# Use of hormonal contraceptives and occurrence of pregnancy-related pelvic pain: a prospective cohort study in Norway

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# Abstract

## Background

Pregnancy-related pelvic pain is a common condition, and use of hormonal contraceptives before pregnancy has been proposed as a risk factor. We used data from a sub-sample of women participating in the "Norwegian Women and Cancer study" (NOWAC) to assess the association between hormonal contraceptive use and pelvic pain in pregnancy.

## Methods

From a sub-group of 1,163 parous women participating in the NOWAC study, information was collected from a self-instructive four-page questionnaire containing questions about lifestyle and medical conditions. We calculated odds ratios (OR) and 95% confidence intervals (CI), using unconditional logistic regression.

## Results

In this study, the prevalence of pelvic pain in women was 26.5% during the first pregnancy and increased with parity. Use of hormonal contraceptives before a woman's first pregnancy was associated with an increased risk of pelvic pain in her first full-term pregnancy (OR=1.6; 95% confidence interval 1.2-2.2). There was no association between use of hormonal contraceptives and pelvic pain in the second or third pregnancy. Occurrence of pelvic pain in a previous pregnancy was the only factor associated with pelvic pain in subsequent pregnancies (OR=51.1; 95% CI 32.9-79.5 in the second pregnancy and OR=28.3; 95% CI 15.4-53.1 in the third pregnancy).

## Conclusion

Use of hormonal contraceptives was associated with an increased risk of pelvic pain in a woman's first full-term pregnancy. The most important determinant of pelvic pain in the second or third pregnancy was the history of pelvic pain in the preceding pregnancy.

# Background

The first documented description of pelvic pain in pregnancy was published by Snelling in the American Journal of Medicine in 1870 [1]. However, it is believed that Hippocrates recognized the disease among pregnant women in Ancient Greece as far back as 400 BC. Pelvic pain in pregnancy is one of the many terms used to describe a collection of typical symptoms [2-5]. Other terms used in scientific literature are: low back pain [6-8], back pain [3,9-11], backache [12] and symphysial pain [10]. In Norway this condition is termed “bekkenløsning”. This word incorporates pregnancy-related low back pain and pelvic pain. The symptoms vary in strength from discomfort to complete immobilization. Several studies have indicated that pelvic pain in pregnancy is a widespread, and possibly increasing, health problem among women in industrialized countries [7,9,13-15]. The prevalence of pelvic pain in pregnancy varies between 25-50% in different studies [7-9,12]. Several risk factors for this condition have been hypothesized, such as age, parity, education, back pain before pregnancy, type of employment, body size, smoking habits, and use of hormonal contraceptives [2].

We present here results from a study of pelvic pain in pregnancy in relation to hormonal contraceptive use before the first pregnancy and between pregnancies.

# Methods

### Study population

The “Norwegian Women and Cancer study” (NOWAC) was implemented between 1991 and 1997. A total of 179,388 women from 30-70 years of age were invited to participate, and 102,443 agreed [16]. All women were sampled randomly from the national population register of Norway. This register records the addresses of all persons alive and residing in the country, and the dates of death or migration to and from Norway since 1960. In this register, each person is identified by a unique 11-digit national registration number. The first six digits encode information on the date of birth, and the last five digits use an algorithm to ensure a unique number, and include information on gender [17]. Health survey questionnaires were mailed to

women in batches for convenience. In 1991-2, as part of NOWAC, a four-page questionnaire was mailed to a batch of 4,000 women born between 1943 and 1957 (35-49 years of age). Women who did not return the questionnaire in a few weeks were mailed a reminder with an identical letter of introduction and questionnaire. The questionnaires were returned to the Institute of Community Medicine in Tromsø, Norway.

The questionnaire assessed lifestyle characteristics, reproductive history, including number and duration of each pregnancy, prevalent diseases, and other different medical conditions, including pelvic pain during each pregnancy. We asked about the occurrence of pregnancy-related pelvic pain (Did you suffer from pelvic pain in any of your pregnancies?) and the grade or severity of the symptoms during each of the first three full-term pregnancies (severe disability, problems with walking, painful walking, problems in doing housework, normal physical function level). We used the severity question to classify pelvic pain in the first three pregnancies. Questions about hormonal contraceptive use were summary measures (as ever having used, total estimated overall duration of use, and use before first pregnancy) with detailed questions for each period of use, such as age when use began, brand used, age when use was interrupted, and duration of use. A folder with photos of almost all the 36 hormonal contraceptive brands that have ever been on the Norwegian market was enclosed with the questionnaire to help women to recall use of these drugs.

**Data analysis**

From the 4,000 women randomly selected for this sub-study we excluded 52 women who had emigrated, were dead at the time the questionnaire was sent, or had a severe mental handicap. Altogether 2,400 women agreed to participate in the study and returned a completed questionnaire, giving a crude response rate of 60.0 % or a corrected response rate of 60.8%. Of these, 2,188 women reported at least one pregnancy lasting six months or more.

Hormonal contraceptives were introduced on the Norwegian market in 1967. Therefore, we considered only women who had a reasonable chance to be exposed to these drugs before their first pregnancy as eligible. We decided to include women born in 1950 or later, who gave birth

to their first child in 1968 or later. This implied the exclusion of 642 women belonging to the birth cohorts 1943-1949, who had a low probability of having used hormonal contraceptives before their first pregnancy, and 332 women born after 1950 who gave birth for the first time before 1968.

We further excluded 12 women due to a lack of information on the use of hormonal contraceptives and 39 women who did not answer the question about pelvic pain. Thus, 1,163 women were included in the final analysis presented here.

We registered twin pregnancies as one pregnancy. All hormonal contraceptives – regardless of the mode of administration (oral or injectable), and hormonal content (combined estrogen-progestin pills, medroxyprogesterone acetate only pills or injections) – were considered together. We classified women as having used hormonal contraceptives before the first pregnancy, between the first and the second pregnancies, and between the second and the third pregnancies.

The statistical analyses were performed using the SAS statistical package version 8.12. Logistic regression was used for the estimation prevalence of odds ratios (OR) with 95% confidence intervals (CI). Analyses were done separately for each of the three first pregnancies.

In the multivariate analysis, besides use of hormonal contraceptives before each relevant pregnancy, we included in the models the following co-variables hypothesized to be associated with pregnancy-related pelvic pain: time elapsed since relevant birth, weight of the newborn in each relevant pregnancy and age at menarche. In the analysis of pelvic pain in the first pregnancy we also included indicator variables for potential risk factors in the multivariate regression models, namely education, height of the mother and smoking habits during the first pregnancy. However, since they did not affect the risk estimates meaningfully, they were excluded in the multivariate analysis of the second and third pregnancies.

For the analysis of the second and third pregnancies we considered the occurrence of pelvic pain in the previous pregnancy as potential determinants of pelvic pain in the following pregnancy.

# Results

## Characteristics

Some characteristics of the women included in the study are shown in Table 1. The age distribution in the study population was nearly uniform, while use of hormonal contraceptives before first full-term pregnancy decreased with increasing age at enrolment. Women who reached menarche before age 14 were more likely to have used hormonal contraceptives before their first full-term pregnancy than women over 14 years of age at menarche ($p<0.03$). Age at first birth, parity, and years of education were inversely associated with hormonal contraceptive use. Nearly one-third of the women smoked during their first pregnancy. The proportion of hormonal contraceptive users was similar among smokers and non-smokers.

## Pelvic pain in pregnancy

Pregnancy-related pelvic pain – in the first, second or third pregnancy – was reported most often in the youngest women in our study (data not shown). The proportion of women reporting pregnancy-related pelvic pain increased with the number of pregnancies, irrespective of age at study enrolment (Figure 1).

## Pelvic pain in the first pregnancy

Women who reported having used hormonal contraceptives before their first pregnancy reported a higher frequency of pelvic pain in the first pregnancy as compared with non-users (OR=1.6; 95% CI 1.2-2.2) (Table 2). Neither age at menarche, age at first birth, time elapsed since first birth; weight of newborn child, years of education nor smoking during the first pregnancy changed significantly the risk estimated in this analysis (Table 2).

## Pelvic pain in the second and third pregnancies

Use of hormonal contraceptives was not associated with risk of pregnancy-related pelvic pain in the second or third pregnancy (OR=1.1; 95% CI 0.7-1.7 and OR=0.9; 95% CI 0.5-1.7 respectively). The only important determinant of pregnancy-related pelvic pain in the second or third pregnancy was the history of pregnancy-related pelvic pain in the preceding pregnancy

(OR=51.1; 95% CI 32.9-79.5 in second pregnancy and OR=27.5; 95% CI 14.8-51.4 in third pregnancy) (Table 3).

## Discussion

In our study use of hormonal contraceptives was associated with the occurrence of pelvic pain in the first pregnancy, but not in the second and third pregnancies. Occurrence of pelvic pain in a previous pregnancy was strongly associated with occurrence of the symptoms in subsequent pregnancies.

During a fertile life, at least 20% of women experience pelvic pain in at least one pregnancy. The prevalence of the symptoms increases with increasing parity [2,9,12]. Most of the published studies on determinants of pregnancy-related pelvic pain originate from Scandinavia, where this condition appears to be prevalent [2,3,9,10,13,18,19]. Only a few studies have looked into hormonal contraceptives as a possible risk factor for pregnancy-related pelvic pain [3,6,7,9,14]. All these studies were negative or non-conclusive, and most of them were too small to allow any conclusions. None of them have stratified the analysis on parity, analysing each pregnancy separately. Our strategy of analysing each pregnancy separately might explain why our results deviate from earlier studies. If hormonal contraceptives are an explanatory biological factor in the development of pelvic pain, it might be an advantage to study each pregnancy separately, because of the high recurrence of the condition in subsequent pregnancies. Endresen [2] emphasises that both age and parity are important explanatory variables, out of which parity is the more powerful. She also argues that adjustment for age would hardly be required if the data were stratified for parity.

Östgaard et al. [11] reported that back problems independent of pregnancy was an important factor when predicting back pain and pain intensity in a future pregnancy. We did not have information about back pain before pregnancy in our study, and thus we could not take this factor into consideration in our analyses.

The response rate in this study was around 60%, which might be considered low. The possible problems with a low response rate, such as selection bias, have been discussed elsewhere [20]. It

is unlikely that the response rate introduced a selection bias that might cause major problems in this study. The unique person-number given to all Norwegian inhabitants made it possible for us to link a sub-sample of the women in the Norwegian Women and Cancer Study to the National Register of Education and Fertility and compare the responses with the total invited group in the same sub-cohort. This linkage uncovered no selection bias except that the response rate increased with increased education. We have slightly better educated women in the cohort than expected according to the Norwegian female population as a whole [16]. In addition, no association between the proportion of women using hormonal contraceptives, parity or age at first birth was revealed according to the response rate from an earlier analysis within our same study cohort [21]. If ever users of hormonal contraceptives with pelvic pain were more likely to answer the questionnaire than never users of hormonal contraceptives without pelvic pain, selection bias could have occurred. We consider this to be rather unlikely, since a possible association between hormonal contraceptive use and pregnancy-related pelvic pain was not a known hypothesis in the general population at the time of the survey. Moreover, the questions about pregnancy-related pelvic pain were not mentioned in the study's letter of introduction or in the headings of the questionnaires used.

Differential misclassification of exposure [22] could have resulted in either an exaggerated or underestimated effect. However, we have no reason to believe that women with a history of pelvic pain systematically remembered their hormonal contraceptive use differently from women without this condition.

Our study could have been affected by recall bias: women might remember in more detail recent events (such as recent use of hormonal contraceptives or pain related to a recent pregnancy) compared to past events. Time elapsed since first birth is correlated with the woman's birth year, and we found a non-significant reduced risk of pregnancy-related pelvic pain with increasing time elapsed since first birth. However, if pelvic pain incidence is increasing, younger women or women who gave birth for the first time close to enrolment will be more likely to report having

suffered from the illness. Both the association between pelvic pain and women's birth year or age have been reported earlier [2,9].

## Conclusions

Our results suggest that use of hormonal contraceptives before the first pregnancy may cause an increased risk of pregnancy-related pelvic pain in the first pregnancy.

The association between use of hormonal contraceptives and pelvic pain in the first pregnancy is this study was weak, but it might be of interest in a public health perspective since both the prevalence of hormonal contraceptive use before first pregnancy, and the prevalence of pelvic pain in pregnancy are high in Scandinavia.

## Competing interests

None declared.

## Authors' contributions

Merethe Kumle and Eiliv Lund conceived of the study and participated in its design and coordination. Merethe Kumle, Elisabete Weiderpass and Eiliv Lund participated in the sequence alignment and drafted the manuscript. Elin Alsaker performed the statistical analysis. All authors read and approved the final manuscript.

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# Figures

**Figure 1 - Prevalence of pregnancy-related pelvic pain in the first three pregnancies**

# Tables

**Table 1 - Characteristics of the study population (n=1163)**

| | | Study cohort Number (%) | Used hormonal contraceptives before first full-term pregnancy | |
|---|---|---|---|---|
| | | | % | p value |
| Age | | | | |
| | 35-36 years | 320 (27.5) | 49.1 | |
| | 37-38 years | 273 (23.5) | 49.5 | |
| | 39-40 years | 276 (23.7) | 42.4 | |
| | 41-42 years | 294 (25.3) | 27.6 | p<0.0001 |
| Age at menarche | | | | |
| | < = 12 year | 323 (28.3) | 42.1 | |
| | 13 years | 366 (32.1) | 47.3 | |
| | > = 14 years | 452 (39.6) | 38.1 | p=0.03 |
| Age at first full-term pregnancy | | | | |
| | <= 20 years | 295 (25.4) | 9.8 | |
| | 21-25 years | 490 (42.1) | 41.6 | |
| | > = 26 years | 378 (32.5) | 68.0 | p<0.0001 |
| Weight of newborn child | | | | |
| | -3000 g | 204 (18.0) | 45.1 | |
| | 30001-3500 g | 408 (36.0) | 44.1 | |
| | 3501-4000 g | 357 (31.4) | 38.9 | |
| | > = 4001 g | 166 (14.6) | 40.4 | p=0.4 |
| Education | | | | |
| | 7-9 years | 175 (15.2) | 22.9 | |
| | 10-12 years | 441 (38.4) | 32.4 | |
| | 13-15 years | 304 (26.5) | 54.3 | |
| | > = 16 years | 229 (19.9) | 60.7 | p<0.0001 |
| Years between menarche and first full-term pregnancy | | | | |
| | 0-5 years | 120 (10.5) | 8.3 | |
| | 6-10 years | 478 (41.9) | 27.8 | |
| | 11-15 years | 362 (31.7) | 57.7 | |
| | > = 16 years | 181 (15.9) | 71.3 | p<0.0001 |
| Number of full-term pregnancies | | | | |
| | One | 193 (16.6) | 51.8 | |
| | Two | 613 (52.7) | 44.2 | |
| | Three | 280 (24.1) | 37.5 | |
| | > = Four | 77 (6.6) | 18.2 | p<0.0001 |
| Smoking in the first pregnancy | | | | |
| Yes | | 352 (31.4) | 41.8 | p=0.8 |

**Table 2 - Odds ratio (OR) with 95% confidence intervals (CI) for pregnancy-related pelvic pain in the first pregnancy**

| Characteristic | | Pregnancy-related pelvic pain in first pregnancy |
|---|---|---|
| | | OR (95% CI) * |
| Use of hormonal contraceptives before first full-term pregnancy | | |
| | No | 1.0 (ref.) |
| | Yes | 1.6 (1.2-2.2) |
| Age at menarche | | |
| | <= 12 years | 1.0 (ref.) |
| | 13 years | 0.9 (0.6-1.3) |
| | 14 + years | 0.9 (0.6-1.2) |
| Age at first birth | | |
| | <=20 years | 1.0 (ref.) |
| | 21-25 years | 1.2 (0.8-1.7) |
| | 26 + years | 0.8 (0.4-1.4) |
| Time elapsed since first birth (per 3 years)** | | 0.9 (0.8-1.1) |
| Weight of newborn child (per 500g) | | 1.1 (1.0-1.2) |
| Years of education | | |
| | 7-9 | 1.0 (ref.) |
| | 10-12 | 1.1 (0.7-1.7) |
| | 13-15 | 1.0 (0.6-1.6) |
| | 16+ | 1.8 (0.7-2.0) |
| Smoking during first pregnancy | | |
| | No | 1.0 (ref.) |
| | Yes | 0.9 (0.7-1.3) |

* All variables are mutually adjusted. Analysis includes women with valid information for listed variables, i.e. 285 women with and 774 women without pregnancy-related pelvic pain during their first pregnancy.

** Years between first birth and enrolment in the study cohort.

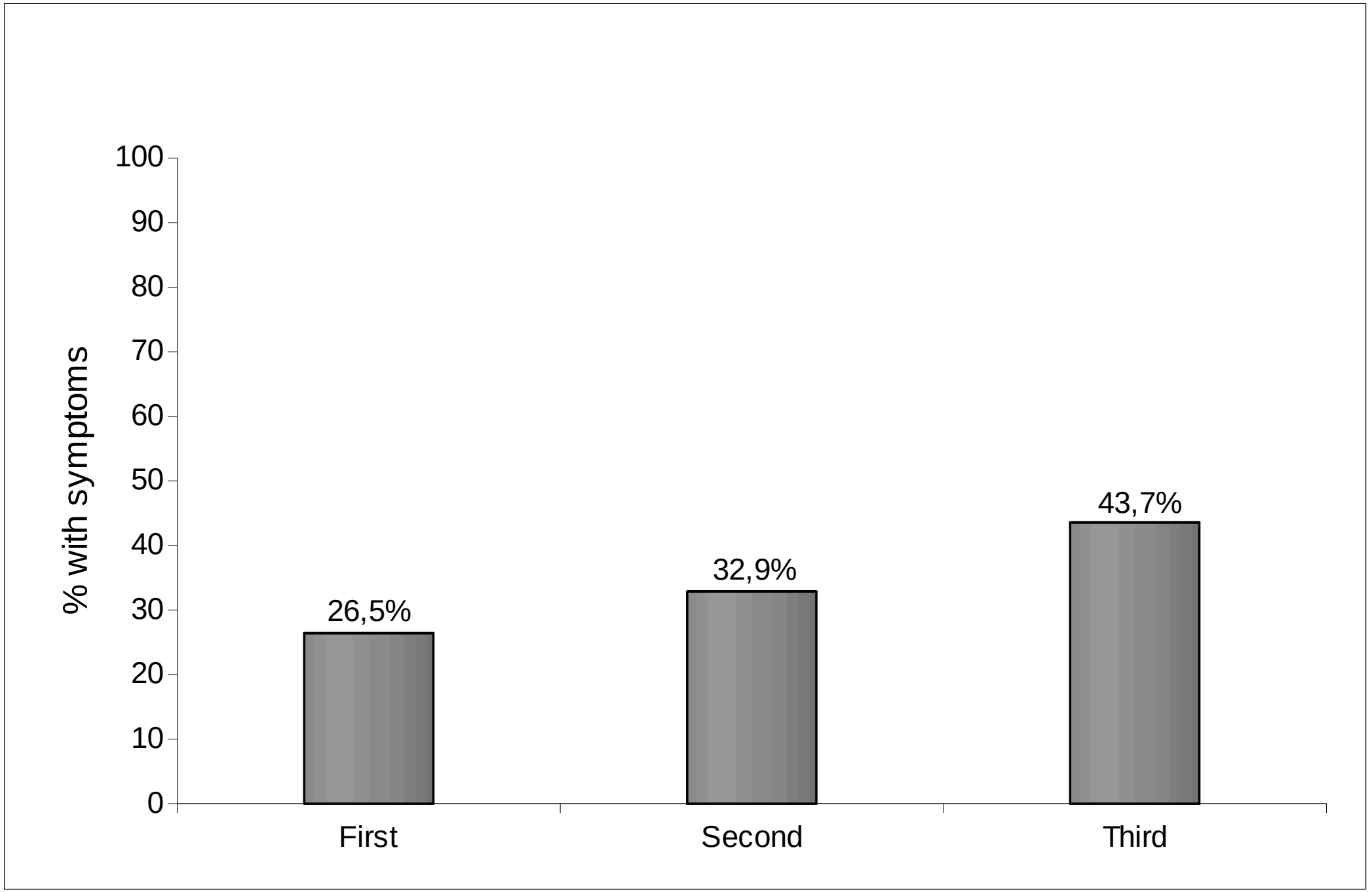
**Table 3 - Relative risk (RR) with 95% confidence intervals (CI) for pregnancy-related pelvic pain in the second and third pregnancies according to history of previous pregnancy (ies)**

| Characteristic | | Pregnancy-related pelvic pain in second pregnancy | Pregnancy-related pelvic pain in third pregnancy |
|---|---|---|---|
| | | RR (95% CI)* | RR (95% CI)** |
| Pregnancy-related pelvic pain in first pregnancy | | | |
| | No | 1.0 (ref.) | - |
| | Yes | 51.1 (32.9-79.5) | - |
| Pregnancy-related pelvic pain in at least one of the first two pregnancies | | | |
| | No | - | 1.0 (ref.) |
| | Yes | - | 27.5 (14.8-51.4) |
| | | | |
| Not suffered from Pregnancy-related pelvic pain in the previous two pregnancies | | | 1.0 (ref) |
| Pregnancy-related pelvic pain | | - | |
| | in the first but not in the second pregnancy | - | 1.7 (0.5-5.6) |
| | not in the first but in the second pregnancy | - | 23.5 (6.4-85.9) |
| | both in the first and the second pregnancy | - | 109.3 (37.1-322.0) |

* Adjusted for use of hormonal contraceptives, age at second birth, weight of newborn and time since second birth (years between second birth and enrolment in the study cohort). Analysis includes women with valid information for listed variables, i.e., 311 women with and 628 women without pregnancy-related pelvic pain in second pregnancy.

** Adjusted for use of hormonal contraceptives, age at third birth, weight newborn and time since third birth (years between third birth and enrolment in the study cohort). Analysis includes women with valid information for listed variables, altogether 150 women with and 191 women without pregnancy-related pelvic pain during their second pregnancy.

Figure 1


% with symptoms
100
90
80
70
60
50
40
30
20
10
0
26,5%
32,9%
43,7%
First
Second
Third