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Faecal incontinence persisting after childbirth: a 12 year longitudinal study

C MacArthur^a, D Wilson^b, P Herbison^c, RJ_Lancashire^a, Suzanne Hagean^d, P Toozs-Hobson^e, Nicola Dean^f, C Glazener^g on behalf of the Prolong study group

^a Public Health, Epidemiology and Biostatistics, School of Health and Population Sciences, University of Birmingham, Birmingham, UK

^b Department of Women's and Children's Health and ^c Department of Preventive and Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand

^d NMAHP Research Unit, Glasgow Caledonian University, Glasgow, UK

^e Birmingham Women's Hospital, Birmingham Women's NHS Foundation Trust, Edgbaston, Birmingham, UK

^f Department of Obstetrics and Gynaecology, York Hospital, Wiggington Road, York, UK

^g Health Services Research Unit, University of Aberdeen, Aberdeen, UK

Correspondence: Prof C MacArthur, Public Health, Epidemiology and Biostatistics, School of Health and Population Sciences, University of Birmingham, Birmingham B15 2TT, UK. Email c.macarthur@bham.ac.uk, tel: 0121 414 6770.

Short running title: Faecal incontinence 12 years after childbirth

Abstract

Objectives: To investigate persistent faecal incontinence (FI) 12 years after birth and association with delivery mode history and quality of life (QoL).

Design: Twelve year longitudinal study.

Setting: Maternity units Aberdeen, Birmingham, Dunedin.

Population: Women who returned questionnaires three months and 12 years after index birth.

Methods: Data on all births over 12 months were obtained from units and women contacted three months, six and 12 years postbirth.

Main outcome measure: Persistent FI, defined as reported at 12 years and one or more previous contact. SF12 assessed QoL.

Results: Of 7879 women recruited at three months 3763 responded at 12 years, 2944 of whom also responded at six years: non-responders were similar in obstetric factors. Prevalence of persistent FI was 6.0% (227/3763). 43% of 12 year responders who reported FI at three months also reported it at 12 years. Women with persistent FI had significantly lower SF12 scores. Compared with only SVD births, women who had with one or more forceps delivery were more likely to have persistent FI (2.08, 95% CI 1.53 to 2.85) but it was no less likely with exclusively caesarean births (OR 0.93, 95% CI 0.54 to 1.58). More obese than normal weight women reported persistent FI (OR 1.52, 95% CI 1.06 to 2.17).

Conclusions: This longitudinal study has demonstrated persistence of FI many years after birth and shown that one forceps birth increased the likelihood, as did obesity, whilst exclusive caesarean birth showedwas not associated. Obesity, which increased symptom likelihood, is a modifiable risk factor. There was a decrement in quality of life yet few women reported treatment.

Introduction

Faecal incontinence (FI) is an unpleasant problem that is more common in parous women [1]. The prevalence of FI varies according to definition and method of ascertainment and most studies report rates of postpartum FI after one delivery. In our longitudinal study, prevalence of FI at three months after the index birth was 9.6% [2], however some FI symptoms did resolve and at six years postpartum we found that 59% of women who had FI at three months no longer experienced it [3]. Specific aspects of childbirth have been found to be associated with an increased likelihood of FI, including forceps delivery, older maternal age and increasing body mass index [4-7] but again most studies investigate risk factors after one delivery. We have continued our cohort study to 12 year follow up to enable examination of the effects of delivery history. We have already reported that FI at 12 years was increased if a woman had just one forceps delivery; and was not reduced in women who had all their births by caesarean section [8]. Given that FI does resolve however, it is also important to examine persisting FI symptoms but few studies have been able to follow a large enough cohort of women for long enough to do this. This paper presents findings on prevalence of persistent FI, effects on quality of life and relationships with delivery mode history and other obstetric and maternal factors. [The main research questions were the extent to which postpartum FI persists and whether delivery mode history or other factors ~~is~~ are predictive of persistent FI.](#)

Methods

All women who delivered over a 12 month period during 1993/1994 in three maternity units, in Aberdeen (Scotland), Birmingham (England) and Dunedin (New Zealand) were sent a postal questionnaire at three months postpartum to assess prevalence of urinary and faecal incontinence. Women with urinary incontinence at this time were eligible to take part in a randomised controlled trial (RCT) of the effects of an intensive pelvic floor muscle training (PFMT) programme (described elsewhere)

[9,10]. Women who responded at three months were sent another questionnaire at six years postpartum, then another at 12 years, including non-responders at six years but excluding those who requested no further contact in their six year questionnaire and known deaths.

Data collection and outcomes

To assess FI women were asked: “do you ever lose control of bowel motions (stool/faeces) from your back passage in between visits to the toilet?” Response options were ‘never’, ‘occasionally’, ‘sometimes’, ‘most of the time’ and ‘all of the time’. The same wording [and response options](#) applied to the question [on asking about flatus incontinence loss of wind \(flatus\)- “do you ever lose control of wind \(gas\) from your back passafepassage in between visits to the toilet?”](#). The questions were designed by the study team, since at the time of initial recruitment there was no suitable validated questionnaire on FI and we continued with the same form of ascertainment in follow up for consistency.

~~FI was defined as loss of control of bowel motions occurring with any level of frequency (‘occasionally’, ‘sometimes’, ‘most of the time’ and ‘all of the time’). The main outcome of persistent FI was defined as FI reported at 12 years as well as at least one of the previous contact points of three months or six years.~~

~~Subsequent a~~Additional questions to women who reported FI were: whether her FI had started before her first birth and whether she ever had passive incontinence (bowel leakage without being aware until it happened). Further questions on FI were about recent use of pads, plugs or constipating medicines to stop leakage: faecal urgency (hold on for five minutes when had desire to open bowels); ~~any surgical treatment or biofeedback/bowel training;~~ and extent to which FI interfered with everyday life (on 10 point scale from ‘not at all’ to ‘a great deal’). [All women were](#)

asked if in the past they had any surgical treatment or biofeedback/bowel training to treat bowel leakage. The SF12 ~~to assess quality of life~~ was also included in the 12 year questionnaire, ~~which is a~~ a 12 item tool to ~~to assess~~ generic health-related quality of life. It has two summary scores, mental component score (MCS) and physical component score (PCS) which assess mental and physical functioning respectively. Both scores have a range of 0-100 and a mean of 50. (Ware et al 2002).

FI was defined as loss of control of bowel motions occurring with *any level of frequency* ('occasionally', 'sometimes', 'most of the time' and 'all of the time'). The main outcome of persistent FI was defined as FI reported at 12 years as well as at least one of the previous contact points of three months or six years.

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A secondary outcome was persistent flatus incontinence. Since flatus is known to be a much more common symptom, our definition of persistent flatus was flatus reported as *more often than occasional* at 12 years and **at least one** of the previous contact points of three months or six years.

Comment [C1]: Do we still mean 'more often than occasional' at the previous contact points?

Obstetric and maternal data on the index delivery were obtained from the hospital case-notes. Follow-up questionnaires at both six and 12 years obtained date and mode of every delivery from each woman to determine delivery mode history. The initial study and both follow-ups were approved by ethics committees in each centre.

Research questions and analysis

The main research questions investigated in this paper were the extent to which postpartum FI persists and whether delivery mode history is predictive of persistent FI. Secondary research questions were the extent to which postpartum flatus incontinence that is more than an occasional occurrence persists and whether

delivery mode history is predictive of persistent flatus incontinence. The relationship between persistent symptoms and quality of life was another secondary research question.

The variable delivery mode history was created from the reported birth histories at 12 years. This categorised all of a woman's deliveries, including those which pre-dated our first contact with them three months following the index birth into: SVD only; CS only; one or more forceps; one or more vacuum extraction but no forceps; a combination of SVD and CS.

Multiple logistic regression was used to investigate independent associations between delivery mode history and outcomes, adjusting for age at first birth (<25/25-29/30-34/35+), total number of births (one/two/three/four or more), current BMI (underweight, normal weight, overweight, obese and not known) and ethnic origin (non-Asian/Asian): and to report on other independent associations.

More detailed obstetric factors were only available from case-notes for index births so to investigate further obstetric associations a sub-group analysis restricted to women for whom the index birth was their first (index primiparae) was undertaken. The additional obstetric and maternal variables included were onset of labour (not induced/induced), perineal trauma (intact/episiotomy/laceration), and birthweight

(quartiles). Data on laceration sub-divisions was not recorded in a comparable format from all three units making it not possible to so that we could not investigate third or fourth degree tears. -use as a variable could not be obtained.

Comment [C2]: What do we mean by that? 3rd or 4th degree tears? It seems a bit cryptic to me.

Cases with missing values were omitted from the models.

Comment [C3]: ? except for BMI which was assigned a 'missing' category ??? ADD IF CORRECT

Results

10989 women had been sent a questionnaire at three months postpartum and 7879 had replied. At six years, 117 women had requested no further contact and there were 41 subsequent deaths and at 12 years further checking of records identified four additional women from three months eligible to receive a 12 year questionnaire. Excluding the 158 women who requested no further contact or had died, 7725 follow-up questionnaires were sent at 12 years. 798 were returned as 'moved away' by the post office and 3763 were returned completed by the women, a response rate of 48.7% (3763/7725). Among these 3763 women, 2944 (78.2%) replied at all three contact points and 819 (21.8%) at three months and 12 years, but not at six years. The 2944 responses represent 69.9% (2944/4214) of women who had replied at six years. Mean duration of follow up was 12.9 years (SD 0.67; range 10.6-14.3) and mean maternal age at follow-up was 42.4 years (SD 4.9; range 27-58).

Comparison of characteristics of respondents (R) and non-respondents (NR) at 12 years showed some differences (Table previously shown [8]). Fewer respondents had been under 25 years at index birth (17.3% for R, 28.5% for NR), fewer were Asian (4.0% for R, 9.1% for NR), fewer were multiparous (53.2% for R, 56.4% for NR) and fewer had an intact perineum (27.0% for R, 36.8% for NR). Delivery mode, onset of labour and length of second stage of index birth were similar. The prevalence of FI at three months was lower among respondents (8.2% for R, 9.5% for NR), which is likely to slightly underestimate the prevalence of symptoms at 12 years.

Prevalence, persistence and effects of FI

The prevalence of persistent FI at 12 years was 6.0% (227/3763). Table 1 shows the pattern of FI across the three contact points at three months, six years and 12 years for all women and separately for women who had had their first baby at our first contact with the cohort at three months (index primiparae). Among all women who

replied at 12 years, 19.9% (747/3763) had reported FI on at least one of the contact points: total FI prevalence at 12 years was 12.9% (487/3763) compared to 9.7% (287/2944) at six years and 8.2% (307/3763) at three months. Among the index primiparae the proportions with persistent FI and with FI at the various contact points were the same as for all women in the sample.

Resolution and new onset of FI symptoms both occurred. Among the 307 women who had reported FI at three months, 131 (42.7%) also reported it at 12 years whilst in 176 (57.3%) symptoms had resolved by 12 years. Even among the latter 19.9% (35/176) had still had FI at our six year contact so it had not just been a short term problem. Of the 3456 women with no FI at three months there were 356 (10.3%) who reported it at 12 years, and in 96 (27.0%) of these cases it had persisted from six years. Again the pattern was the same among those who had given birth for the first time at our three month contact (index primiparae).

Most of the 227 women who reported persistent FI reported it as occurring occasionally at 12 years, with 27.3% (62/227) reporting it occurring more frequently than this. Very few of the women with persistent FI (7.9%,18/227) said that it had started before having their first baby. There was indication of some severe symptoms: among the women with persistent FI 22.9% (52/227) said at 12 years that they sometimes had leakage without being aware until it had happened; 7.5% (17/227) wore a pad or plug and 9.3% (21/227) used constipating medicine to protect against leakage. In terms of interference with everyday life, 14.1% of the women with persistent FI (32/227) reported no effect at all and on a scale 0-10 where 10 is a great deal, 29.1% (66/227) rated it as 5 or more. Only six women with persistent FI said that they had had surgical treatment for this and three more reported physiotherapeutic treatment.

The quality of life SF12 Mental Component Score (MCS) and Physical Component Score (PCS) were significantly lower (worse) among women with than without persistent FI (Table 2). Given that the group without persistent FI comprised three sub-groups (FI at 12 years but not before; FI sometime since index birth but not at 12 years; no FI) we looked separately at mean MCS and PCS scores in these groups (Table 2). It was the group with no FI at all that had the significantly higher SF12 scores although the difference in MCS for those who previously had FI that was now resolved almost reached statistical significance.

We also asked about faecal urgency at 12 years and among the women with persistent FI, 41.0% (93/227) also reported faecal urgency. Among those in the sample without persistent FI but FI at some time, the proportion also reporting faecal urgency was 20.0% (104/ 520), whilst among those who had no FI at any time only 4.4% (104/2347) reported faecal urgency.

Persistent faecal incontinence and delivery mode history

Persistent FI was significantly more common if any of a woman's births were by forceps, but there was no association for a delivery history mode that included vacuum extraction but no forceps. There was no association between persistent FI and a history of exclusively CS births or where the history comprised SVD and CS births (Table 3). Current BMI also showed an independent association: obese women had significantly more persistent FI compared with those of normal weight.

Significantly more Asian women reported persistent FI, but [this was](#) based on small numbers [\(n=10/67\)](#). There were trends for more persistent FI with increasing maternal age at first birth and total number of births, but differences were not statistically significant except for age 30-34 at first birth (Table 3) The comparison shown in Table 3 is between women with and those without persistent FI and the latter includes women with no FI at all as well as those who experienced FI but not

persistently We repeated the logistic regression model excluding women who experienced non-persistent FI and the same pattern of associations remained (data not shown).

To consider whether other obstetric factors (only available for index births) might be associated with persistent FI, the model was repeated for those for whom index birth was their first (Table 4). None of these obstetric factors were significantly associated with persistent FI, although there was a non-significant increase in women who had a non-intact perineum. The increased likelihood of persistent FI with any forceps birth and lack of effect for only CS births remained with entry of the additional obstetric factors into the model.

Persistent flatus incontinence: prevalence and delivery mode history

The prevalence of persistent flatus incontinence (more often than occasional) at 12 years was greater than persistent FI, being reported by 18.8% of the women (709/3763) (Table 5). Persistent flatus incontinence, experienced with any degree of frequency, was very common, reported by over half of the sample (53.4% 2011/3763).

The quality of life SF12 [MCS and PCS](#) scores for women with persistent non-occasional flatus incontinence (after excluding women with persistent FI) [are](#) shown in Table 2. Overall women with persistent flatus had higher MCS and PCS scores than those with persistent FI but they were significantly lower (worse) than among the women with no persistent flatus.

The pattern of associations with delivery history for persistent flatus (more often than occasional) was the same as for persistent FI: an increase among women who had any forceps birth and no association for vacuum without forceps, for exclusive

caesarean births or for mixed SVD and CS births. There were no significant associations for maternal age at first birth, parity or Asian ethnicity but persistent flatus was more common among women who were overweight and obese at 12 years (Table 6). As for persistent FI, the model including index primiparae and other obstetric factors at the index birth showed no other associations with persistent flatus incontinence (data not shown).

Discussion

This large longitudinal study, following women to 12 years after index birth, has shown that 6% had persistent FI since either their three month or six year follow-up. FI occurring after birth seemed to have become persistent for just under half [these](#) women: of those who had FI when first asked at three months, 42.7% also reported it at 12 years. The same pattern of persistence and resolution of FI was evident for women of any parity at index birth and separately for those who had just delivered their first baby. Although most women with persistent FI reported this as an occasional occurrence, over a quarter said it was more common than this at 12 year follow up and just under a quarter sometimes had leakage without any prior awareness. There was a clear [association with effect on](#) quality of life: women with persistent FI had significantly worse SF12 mental and physical component scores with the greatest effect on the mental score; yet only nine women reported having surgical or physiotherapeutic treatment. Prevalence of persistent flatus incontinence (more than occasional) was 18.8% and was also significantly associated with reduced quality of life.

We have already reported that delivery mode history was a predictor of any FI at 12 years [8] and this paper has shown the same delivery mode history pattern to be predictive of FI that is persistent. This has not previously been reported in the literature. Relative to having only SVD births, one or more forceps in the delivery

history was predictive of persistent FI, whilst having delivered exclusively by CS, having one or more vacuum extraction deliveries or a combination of CS and SVD births showed no differences. For any FI at 12 years we had sub-divided the exclusive CS group into only pre labour, only post labour and a mix of both and shown no difference [8]. For persistent FI numbers were too small for us to consider them meaningful, however this issue is of great interest to clinicians so we have reported them in a footnote on Table 2 showing no obvious difference indicated for type of CS. BMI categorised as obese at 12 years was independently associated with persistent FI, as was older age (30-34) at first birth and Asian ethnicity. Persistent incontinence of flatus showed a similar pattern of independent associations with delivery history and greater BMI.

[There is very little literature on long term postpartum faecal incontinence and almost none documenting extent of persistence. Dolan and Hilton \[14\] sent postal questionnaires \(including Sheffield pelvic floor questionnaire\) to women 20 years after they had their first baby in one UK unit in 1983-6 and 888 \(62%\) responded to questions on FI. Prevalence of FI at 20 years was 23.1%, higher than our 12 year prevalence of 12.9% \[8\], although only 3% of the women with FI in their study reported it as more often than occasional compared to our 27%. They found that women who had instrumental first births were more likely to have FI at 20 years, consistent with our findings although they did not subdivide type of instrument used or take account of subsequent births. Also consistent with our findings was an association between increasing BMI and 20 year FI. The women in this study had not been contacted prior to the 20 year questionnaire so there was no data on persistent FI 20 years post birth.](#)

[A US population based study using a postal survey at three to six months postpartum \(40% response\) then to follow up of symptomatic women at one and two years had](#)

Comment [C4]: I don't quite follow what survey followed up which women??

some data on persistence of postpartum FI. At first contact 29% of the 8774 responders reported anal incontinence (flatus and stool) in the last 30 days and almost half of these included FI [7]. Follow up showed that for all anal incontinence prevalence decreased over time from 45% at one year to 28% of those initially reporting at two years: and with significant effect on several quality of life indicators relative to resolved cases [15]. For those with FI the proportion with persistence after initial contact remained stable up to two years, at 35%. This is a little lower than in our study but less than half of the original symptomatic women responded again and the assumption made was that all non-responding cases had resolved which is not likely. They found that women with persistent anal incontinence were significantly more likely to report greater adverse effects on various quality of life items and that this was 4 to 7 times higher for persistent FI. Only 17% of women reported ~~Reporting~~ persistent anal incontinence symptoms to a medical provider at two years. ~~was only 17%.~~

In a US study, Handa *et al* [16] ~~in a US study to compare~~ three groups of women: those with anal sphincter tear, vaginal birth without sphincter tear and caesarean delivery. ~~used~~ The SF12 ~~was used~~ to assess quality of life in women who reported FI at six months postpartum. As in the current study, they found both MCS and PCS to be significantly reduced in symptomatic women and there was a greater effect on MCS. Their SF12 scores overall were higher than in our study, unsurprising since they were not investigating persistent symptoms.

The large size and long duration are the main strengths of the present is study. It is the largest postpartum cohort study in the literature with this length of follow-up, only small studies having longer follow up [4,11, ref numbering will now need to change].

Without long term follow-up it is not possible to ascertain the extent to which postpartum FI, which we now know to be relatively common, is transient or continues

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as a chronic problem for women and our intention is to follow the sample again at 20 years. Unless a study is large there will be inadequate numbers of women in the various delivery mode history groups to be able to make comparisons of persistent incontinence with an acceptable level of precision.

Obstetric data for the index delivery was available from case records, although data on overall delivery history was obtained directly from the women. Validation studies, however, have shown that women's reports of delivery details are accurate [12] and we checked accuracy of reports for index birth delivery mode with hospital obstetric records showing that for 98% of CS, 98% of SVD, 87% of forceps and 88% of vacuum deliveries data were consistent.

The rate of our follow-up at 12 years may be considered the main limitation of the study at just under 50% of those initially contacted at three months and 54% excluding those known to have moved house. However, it is important to consider the ways in which this might produce bias. The initial intention of the study had been for a single three month contact so we did not seek alternative contact details in the event of a house move. At six years, alternative contact details to facilitate subsequent follow-up were sought and loss between six and 12 years was much smaller, with 70% of the six year responders responding again. At 12 years, additional methods of tracing were available in the UK centres. As a result 819 women who had moved by six years and thus had not responded did so when traced to a different address at 12 years. It is therefore likely that much non-response was not purposeful and geographical mobility is not known to be systematically associated with incontinence or delivery mode. We had computerised index birth note data for all women and comparisons were made between responders and non-responders at 12 years to examine possible response bias. The main differences were that fewer younger women (under 25) responded as did fewer from ethnic

minority groups, which is a typical response pattern among childbirth populations [13]. Given that the younger women had a lower rate of FI, the age difference is likely to lead to some overestimate from the study of overall prevalence of FI. The reverse was the case for ethnic groups, with Asian women reporting higher rates of FI. Obstetric factors, however, particularly mode of delivery, were broadly similar between responders and non-responders. So although demographic differences of responders might have some effect on symptom prevalence estimates, it is harder to see how they might bias delivery mode history associations. Another study weaknesses are-is that a validated questionnaire was not used to assess FI, but at the time of recruitment in 1993 there were none available and we wanted to follow-up women using consistent questioning: and BMI was calculated based on self-reported height and weight which is subject to bias, but no other options was available.

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Handa *et al* [16] in a US study to compare three groups of women, those with anal sphincter tear, vaginal birth without sphincter tear and caesarean delivery, used the SF12 to assess quality of life in women who reported FI at six months postpartum. As in the current study they found both MCS and PCS to be significantly reduced in symptomatic women and there was a greater effect on MCS. Their SF12 scores overall were higher than in our study, unsurprising since they were not investigating persistent symptoms.

Conclusions

This large longitudinal study has demonstrated the persistence of faecal and flatus incontinence many years after birth and shown that one forceps birth increased the likelihood of this, whilst exclusive caesarean birth did not show an effect. Current BMI categorised as obese increased the likelihood, as did Asian ethnic group but

based on small numbers. There was a clear [association with decrement in](#) quality of life yet almost no women reported having treatment.

Disclosure of interest

All authors declare that they have no interests to declare.

Contribution to authorship

CM, CG, DW, RL and PH contributed to design and analysis of the whole ProLong study. SH, ND and PT-H joined the study group at 12 years and contributed to this part of the study. CM drafted the paper with CG and all authors commented. Other members of the ProLong study group are Adrian Grant and Christine Bain.

Details of ethics approval

Ethical approval from UK centres for the 12 year follow up was obtained from Multicentre Research Ethics Committee Edinburgh, Ref No RG 819/06, November 2007 and from New Zealand National Ethics Committee, Ref No LRS/05/04/009 March 2005.

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Table 1: Faecal incontinence among all women at each contact among those who replied at 12 years (n=3763) and for primiparae at index delivery (n=1760)

3 months	6 years	12 years	Total all women		Total Primips	Index
			no.	(%)	no	(%)
No	No	No	2347	(62.4)	1106	(62.8)
No	Yes	No	84	(2.2)	36	(2.0)
No	--	No	669	(17.8)	325	(18.5)
No	No	Yes	173	(4.6)	78	(4.4)
No	Yes	Yes	96	(2.6)	45	(2.6) *
No	--	Yes	87	(2.3)	32	(1.8)
Yes	No	No	106	(2.8)	48	(2.7)
Yes	Yes	No	35	(0.9)	15	(0.9)
Yes	--	No	35	(0.9)	17	(1.0)
Yes	No	Yes	31	(0.8)	14	(0.8) *
Yes	Yes	Yes	72	(1.9)	31	(1.8) *
Yes	--	Yes	28	(0.7)	13	(0.7) *
Total at 3 mths	Total at 6 yrs	Total at 12 yrs	Total at any time		Total at any time	
<i>All women</i>	<i>All women</i>	<i>All women</i>	<i>All women</i>			
307/3763	287/2944	487/3763	747/3763			
(8.2%)	(9.7%)	(12.9%)	(19.9%)			
<i>Index primips</i>	<i>Index primips</i>	<i>Index primips</i>			<i>Index primips</i>	
138/1760	127/1373	213/1760			329/1760	
(7.8%)	(9.2%)	(12.1%)			(18.7%)	

-- non-response as not all women replied at 6 years as well as 12 years .

* Persistent FI

Table 2: Quality of Life - comparison of SF12, MCS and PCS scores for faecal incontinence and flatus incontinence

FI	Persistent	Not persistent	Not persistent		
			At 12 years not before	Sometime not at 12 years	None
n (%)	<u>225 (6.1)</u>	<u>3463 (93.9)</u>	<u>255 (6.9)</u>	<u>257 (7.0)</u>	<u>2951 (80.0)</u>
MCS	<u>42.59</u>	<u>47.08</u>	<u>43.38</u>	<u>44.37</u>	<u>47.63</u>
Diff (95% CI)*		<u>4.49 (3.10 to 5.87)</u>	<u>0.79 (-1.24 to 2.81)</u>	<u>1.78 (-0.14 to 3.70)</u>	<u>5.04 (3.59 to 6.50)</u>
p*		<u><0.001</u>	<u>0.443</u>	<u>0.069</u>	<u><0.001</u>
PCS	<u>51.27</u>	<u>53.98</u>	<u>50.94</u>	<u>52.54</u>	<u>54.37</u>
Diff (95% CI)*		<u>2.71 (1.33 to 4.10)</u>	<u>-0.32 (-2.24 to 1.59)</u>	<u>1.27 (-0.56 to 3.09)</u>	<u>3.10 (1.72 to 4.49)</u>
p*		<u><0.001</u>	<u>0.739</u>	<u>0.172</u>	<u><0.001</u>
Flatus incontinence+					
n (%)	<u>575 (16.6)</u>	<u>2888 (83.4)</u>	<u>415 (12.0)</u>	<u>692 (20.0)</u>	<u>1781 (51.4)</u>
MCS	<u>44.75</u>	<u>47.54</u>	<u>44.43</u>	<u>46.62</u>	<u>48.63</u>
Diff (95% CI)*		<u>2.79 (1.84 to 3.75)</u>	<u>-0.32 (-1.72 to 1.08)</u>	<u>1.87 (0.71 to 3.03)</u>	<u>3.88 (2.89 to 4.86)</u>
p*		<u><0.001</u>	<u>0.655</u>	<u>0.002</u>	<u><0.001</u>
PCS	<u>53.18</u>	<u>54.14</u>	<u>52.82</u>	<u>53.95</u>	<u>54.53</u>
Diff (95% CI)*		<u>0.96 (0.17 to 1.75)</u>	<u>-0.36 (-1.52 to 0.81)</u>	<u>0.77 (-0.19 to 1.73)</u>	<u>1.35 (0.53 to 2.16)</u>
p*		<u>0.017</u>	<u>0.548</u>	<u>0.117</u>	<u>0.001</u>

* Comparison of Persistent FI by FI status

+ After removing Persistent FI cases

Table 2: Quality of Life - comparison of SF12, MCS and PCS scores for faecal incontinence and flatus incontinence

FI	Persistent	Not persistent	Not persistent		
			At 12 years not before	Sometime not at 12 years	None
n (%)	225 (6.1)	3463 (93.9)	255 (6.9)	257 (7.0)	2951 (80.0)
MCS	42.6	47.1	43.4	44.4	47.6
Diff (95% CI)*		4.5 (3.1 to 5.9)	0.7 (-1.2 to 2.8)	1.8 (-0.1 to 3.7)	5.0 (3.6 to 6.5)
p*		<0.001	0.443	0.069	<0.001
PCS	51.3	54.0	50.9	52.5	54.4
Diff (95% CI)*		2.7 (1.3 to 4.1)	-0.3 (-2.2 to 1.6)	1.3 (-0.6 to 3.1)	3.1 (1.7 to 4.5)
p*		<0.001	0.739	0.172	<0.001
Flatus incontinence+					
n (%)	575 (16.6)	2888 (83.4)	415 (12.0)	692 (20.0)	1781 (51.4)
MCS	44.8	47.5	44.4	46.6	48.6
Diff (95% CI)*		2.8 (1.8 to 3.7)	-0.3 (-1.7 to 1.1)	1.9 (0.7 to 3.0)	3.9 (2.9 to 4.9)
p*		<0.001	0.655	0.002	<0.001
PCS	53.2	54.1	52.8	53.9	54.5
Diff (95% CI)*		1.0 (0.2 to 1.8)	-0.4 (-1.5 to 0.8)	0.8 (-0.2 to 1.7)	1.3 (0.5 to 2.2)
p*		0.017	0.548	0.117	0.001

* Comparison of Persistent FI by FI status

+ After removing Persistent FI cases

Table 3: Logistic regression of persistent FI and delivery mode history

Variable	Total	Unadjusted persistent FI no. %	Adjusted OR	(95% CI)	p
Delivery mode history					
Only SVD	1858	85 (4.6)	Reference		
Only CS *	403	18 (4.5)	0.93	(0.54 to 1.58)	0.777
Any forceps	956	89 (9.3)	2.08	(1.53 to 2.85)	<0.001
Any vacuum no forceps	248	14 (5.6)	1.22	(0.68 to 2.19)	0.509
SVD + CS	294	21 (7.1)	1.46	(0.89 to 2.40)	0.139
Age at 1st birth					
≤ 24	1274	75 (5.9)	Reference		
25-29	1493	82 (5.5)	1.01	(0.72 to 1.42)	0.962
30-34	788	56 (7.1)	1.48	(1.00 to 2.18)	0.050
35 ≥	204	14 (6.9)	1.48	(0.79 to 2.76)	0.223
Number of births					
One	411	17 (4.1)	Reference		
Two	1836	110 (6.0)	1.50	(0.88 to 2.57)	0.135
Three	1015	65 (6.4)	1.67	(0.94 to 2.95)	0.080
Four or more	497	35 (7.0)	1.67	(0.88 to 3.18)	0.119
BMI at 12 yrs					
Underweight	61	5 (8.2)	1.71	(0.66 to 4.40)	0.267
Normal	1786	97 (5.4)	Reference		
Overweight	1020	61 (6.0)	1.11	(0.80 to 1.56)	0.525
Obese	643	51 (7.9)	1.52	(1.06 to 2.17)	0.023
NK	249	13 (5.2)	0.95	(0.52 to 1.72)	0.852
Asian ethnicity					
No	3598	209 (5.8)	Reference		
Yes	161	18 (11.2)	2.06	(1.20 to 3.53)	0.008

Total n=3759: 4 cases excluded from analysis due to missing delivery history data

*Only CS sub-divisions: only pre-labour 7/124; only post labour 2/109; only pre/post labour 9/170

Table 4 Logistic regression persistent FI and delivery mode history among index primiparae (n=1759)

Variable	Total	Unadjusted persistent FI no. %	Adjusted OR	(95% CI)	p
Delivery mode history					
Only SVD	843	34 (4.0)	Reference		
Only CS	244	9 (3.7)	0.75	(0.35 to 1.62)	0.463
Any forceps	395	41 (10.4)	2.65	(1.64 to 4.28)	<0.001
Any vacuum no forceps	171	12 (7.0)	1.78	(0.89 to 3.55)	0.101
SVD + CS	106	7 (6.6)	1.45	(0.61 to 3.43)	0.403
Age at 1st birth					
≤ 24	487	22 (4.5)	Reference		
25-29	669	34 (5.1)	1.22	(0.68 to 2.17)	0.505
30-34	462	35 (7.6)	2.08	(1.15 to 3.75)	0.015
35 ≥	141	12 (8.5)	2.42	(1.10 to 5.30)	0.027
Number of births					
One	401	17 (4.2)	Reference		
Two	928	61 (6.6)	1.68	(0.94 to 3.00)	0.078
Three	337	21 (6.2)	1.57	(0.78 to 3.15)	0.205
Four or more	93	4 (4.3)	0.78	(0.23 to 2.66)	0.695
BMI at 12 yrs					
Underweight	29	3 (10.3)	2.28	(0.63 to 8.26)	0.209
Normal	835	42 (5.0)	Reference		
Overweight	480	34 (7.1)	1.62	(1.00 to 2.62)	0.051
Obese	308	19 (6.2)	1.35	(0.76 to 2.40)	0.301
NK	107	5 (4.7)	0.81	(0.31 to 2.16)	0.680
Asian ethnicity					
No	1692	93 (5.5)	Reference		
Yes	67	10 (14.9)	4.59	(2.08 to 10.13)	<0.001

Total n=1759: 1 case excluded from analysis due to missing delivery history data

Table 5: Flatus incontinence among all women at each contact among those who replied at 12 years (n=3763) and for primiparae at index delivery (n=1760)

3 months	6 years	12 years	Total all women		Total Primips	Index
			no.	(%)	no	(%)
No	No	No	1395	(37.1)	662	(37.6)
No	Yes	No	251	(6.7)	108	(6.1)
No	--	No	451	(12.0)	208	(11.8)
No	No	Yes	295	(7.8)	153	(8.7)
No	Yes	Yes	224	(6.0)	96	(5.5) *
No	--	Yes	159	(4.2)	78	(4.4)
Yes	No	No	211	(5.6)	96	(5.5)
Yes	Yes	No	178	(4.7)	81	(4.6)
Yes	--	No	114	(3.0)	54	(3.1)
Yes	No	Yes	111	(2.9)	43	(2.4) *
Yes	Yes	Yes	279	(7.4)	134	(7.6) *
Yes	--	Yes	95	(2.5)	47	(2.7) *
Total at 3 mths	Total at 6 yrs	Total at 12 yrs	Total at any time	Total at any time		
<i>All women</i>	<i>All women</i>	<i>All women</i>	<i>All women</i>			
988/3763	932/2944	1163/3763	1917/3763			
(26.3%)	(31.7%)	(30.9%)	(50.9%)			
<i>Index primips</i>	<i>Index primips</i>	<i>Index primips</i>		<i>Index primips</i>		
455/1760	419/1373	551/1760		890/1760		
(25.9%)	(30.5%)	(31.3%)		(50.6%)		

-- non-response as not all women replied at 6 years as well as 12 years
 * persistent flatus incontinence

Table 6: Logistic regression of persistent flatus incontinence and delivery mode history

Variable	Total	Unadjusted persistent flatus no. %	<u>Adjusted</u> OR	(95% CI)	p
Delivery mode history					
Only SVD	1858	318 (17.1)	Reference		
Only CS	403	69 (17.1)	0.88	(0.66 to 1.18)	0.394
Any forceps	956	227 (23.7)	1.46	(1.20 to 1.77)	<0.001
Any vacuum no forceps	248	39 (15.7)	0.86	(0.60 to 1.24)	0.418
SVD + CS	294	56 (19.0)	1.13	(0.82 to 1.55)	0.460
Age at 1st birth					
≤ 24	1274	231 (18.1)	Reference		
25-29	1493	277 (18.6)	1.04	(0.85 to 1.28)	0.681
30-34	788	157 (19.9)	1.16	(0.91 to 1.48)	0.234
35 ≥	204	44 (21.6)	1.26	(0.86 to 1.85)	0.234
Number of births					
One	411	81 (19.7)	Reference		
Two	1836	360 (19.6)	1.01	(0.77 to 1.34)	0.919
Three	1015	170 (16.7)	0.84	(0.62 to 1.14)	0.264
Four or more	497	98 (19.7)	0.99	(0.69 to 1.42)	0.959
BMI at 12 yrs					
Underweight	61	8 (13.1)	0.80	(0.38 to 1.71)	0.566
Normal	1786	294 (16.5)	Reference		
Overweight	1020	216 (21.2)	1.38	(1.13 to 1.68)	0.001
Obese	643	154 (24.0)	1.62	(1.29 to 2.02)	<0.001
NK	249	37 (14.9)	0.89	(0.61 to 1.29)	0.529
Asian ethnicity					
No	3598	676 (18.8)	Reference		
Yes	161	33 (20.5)	1.14	(0.76 to 1.72)	0.516

Total n=3759: 4 excluded from analysis due to missing delivery history data