

# Pelvic Floor Dysfunction in Nulliparous Women: A Comparison with Parous Women

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## ABSTRACT

**OBJECTIVE** – To compare incontinence and pelvic organ prolapse in women who have not had children with those who had children 12 years ago and are involved in an on-going study.

**METHOD** – We advertised for women who have not had children and asked them to attend for a pelvic examination and complete a questionnaire, enquiring about symptoms of incontinence and pelvic organ prolapse.

**RESULTS** – A total of 30 nulliparous women were recruited. We found that there was an increase in the POP-Q stage (ie. more prolapse) for all parous women regardless of the mode of delivery when compared to nulliparous women. This was statistically significant in all groups, except in the caesarean section only group. Significance remained even when age and parity was adjusted for in the parous groups.

**CONCLUSIONS** - This study confirms that a small degree of prolapse is normal in nulliparous women, especially with increasing age. The degree of prolapse is increased by pregnancy and parturition, especially in those women with vaginal deliveries.

## INTRODUCTION

Pelvic floor dysfunction has a significant effect on the quality of life for a large number of women and has great cost implications for health services. About one third of women have some degree of urinary incontinence, 3-4 per cent have faecal incontinence and 9-10 per cent have symptoms of prolapse.<sup>1</sup> Symptoms of pelvic organ prolapse include vaginal discomfort and urinary and bowel dysfunction. However they can also be vague and non-specific. It is therefore difficult to assess pelvic organ prolapse with symptoms alone.<sup>2,3</sup>

The bones, ligaments and muscles of the female pelvis have evolved from our ancestors. The transition from quadrupedal to bipedal ambulation has resulted in a change of function of the pelvic floor muscles, having evolved from being tail-movers to providing pelvic support.<sup>4,5</sup> The human birth canal seems to have evolved more as a result of bipedalism, rather than for parturition. It is also curved so that human labour is more complicated in comparison to other primates (with a straight birth canal) due to the maneuvering required of the fetus. This increases the risk of complications, such as trauma to the pelvic floor during birth.<sup>6</sup> One study estimates that

by age 80, 11.1 per cent of women will need to undergo surgery for urinary incontinence or pelvic organ prolapse.<sup>7</sup> There is very little published data on the prevalence of prolapse in the general population, especially in nulliparous and asymptomatic women. In a Swedish study, 30 per cent of the general population were found to have some form of prolapse on examination.<sup>8</sup> There has only been one small, case-control study comparing nulliparous with primigravida women and it showed that pregnant women have more vaginal prolapse. None of the nulliparous women had stage 2 prolapse compared with 47.6 per cent of the primigravida women. Only 9.6 per cent of the pregnant women had no sign of prolapse, compared to 42.8 per cent of the nulliparous women.<sup>9</sup> Childbirth is a significant risk factor for pelvic organ dysfunction<sup>1,2,10,11</sup> and it is clear that there are contributions from both pregnancy and parturition. A large on-going longitudinal study involving women in Dunedin (NZ), Aberdeen (UK) and Birmingham (UK), who gave birth 10-12 years ago, has shown that modes of delivery, parity and pre-pregnancy BMI are all related to the prevalence of urinary incontinence. This study also showed that delivery solely by caesarean section is partially protective for urinary incontinence, especially in the short term.<sup>3</sup>

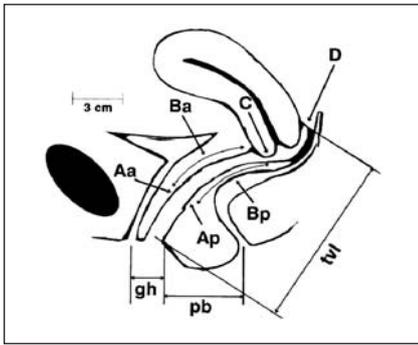
This longitudinal study aims to investigate the relationship of pelvic organ prolapse with mode of delivery. The Pelvic Organ Prolapse Quantified (POP-Q) scale, used in this study was developed by urogynaecologists to provide an objective assessment of prolapse of the uterus, anterior vaginal wall (cystocele) and posterior vaginal wall (rectocele). It allows site specific observations of stability or progression of prolapse over time and also allows judgements regarding outcomes of surgical repair. It involves nine measurements that are combined to give one of five stages of pelvic organ support. Stage 0 is no prolapse and stage 4 is complete eversion of the lower genital tract.<sup>12</sup>

This present study aims to compare the prevalence of pelvic organ prolapse in nulliparous women to those women who gave birth 10-12 years ago and who are part of the on-going longitudinal study mentioned above.

## METHODS

This study was approved by the Otago Regional Ethics Committee. We advertised at GP surgeries, family planning clinics, fertility clinics and around the University and hospital, for nulliparous women between the ages of 30-50 years and offered to assess them for pelvic organ prolapse and at the same time, perform a cervical smear if required. We examined thirty women, and asked them to complete a questionnaire enquiring about any symptoms of urinary incontinence, faecal incontinence and pelvic organ prolapse. The Pelvic Organ Prolapse Quantified (POP-Q) scale was used to assess prolapse in these women. The POP-Q scale uses nine measurements to stage prolapse that are set out in Figure 1. From these

Figure 1. Diagram of POP-Q measurements and POP-Q measurement grid<sup>12</sup>



anterior wall <b>Aa</b>	anterior wall <b>Ba</b>	cervix or cuff <b>C</b>
genital hiatus <b>gh</b>	perineal body <b>pb</b>	total vaginal length <b>tvl</b>
posterior wall <b>Ap</b>	posterior wall <b>Bp</b>	posterior fornix <b>D</b>

measurements, the prolapse is staged as shown in Table 1.<sup>12</sup>

The women were examined by the same investigator (ND) in the dorsal lithotomy position with the woman having an empty bladder. All measurements except for total vaginal length were taken with the patient performing a maximal valsalva manoeuvre. The women were coached by the examiner to perform this manoeuvre, or a forceful cough.

These nulliparous women were compared with women who gave birth in Dunedin in 1993. From June to August 2005, 424 women completed questionnaires and 166 had POP-Q examinations. Data was age-matched and the prevalence of urinary and faecal symptoms and prolapse measurements among the nulliparous women was compared to women from the original study.

Mode of delivery for the parous women was grouped into four categories, taking into account their entire reproductive history. These groups were: CS only – all deliveries were by caesarean section; SVD & CS – any combination of spontaneous vaginal delivery and caesarean section; SVD – spontaneous vaginal delivery only; and AVD – at least one assisted vaginal delivery (forceps or vacuum).

Results were compared using multinomial logistic regression in STATA V9.

## RESULTS

A total of 30 nulliparous women were recruited and attended for POP-Q examinations. The mean age was slightly younger in the nulliparous women (37 years old), compared to the parous groups (40 years old). Table 2 shows the results of POP-Q stages within these groups. Figure 2 shows the distribution of the POP-Q grades across the groups, with instrumental delivery having the highest prolapse grades, followed by caesarean section and the lowest grades of prolapse being seen in the nulliparous women. The anterior compartment most commonly contributed to a stage I prolapse in nulliparous women, with 70.5 per cent of nulliparous women in the stage I groups having some anterior vaginal wall descent.

The POP-Q stages were significantly higher among the SVD & CS, SVD and AVD delivery groups compared to the nulliparous group ( $p = 0.001$ ,  $<0.0001$  and  $<0.0001$ , respectively). Even when adjusted for age, parity (in the parous women), BMI and smoking, this significance remained. Although a POP-Q stage of 2 or greater was three times more likely in the CS only group compared to the nulliparous group this was not significant ( $p = 0.11$ ), but could be due to the small number of women in this group ( $n=14$ ).

Advancing age and increasing parity independently had statistically significant effect

on increasing POP-Q grade but did not affect the relationship between mode of delivery and POP-Q grade. However, there was no relationship between BMI or smoking with the grade of POP-Q in any of the groups.

## DISCUSSION

This study shows a significant increase in POP-Q stages in women that have undergone spontaneous vaginal delivery and caesarean section, spontaneous vaginal delivery only and instrumental delivery when compared to the nulliparous women. The caesarean section only group did not have a statistically significant increase in POP-Q stage when compared to the nulliparous women. The caesarean section only group was quite small ( $n=14$ ) so this may be one reason why there was no significant difference between those women and nulliparous women. Advancing age and parity also exerts statistically significant effects on prolapse stage but did not affect the relationship between mode of delivery and POP-Q stage. We recruited 30 nulliparous women for this study; however it would have been better to have a larger sample that would have increased the power of this study to detect differences between mode of delivery groups and prolapse stage.

The proportion of women in each POP-Q stage found in this study was similar to that seen in other studies. A study on nulliparous women in a US military academy found that 46 per cent had stage I and 4 per cent of the women had stage 2 prolapse. The women with stage I prolapse in this study (46 per cent), most commonly had prolapse in the anterior compartment. This study suggested that a small amount of prolapse in the anterior compartment seems to be quite common in nulliparous women and that it should be considered as normal.<sup>13</sup> Our findings seem to agree with this as anterior compartment movement was the most common site that contributed to the women having stage I pelvic support. However, most of these women did not have any associated symptoms. In a study of nulliparous women seen at a gynaecological clinic (mean age = 44), 58.3 per cent had stage I prolapse and 14.6 per cent had stage 2 and the rest of these women had no signs of prolapse on examination. This was compared to multiparous women (>3 pregnancies) where 4.6 per cent had stage 3 prolapse and 64.6 per cent had stage 2 prolapse on examination.<sup>11</sup> An Italian study found that the risk of pelvic organ prolapse increases with the number of vaginal births a woman has had, and that age and parity are the most important determinants for risk of prolapse.<sup>14</sup> This agrees with our study's findings. A study of older women (mean age 68), enrolled in an HRT trial, who were nulliparous found that 17 per cent had stage 0 or I prolapse and 5.8 per cent had stage 2 or 3. This study also found no association between BMI and smoking and pelvic organ prolapse.<sup>15</sup>

Another study of women that were enrolled in

Table 1. POP-Q stages<sup>12</sup>

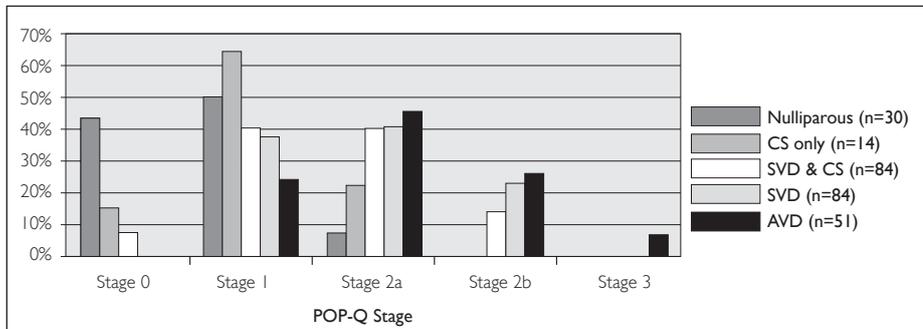
Prolapse (POP-Q) Stage	Measurements Taken During POP-Q Examination
Stage 0	No prolapse present. Points Aa, Ap, Ba and Bp are all at -3 cm and either point C or D is between -TVL (total vaginal length) cm and - (TVL-2) cm.
Stage 1	The criteria for stage 0 are not met, but the most distal portion of the prolapse is >1 cm above the level of the hymen.
Stage 2	The most distal portion of the prolapse is <1 cm proximal to or distal to the plane of the hymen. Stage 2 can be further divided into 2a and b: a is above the hymen and b is below.
Stage 3	The most distal portion of the prolapse is >1 cm below the plane of the hymen but protrudes no further than 2 cm less than the total vaginal length in centimetres.
Stage 4	Essentially, complete eversion of the total length of the lower genital tract is demonstrated. The distal portion of the prolapse protrudes to at least (TVL-2) cm.

Table 2. Distribution of POP-Q Stage for Nulliparous and Parous Groups

POP-Q stage	Nulliparous (n=30)	CS only (n=14)	SVD & CS (n=84)	SVD (n=84)	AVD (n=51)
0	13 (43)	2 (14)	6 (7)		
I	15 (50)	9 (64)	33 (40)	31 (37)	12 (23)
2a (above the hymen)	2 (7)	3 (22)	34 (40)	34 (40)	23 (45)
2b (below the hymen)			11 (13)	19 (23)	13 (26)
3					3 (6)

CS = caesarean section only; SVD & CS = spontaneous vaginal delivery and caesarean section only; SVD = spontaneous vaginal delivery; AVD = assisted vaginal delivery

Figure 2. Distribution of POP-Q stage and mode of delivery



an HRT trial found that 19.2 per cent of nulliparous women with a uterus had some prolapse (14.9 per cent had a cystocele, 6.3 per cent uterine prolapse and 6.5 per cent had a rectocele). In nulliparous women without a uterus, 20% of women had some form of prolapse.<sup>2</sup> The prolapse was not described using the POP-Q staging system in this study. A study of women presenting to a gynaecological clinic for urinary incontinence or pelvic organ prolapse found that 11.3 per cent of nulliparous women had prolapse (stage not stated) compared with 32.9 per cent in parous women.<sup>16</sup>

Collagen deficiency is often thought to be an important risk factor for pelvic organ prolapse in younger women. A study looking at women aged under 53 years old with prolapse found that the endopelvic connective tissue extracellular matrix collagen concentration was 30 per cent less than in women in this age group without prolapse. In women older than 53, there was no significant difference in collagen concentration between women with and without prolapse. This suggests a genetic component increases the risk of pelvic organ prolapse in these women.<sup>17</sup>

The fullness of the rectum may affect measurements taken on the posterior wall. If it is full there may be more positive measurements taken from the back wall. This is a difficult factor to control for in study subjects. A study into posterior vaginal wall prolapse and bowel function found that bowel symptoms and posterior prolapse can co-exist, without being causal to the other.<sup>18</sup> The time of day may affect POP-Q stage. In the afternoon, any signs of prolapse may be more pronounced due to increasing pressure on the pelvic floor during the day.

The women in the nulliparous group are younger than the women in the other mode of delivery groups. This may increase the apparent protective factor of not having children as these women have the overall lower risk of prolapse due to their younger age.

This study certainly suggests that mode of delivery, especially vaginal delivery, is a very important risk factor for pelvic organ prolapse, as shown by comparisons with nulliparous women. While women who had only had caesarean sections had increased grades of prolapse this was not statistically significant, possibly due to the small numbers.

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