6-10 figs 2-4
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	n/a
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	n/a
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	n/a
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	10-13
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	13-15
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	15-16
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	16

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

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