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Observational study

Female chronic pelvic pain is highly prevalent in Denmark. A cross-sectional population-based study with randomly selected participants

S. Loving[a,*], T. Thomsen[b], P. Jaszczak[c], J. Nordling[d]

[a] Multidisciplinary Pain Centre, Department of Anaesthesiology, Copenhagen University Hospital Herlev, Denmark
[b] Abdominal Centre, Copenhagen University Hospital Rigshospitalet, Denmark
[c] Department of Gynaecology, Copenhagen University Hospital Herlev, Denmark
[d] Department of Urology, Copenhagen University Hospital Herlev, Denmark

HIGHLIGHTS

- A cross-sectional study of female chronic pelvic pain (CPP) in Denmark.
- The prevalence of CPP was 11% in women ≥18 years; 13.6% in women aged 18–49 years.
- CPP of a moderate to severe intensity was prevalent in 6.2% of the included women.
- Four factors independently associated with female CPP were identified.
- Factors were age ≤49 years, country of birth, former pelvic trauma and pelvic surgery.

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ABSTRACT

Background and purpose: Female chronic pelvic pain is a significant clinical problem that burdens the health care services and work productivity, and leads to disability and reduced quality of life among the women affected. A recent systematic review reported worldwide prevalence rates for female chronic pelvic pain ranging from 2.1% to 24%. Our aim was to assess the prevalence, characteristics, and factors associated with chronic pelvic pain among women living in Denmark, and to compare these findings with a pain-free reference group. Secondly, we evaluated the impact of pain on daily life in women suffering from chronic pelvic pain.

Methods: A cross-sectional postal survey of the prevalence of chronic pelvic pain was undertaken in a randomly selected general female population in Denmark ($N = 2500$). Inclusion criteria were: (a) ≥18 years of age and (b) living in the Capital region or the region of Zealand in Denmark. Statistical analyses included prevalence percentage rates, chi-square tests, Mann–Whitney tests, and unpaired *T*-tests. Logistic regression analysis was used to identify the significant independent variables and to estimate their simultaneous impact on chronic pelvic pain. The results were expressed as odds ratio and 95% confidence intervals. All tests were two-tailed and significance levels were set at $p < 0.05$.

Results: 1179 (48%) women living in representative areas of Denmark responded. The prevalence of chronic pelvic pain was 11% ($n = 130$) in women ≥18 years with a prevalence of 13.6% ($n = 87$) in women of reproductive age; 6.2% ($n = 73$) women experienced at least moderate average pain intensity (numerical rating scale ≥4). Self-reported diagnosis of irritable bowel syndrome (20%), bladder pain syndrome/interstitial cystitis (3%), vulvodynia (9%), endometriosis (8%), and pelvic surgery in the preceding 6 months (5%) were more prevalent in cases compared to pain-free reference subjects ($p = 0.00$). Chronic pelvic pain interfered with daily life "all the time" in 5% of the women, "sometimes" in 72.3%, and "not at all" in 22.7%. Factors independently associated with chronic pelvic pain were age, country of birth, and former pelvic trauma or pelvic surgery ($p < 0.05$). No association was found between chronic pelvic pain and selected socio-demographic factors (residential area, educational level, cohabitation status and employment status).

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* Corresponding author at: Multidisciplinary Pain Centre, Department of Anaesthesiology, Copenhagen University Hospital Herlev, DK-2730 Herlev, Denmark. Tel.: +45 38681586; fax: +45 44535345.
E-mail addresses: lovingsys@gmail.com, Sys.Loving@regionh.dk (S. Loving).

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Conclusions: Female chronic pelvic pain appears highly prevalent (11%) in Denmark (6.2% with moderate to severe pain). Women of reproductive age had a slightly increased prevalence (13.6%). Although the reported prevalence is based on 48% ($N = 1179$) of the invited sample, dropout analyses found that respondents did not deviate from non-respondents. Therefore, we considered the reported prevalence rate representative for the total sample and generalisable to the general female population in Denmark. This study was cross-sectional, and relied on association-based analyses. Consequently, causality between age groups, country of birth, former pelvic surgeries and pelvic traumas and experiences of chronic pelvic pain remains unknown.

Implications: In order to improve prevention and treatment of chronic pelvic pain in Denmark, high quality, population-based cohort studies and randomised clinical trials are essential. The demand for trustworthy chronic pelvic pain prevalence estimates might also inspire political attention and hereby facilitate funding for further development of treatment and research.

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1. Introduction

Chronic pelvic pain (CPP) is a common cause of disability and reduced quality of life in women in the Western world. The International Association for the study of pain (IASP) defines CPP as chronic or persistent pain for at least 6 months duration perceived in structures related to the anatomic pelvis, and often associated with negative cognitive, behavioural, sexual and emotional consequences, as well as with symptoms suggestive of lower urinary tract, sexual, bowel, pelvic floor or gynaecological dysfunction. Cyclical pain is included (dysmenorrhea) if it is persistent and associated with the above-mentioned consequences [1,2].

In a retrospective primary care database study the most commonly cited annual prevalence rate of female CPP with multisystem aetiology (visceral, somatic, psycho-neurological) was 3.8% in women aged 12–70 years [3]. Other population-based studies have reported prevalence rates ranging from 11.5% to 25.4% [4–8]. These high prevalence rates were confirmed in a recent systematic review of worldwide female CPP [9]. However, inconsistent diagnostic criteria for CPP and heterogeneity in methods and designs of previous epidemiological studies contribute to the substantial variation in prevalence estimates. This is problematic, as valid information on CPP prevalence is prerequisite for national resource allocation and health care planning. No recent data are available on the economic burden of CPP on healthcare systems. In the USA (1996), the total direct annual health care costs for physician visits plus out-of-pocket expenses for CPP were estimated at $2.8 billion per year [5]. Female CPP accounts for 10% of consultations in primary care [3,5] and up to 40% of all gynaecological visits [5,10,11]. Abdominal and pelvic pain is the main indication for 34% of diagnostic laparoscopies [12] and 7% of hysterectomies performed for benign diseases in the USA and Denmark [13,14]. In Western countries, epidemiological studies have provided inconsistent results regarding the association between female CPP and socio-demographic factors (economical-, educational-, occupational-, ethnic and cohabitation status) [5,6,8,11]. Consequently, the evidence for a direct association between these factors and female CPP remains inconclusive. However, recent Scandinavian studies have suggested that socio-demographic characteristics (female sex, older age, low income and low educational level, and being divorced or separated) are associated to chronic pain conditions, although not specifically related to CPP [15,16,17].

1.1. Objectives

To our knowledge the prevalence of female CPP in Denmark and associated clinical and socio-demographic factors remains uninvestigated. We aimed to provide primary information on the prevalence rate, pain characteristics and factors potentially associated with CPP. Secondly, we aimed to evaluate the impact of pain on daily life in women suffering from CPP.

2. Methods

2.1. Participants and procedure

We undertook a population-based cross-sectional postal survey of the prevalence of CPP among 2500 randomly selected women living in Denmark. Between November 2010 and April 2011, we mailed study information, an invitation to participate, and a questionnaire on CPP together with a prestamped return envelope to potential participants. Potential participants were randomly selected by a computer-program and identified by date of birth, name and address through the Central Office of Civil Registration, in which all inhabitants in Denmark are registered. Inclusion criteria were: (a) female, (b) ≥18 years of age, and (c) living in the Capital region or the region of Zealand in Denmark. The population in this area includes approximately 2.52 million inhabitants [18]. Non-respondents received a reminder within 5 weeks after the first mailing.

2.2. Definition of CPP

We defined CPP as chronic or persistent pain for at least 6 months duration perceived (by the subject) in structures related to the anatomic pelvis. This definition is somewhat broader than the definition provided by IASP which includes a clinical validation of the pain as originating from the specified anatomical pelvic area [19]. Alternatively, identification of CPP was completed with a body map and a body scheme that visually and verbally specified the localisation to the anatomic pelvis, the anterior abdominal wall at or below the umbilicus, the lumbosacral back, or the buttocks [20].

2.3. Questionnaire

Initially, we developed and undertook a classic stepwise validation of a self-reported questionnaire on experiences of CPP (data available from the corresponding author). The questionnaire consisted of 18 questions; the first part (items 1–7) obtained information on background variables (age, socio-demographic characteristics, pregnancies/children, and self-reported pelvic diagnoses); the second part (items 8–14) included specific questions about CPP: location, frequency, pain intensity, use of pain medication and influence of CPP on daily life; and finally, the third part (items 15–18) included questions about former pelvic trauma, former pelvic surgery, and presence of dyspareunia (painful sexual intercourse). The Danish National Institute of Public Health informed the questionnaire items on socio-demographic background variables [21]. We identified respondents with experiences of CPP with the following question "Do you have chronic/longstanding pain in the pelvic area or lower abdomen, i.e. constant or recurrent pain lasting 6 months or more?"[22]. Positive respondents differentiated frequencies of CPP into

"constant, daily or minimum 2 weekly repeated pains" vs. "pain less than 2 days a week". Only respondents with CPP "constant, daily or minimum 2 weekly repeated pains" were to answer specific questions on pain (items 8–14), all other respondents were instructed to continue with item 15. We followed the recommendations by IMMPACT [23] and included core pain outcome items; pain intensity (current-, average- and worst pain) measured by the numerical rating scale (NRS) [24], pain frequencies as measured in painDETECT Questionnaire (PDQ) [25], consumption of pain medication, and exacerbation of pain during physical activity, tight clothing, and by menstruation. Two Danish validated pain questionnaires [26,27] contributed with questions on dyspareunia and pain impact on daily life. CPP impact on daily life was measured as a five-level Likert item ranging from "not at all" to "all the time". At the end of the questionnaire space was left for comments and approval of further contact was requested.

2.4. Validity and reliability

To secure the validity and reliability of the questionnaire, we evaluated the face-, content- and construct validity during five post hoc cognitive interviews [28,29] of voluntary respondents. Moreover, we undertook a test–retest study ($n = 87$, 60% response rate) of background demographic and clinical items to investigate reproducibility. Neither of the analyses detected any serious problems related to the main outcomes of the questionnaire (data available from the corresponding author). Finally, as proposed in the recent methodological study of stability of chronic pain reporting in cross-sectional studies [30], we undertook a sub-group analysis excluding cases with average pain intensity <4 on NRS (none or mild pain) to secure the validity of the incoming answers.

2.5. Statistical analyses

We used the statistical software SPSS version 19. For a preliminary power calculation we expected a minimum 3.8% prevalence of female CPP [3]. Theoretically, based on prevalence estimates reported in previous epidemiological studies of CPP [4,5,6,7], we assumed fertile women (estimated 5% prevalence) to be more vulnerable to CPP than older women (estimated 2% prevalence). Detection of this difference required inclusion of 588 women in each age group (more or less than 50 years) to achieve 80% power and 5% significance (total $N = 1176$). Due to reported participation rates from former population-based surveys in similar fields [30–32], we chose to include 2500 possible questionnaire receivers, as we anticipated an approximate 50% dropout. Correctness of the incoming data was ensured by a datamanager and error diagnostics were conducted. We controlled items related to CPP (items 8–14) for internal subscale reliability and consistency calculating Cronbach's alpha, and found these items to contribute positively to overall reliability (Cronbach's alpha, $\alpha = 0.82$). The corrected item-total correlation values for all items were above 0.3, and none of the items increased reliability when left out of the analysis. These results indicated homogeneity and internal consistency for questions on experiences of CPP. We presented the relative frequency of CPP findings descriptively and calculated group differences using χ^2/Fisher's exact tests for nominal variables, the unpaired T-tests for continuous variable with normal distribution (age) and the Mann–Whitney tests for continuous variable not normal distributed (NRS). Normality of continuous data was investigated by P–P plots and Kolmogorov–Smirnov test (2 sample K–S test). The outcome level of CPP intensity (NRS) was reported as median values with inter-quartile-range (IQR). We classified CPP intensity (current-, average and worst pain) into 4 levels: no pain (NRS = 0), mild pain (NRS = 1–3), moderate pain (NRS = 4–6), and severe pain (NRS = 7–10) [33,34] for further data analyses. Finally, we selected significant and relevant dichotomous variables ($p < 0.2$) from the bivariate analyses. Logistic regression was used to identify the significant independent variables and to estimate their simultaneous impact on CPP. The results were expressed as odds ratio (OR) and 95% confidence intervals (95% CI). All tests were two-tailed and significance levels at $p < 0.05$.

2.6. Ethics

The Ethics Committee of the Capital Region, Denmark (ID H-1-2010-037) and the Data Protection Agency (ID 10122009.HEH.I.SL) approved the study, which was performed according to the Declaration of Helsinki.

3. Results

3.1. Respondents

Eligible respondents included 1179 women aged +18 years living in representative metropolis or province areas of Denmark (response rate 48%, adjusted for 54 non-receivers, 1 subject excluded). 154 (6%) women declined participation and were deleted from the registry database. Of the 1166 (47%) non-respondents, 52 (2%) had changed their official address, and 2 (0.1%) had died. We excluded one respondent due to incomprehensible and incomplete answers (Fig. 1). When necessary, we contacted participants by telephone to clarify responses.

3.2. Questionnaire generalisability

The included questionnaire items had few missing data, with a median response rate to each question of 97.1% (range 58.5–100%). We excluded individuals with missing data from the specific analysis. Data were given as number (valid percentage, i.e. percentage based on the number of subjects who answered the specific question). To ensure the generalisability and validity of incoming data (respondents), we conducted two separate drop-out analyses. Initially, we interviewed a randomly selected group of non-respondents by phone during June 2011. A person with no other involvement in the study extracted 56 (5%) interview persons by taking every 10 questionnaire ID among the non-respondents (excluding non-receivers). Reasons for missing responses were: 29 (51.8%) reported lack of time/forgotten/misplaced, 18 (32.1%) perceived participation as irrelevant (pain-free), 2 (3.6%) never received the questionnaire and 7 (12.5%) other reasons (language, severe illness, old age, or cognitive problems). We based our drop-out analysis on 3 selected factors and found that questionnaire respondents and non-respondents were similar regarding age, presence of experienced CPP and residential area (urban vs. provincial). Likewise, an analysis of possible differences between spontaneous vs. reminder respondents including all questionnaire items demonstrated non-significant results exclusively (data available from the corresponding author). Conclusively, we assumed the responding group of women representative for the whole sample.

3.3. CPP prevalence and clinical characteristics

The prevalence of female CPP was 11% ($n = 130$) in women ≥18 years with a prevalence of 13.6% ($n = 87$) in women of reproductive age. A subgroup analysis revealed that CPP prevalence varied among age groups (Table 1). We found the highest prevalence in women aged ≤25 years (17%), and in women aged 46–55 years (17%). Twenty-six (20%) of the women reported a diagnosis of irritable bowel syndrome (IBS), 12 (9%) of vulvodynia, 10 (8%) of endometriosis, 7 (5%) had pelvic surgery in the preceding 6 months,

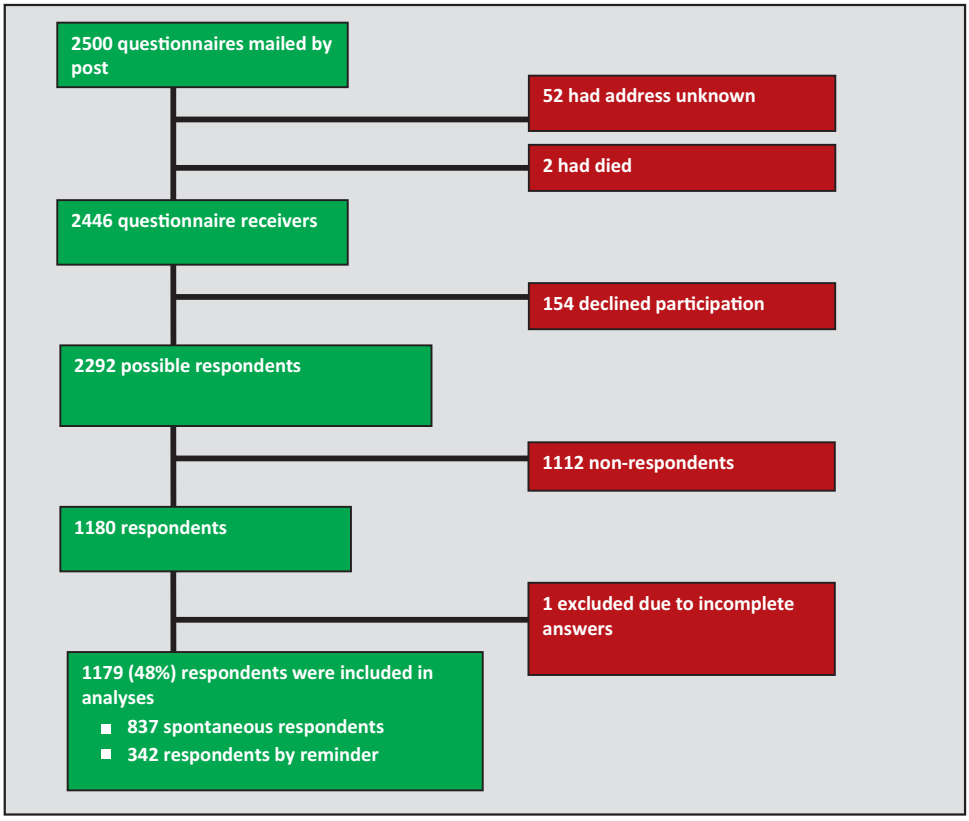

Fig. 1. Flowchart of the participants.

4 (3%) of bladder pain syndrome (BPS/IC), and 5 (4%) had an abdominal cancer. We found a higher prevalence of these self-reported pelvic diagnoses (except cancer) in women with CPP compared to healthy women. Likewise, women with CPP more often reported pain during intercourse than pain-free reference subjects (Table 2). A representative sample of the respondents (8%) was born outside of Denmark. Other countries of birth encompassed neighbour Scandinavian Countries, other European countries, Russia, Asia, Canada, Brazil, USA, etc. This very much reflects the proportion of women with non-Danish origin in the included regions (Statistics Denmark). We failed to identify socio-demographic or clinical patterns between "ethnicity" and experiences of CPP.

Sixty-five (50%) of women with CPP experienced pain ≥2 days weekly, 65 (50%) women <2 days weekly. Despite contra-instruction, approximately 2/3 of the women with CPP less than 2 days weekly answered the specific questions on pain (items 8–14). Consequently, we did a sub-group analysis to explore possible differences in pain experiences (items 9–14) between women with CPP for more vs. less than 2 days weekly. Only a single item (constant pain vs. pain attack) differentiated between these groups; constant pain was positively associated to an experience of pain ≥2 days weekly. We concluded that experiences of CPP were similar regardless of weekly duration of pain (having CPP more or less than 2 days a week). Consequently, for data analyses, we included all 103 (79%) valid answers on experiences of CPP (Fig. 2a–b, Table 3).

Finally, we dichotomised cases into CPP intensity groups (none/mild pain vs. moderate/severe pain). Moderate or severe pain intensity (NRS ≥ 4) was associated with experience of constant pain ($p = 0.02$), more frequent use of pain medication ($p = 0.02$) and higher influences on daily life ($p = 0.04$). The remaining differences in pain characteristics were non-significant (Table 3). For a subgroup analysis excluding women with mild pain (NRS < 4), we assumed a consistent distribution of an average pain intensity between those women with CPP less than 2 days weekly ($n = 65$) who completed items on pain intensity ($n = 38$) and those women with missing responses ($n = 27$). Hence, CPP of moderate to severe intensity was prevalent in 6.2% ($n = 73$) of all the respondents. The trend in the distribution of CPP percentage prevalence for age subgroups (Table 1), self-reported pelvic diagnosis and CPP localisation remained unaffected (data not shown).

3.4. Factors independently associated with CPP

Bivariate analyses showed significant differences between women with CPP and pain-free reference subjects regarding age,

Table 1
CPP prevalence by age groups.

	18–25 years	26–35 years	36–45 years	46–55 years	56–65 years	66–75 years	>75 years	Total
CPP, *n* % (95% CI)	20 17% (11–25%)	17 11% (7–17%)	23 10% (7–15%)	36 17% (12–23%)	15 6% (3–9%)	11 7% (4–13%)	8 13% (6–25%)	130 11% (9–13%)
Controls, *n* % (95% CI)	97 83% (75–89%)	134 89% (83–93%)	200 90% (85–93%)	178 83% (77–88%)	248 94% (91–97%)	137 93% (87–96%)	52 87% (75–94%)	1046 89% (87–91%)
Total	117 (100%)	151 (100%)	223 (100%)	214 (100%)	263 (100%)	148 (100%)	60 (100%)	1176 (100%)

CI, confidence interval.

Table 2
Characteristics of women with CPP and pain-free controls (bivariate analyses).

Demographic and clinical characteristics	Responding sample $N = 1179$ (100%)		
	Women with CPP, $n = 130$ (11%) n (valid %, valid 95% CI)	Pain-free women, $n = 1049$ (89%) n (valid % valid 95% CI)	p-Value
Age, mean 49.5 years (SD 16.6)	46.3 (SD 17.2)	49.9 (SD 16.5)	0.01[a]
•18–49 years	78 (60.0%, CI 51.0–68.4%)	495 (47.3%, CI 44.3–50.4%)	0.01[b]
•≥50 years	52 (40.0%, CI 31.6–49.0%)	551 (52.7%, CI 49.6–55.7%)	
Residence			
•Metropolitan area	63 (48.5%, CI 39.7–57.4%)	553 (52.8%, CI 49.7–55.8%)	0.40[b]
•Provinces	67 (51.5%, CI 42.7–60.3%)	495 (47.2%, CI 44.2–50.3%)	
Country of birth			
•DK	111 (85.4%, CI 77.9–90.8%)	973 (92.9%, CI 91.2–94.4%)	0.01[b]
•Other	19 (14.6%, CI 9.3–22.1%)	74 (7.1%, CI 5.6–8.8%)	
Cohabitation status			
•Cohabiting (married, unmarried)	92 (70.8%, CI 62.0–78.3%)	745 (71.2%, CI 68.3–73.9%)	0.92[b]
•Single (divorced, separated, widowed, unmarried)	38 (29.2%, CI 21.8–38.0%)	302 (28.8%, CI 26.1–31.7%)	
Combined school and vocational education			
•≤7 years	14 (11.1%, CI 6.4–18.3%)	121 (11.8%, CI 10.0–14.0%)	0.88[c]
•Middle-range education	91 (72.2%, CI 63.4–79.7%)	717 (70.1%, CI 67.2–72.9%)	
•Further and higher education	21 (16.7%, CI 10.8–24.6%)	185 (18.1%, CI 15.8–20.6%)	
Occupation			
•Employed	74 (57.4%, CI 48.4–65.9%)	648 (62.0%, CI 58.9–64.9%)	0.34[b]
•Unemployed	55 (42.6%, CI 34.1–51.7%)	398 (38.0%, CI 35.1– 41.1%)	
Present or former pregnancies			
•Zero	30 (23.1%, CI 16.3–31.5%)	229 (22.0%, CI 19.5–24.6%)	0.82[b]
•≥One	100 (76.9%, CI 68.6–83.7%)	813 (78.0%, CI 75.4–80.5%)	
Children			
•Zero	34 (26.2%, CI 19.0–34.7%)	258 (24.6%, CI 22.1–27.4%)	0.75[b]
•≥One	96 (73.8%, CI 65.3–81.0%)	790 (75.4%, CI 72.6–77.9%)	
Prior caesarean section			
•Yes	16 (12.3%, CI 7.4–19.5%)	119 (11.4%, CI 9.5–13.5%)	0.77[b]
•No	114 (87.7%, CI 80.5–92.6%)	929 (88.6%, CI 86.5–90.5%)	
Diagnosis of pelvic diseases			
•Yes	63 (48.5%, CI 39.7–57.4%)	191 (18.2%, CI 16.0–20.7%)	0.00[b]
•No	67 (51.5%, CI 42.7–60.3%)	857 (81.8%, CI 79.3–84.0%)	
Former pelvic surgery			
•Yes	64 (49.2%, CI 40.4–58.1%)	319 (31.4%, CI 28.6–34.4%)	0.00[b]
•No	66 (50.8%, CI 41.9–59.6%)	697 (68.6%, CI 65.6–71.4%)	
Former pelvic traumas			
•Yes	20 (15.4%, CI 9.9–23.0%)	47 (4.6%, CI 3.5–6.2%)	0.00[b]
•No	110 (84.6%, CI 77.0–70.1%)	965 (95.4%, CI 93.8–96.5%)	
Dyspareunia			
•Never	80 (63.5%, CI 54.4–71.8%)	899 (89.1%, CI 87.0–90.9%)	
•<50%	20 (15.9%, CI 10.2–23.7%)	56 (5.6%, CI 4.3–7.2%)	0.00[c]
•>50%	17 (13.5%, CI 8.3–21.0%)	28 (2.8%, CI 1.9–4.1%)	
•Every times	9 (7.1%, CI 3.5–13.5%)	26 (2.6%, CI 1.7–3.8%)	

Missing values excluded from analyses. SD, standard deviation; CI, confidence interval.
[a] Unpaired T-test.
[b] Fisher's exact test.
[c] χ^2.

country of birth, self-reported pelvic diagnoses, former pelvic trauma or surgery, and presence of dyspareunia (Table 2). These results remained stable when excluding those with mild average pain intensity (NRS ≤ 4). We tested four factors significantly associated with CPP ($p < 0.2$) in a multiple logistic regression model (Table 4). Age below 50 years, birth outside of Denmark, former pelvic trauma, and former pelvic surgery independently increased the odds ratio for having CPP. Self-reported pelvic diagnoses and presence of dyspareunia were excluded from the logistic regression analyses due to the intrinsic overlap with CPP. Prior caesarean section, educational level, cohabitation- and employment-status were not significantly associated with CPP in our sample.

4. Discussion

In this population-based cross-sectional postal survey among randomly selected women living in Denmark we found a high prevalence of chronic pelvic pain. Experiences of CPP were independently associated to younger age, birth outside of Denmark, former pelvic trauma and former pelvic surgery. CPP was mainly located to the lower abdomen and the groin. The average pain intensity reported was 4 (IQR 2–6) on a NRS, which confirms previous findings [35]. Furthermore, women with CPP had substantial pain interference on daily life, and more often experiences of dyspareunia than pain-free reference subjects.

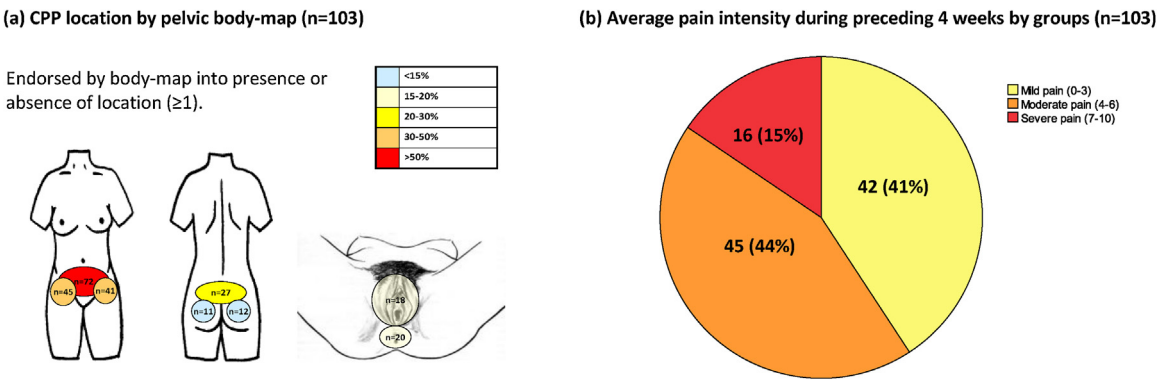

Fig. 2. Pain location (a) and severity (b).

Table 3
Clinical characteristics, severity of CPP.

CPP clinical characteristics (item 9–14)	All women with CPP ($n = 130$), valid answers ($n = 103$) n (valid percent, valid 95% CI)			
		Average pain intensity during the preceding 4 weeks, dichotomised into groups: no/mild pain (NRS 0–3) vs. moderate/severe CPP (NRS 4–10)		
		NRS ≤ 3 $n = 42$ (valid percent, valid 95% CI)	NRS ≥ 4 $n = 61$ (valid percent, valid 95% CI)	p-Value
Pain intensity (NRS)				
•Actual pain, median (IQR)	1 (0.00–4.00)			
•Mean pain, median (IQR)	4 (2.00–6.00)			
•Strongest pain, median (IQR)	6 (3.75–8.00)			
Localisation by drawing body map				
•Local	60 (63.8%, CI 53.2–73.3%)	26 (65.0%, CI 48.3–78.9%)	34 (63.0%, CI 48.7–75.4%)	1.00[a]
•Global (emitted radiation)	34 (36.2%, CI 26.7–46.8%)	14 (35.0%, CI 21.1–51.7%)	20 (37.0%, CI 24.6–51.3%)	
Number localisations				
•1 area	48 (47.5%, CI 38.0–58.2%)	22 (55.0%, CI 38.7–70.4%)	26 (43.3%, CI 30.8–56.7%)	0.31[a]
•≥2 areas	52 (52.5%, CI 41.8–62.0%)	18 (45.0%, CI 29.6–61.3%)	34 (56.7%, CI 43.3–69.2%)	
Experiences of CPP				
•Constant pain	42 (41.6%, CI 32.0–51.8%)	11 (27.5%, CI 15.1–44.1%)	31 (50.8%, CI 37.8–63.7%)	0.03[a]
•Pain occurring in attacks	59 (58.4%, CI 48.2–68.0%)	29 (72.5%, CI 55.9–84.9%)	30 (49.2%, CI 36.3–62.2%)	
Exacerbation of pain during				
•Physical activity	41 (N/A)	18 (N/A)	23 (N/A)	0.68
•Tight clothing	17 (N/A)	9 (N/A)	8 (N/A)	0.29
•Menstruation	43 (N/A)	15 (N/A)	28 (N/A)	0.32
Pain medication				
•No	50 (51.0%, CI 40.8–61.2%)	27 (65.9%, CI 49.3–79.4%)	23 (40.4%, CI 27.8–54.2%)	0.02[a]
•Yes	48 (49.0%, CI 38.8–59.2%)	14 (34.1%, CI 20.6–50.7%)	34 (59.6%, CI 45.8–72.2%)	
- Daily	- 10 (10.3%, CI 5.3–18.4%)	- 2 (5.0%, CI 0.9–17.8%)	- 8 (14.0%, CI 6.7–26.4%)	
- ≥2 days weekly	- 13 (13.4%, CI 7.5–22.0%)	- 3 (7.5%, CI 1.9–21.0%)	- 10 (17.5%, CI 9.2–30.4%)	
- <2 days weekly	- 25 (25.3%, CI 17.5–35.5%)	- 9 (21.6%, CI 11.1–38.0%)	- 16 (28.1%, CI 17.4–41.8%)	
Influence on daily life[c]				
•Never	23 (22.7%, CI 15.3–32.4%)	15 (37.5%, CI 23.2–54.2%)	7 (13.0%, CI 5.2–23.2%)	0.04[b]
•Sometimes	73 (72.3%, CI 62.3–80.5%)	22 (55.0%, CI 38.7–70.4%)	51 (85.0%, CI 72.9–92.5%)	
•Always	5 (5.0%, CI 1.8–11.7%)	3 (7.5%, CI 4.7–27.6%)	2 (2.0%, CI 0.6–12.5%)	

Missing values excluded from analyses. NRS, numerical rating scale; IQR, inter-quartile-range; CI, confidence interval; N/A, not applicable.
[a] Fisher's exact test.
[b] Mann–Whitney test.
[c] Five-level Likert item modified into 3 level: "never", "sometimes", "always".

Table 4
Factors independently associated with CPP.

Variables	Univariate logistic regression (unadjusted model)		Multiple logistic regression (adjusted model)	
	Odd ratio (95% CI)	p-Value	Odds ratio (95% CI)	p-Value
Item 1: age	0.60 (0.41–0.87)	0.01	0.59 (0.40–0.86)	0.01
Item 2: country of birth	0.44 (0.26–0.76)	0.01	0.44 (0.25–0.77)	0.00
Item 15: former pelvic surgery	2.12 (1.47–3.06)	0.00	2.32 (1.58–3.41)	0.00
Item 16: former pelvic trauma	3.73 (2.13–6.53)	0.00	3.09 (1.73–5.51)	0.00

OR, odds ratio; CI, confidence interval.

4.1. Prevalence, co-morbidities and socio-demographic characteristics

Our primary finding was that female CPP in Denmark, like in other Western countries, appears highly prevalent and should be considered in national resource allocation and health care planning. Our estimate of an 11% CPP prevalence (women of reproductive age 13.6%) confirms previously reported prevalence rates [5,8], although the general heterogeneity in methods and materials has to be kept in mind. Similar to a previous high quality epidemiological study of non-malign chronic pain in Denmark, we chose also to include women with only mild pain intensity [15]. Contrarily, a recent methodological study on the epidemiology of chronic bodily pain showed that a six-month recall question alone gave an overestimation of the problem, and recommended a supplemental criterion of at least moderate pain intensity [30]. Consequently, we repeated analyses excluding cases with only mild pain. This resulted in a 6.2% ($n = 73$) female CPP prevalence, whereas the trend in distribution of pain characteristics and significant associated background variables remained stable. Still, the commonly suggested 3.8% CPP prevalence rate seems underestimated due to the clinical population database design [3]. Probably because, as documented in large general population-based questionnaire survey, CPP-related health care utilisation is low [4–7,35].

We confirmed previous results on the prevalence of CPP-associated pelvic diseases [10,35–37]. In our sample, especially IBS (20%), vulvodynia (9%) and endometriosis (8%) were common. Less frequent was BPS/IC (3%). It should be noted we did not use validated criteria or general practitioners or specialists to confirm self-reported data regarding co-morbid pelvic diagnoses; data were exclusively based on respondents' recall information. However, we regard the self-reported results as important as they represent the women's subjective perceptions of the diagnoses they have received for their pain condition. Not surprisingly, we found a higher prevalence of dyspareunia in women with CPP (36.5%) compared with pain-free reference subjects (11%). Likewise, in three community-based studies in the UK [38], New Zealand [39] and Australia [6], a substantially larger proportion of the women with CPP reported dyspareunia (29–42%) compared to those without (11–14%).

In a systematic review, Latthe et al. [9] sampled the best available evidence for an association between previously described risk factors and various types of CPP in a systematic review. They found no significant association between non-cyclical CPP and length of education, employment status or marital status [40]. However, the demographic profiles of women with CPP in previous community-based surveys are heterogeneous [5,6,8,11]. Silva et al. [8] found marital status (married) and low income- and educational level associated with female CPP (unadjusted analysis); only low educational level remained significantly associated in an adjusted analysis. Mathias et al. [5] found a higher risk of CPP in separated, divorced or widowed women (compared to single); being married (compared to single) was non-significant. Other studies have found no associations (unadjusted analyses) between female CPP and educational- and employment status, regions of residence, parity, income, and marital status [6,11]. Likewise, the results of the present study indicated that women with CPP living in Denmark are similar to pain-free women in terms of educational level, occupational status, and cohabitation status. Similar to our study, one study found a higher prevalence of CPP in women of reproductive age [8]. Likewise, the highest prevalence rates of CPP have been reported consistently in studies investigating women aged 16–50 years [4–7].

4.2. Strengths of the study

The strength of our study is the population-based data, the large randomly selected cohort, use of a pain-free reference group, validation of the questionnaire, and drop-out planning. Our study shared the difficulty in achieving a high participation rate (48% respondents) with other studies in related fields. Reported participation rates have ranged between 44% and 74% [7,35,41–43], with the majority being approximately 50% [15,30–32]. Consequently, we accounted a high refusal rate into our preliminary power calculation, resulting in a sufficient sample size. Moreover, to address missing responses and to ensure generalisability of the incoming data, we conducted two separate drop-out analyses. These analyses failed to detect any differences between questionnaire (spontaneous) respondents and non- or reminder-respondents. This markedly strengthens the validity of our results.

4.3. Limitations of the study

Our study also had several limitations. An important criticism could be that positive respondents of CPP only had to answer specific questions on CPP if satisfying a criterion of "constant, daily or minimum 2 weekly repeated pains". Still, approximately 2/3 with CPP less than 2 days weekly answered these questions, indicating that several women's experiences of CPP are independent from quantification of days. Consequently, we conducted a sub-group analysis examining possible differences between CPP experiences for more or less than 2 days a week. No meaningful significant differences could be detected between the sub-groups, and we decided to include all valid answers of CPP. However, the missing data could bias the validity of the results, as these women might represent a sub-group with less severity of CPP, causing a reduced motivation to continue answering. Our findings confirmed the recent IASP definition of CPP that includes cyclical pain if persistent and associated with negative cognitive, behavioural, sexual, or emotional consequences. Moreover, it emphasised that chronic pain is multifactorial and one-dimensional measurements (e.g. frequency) should be avoided.

The lack of a clinical validation of the pain as originating from the anatomical pelvic structures may have introduced a risk of "mis"-diagnosis". Moreover, self-report of CPP and lack of past medical history may have introduced a risk of recall-bias and lack of information on potential co-morbidity. For example, we lacked information on implemented pelvic surgery caused by previous experiences of CPP; i.e. former pelvic surgery as a predictor for CPP was inconclusive.

Limited knowledge about the persistence of pain and the validity of recall questions defining chronic pain condition has been criticised for making findings difficult to interpret and compare. In addition, our questions on CPP did not inquire specifically about when the pain was experienced. Thus, the responding women may have reported recovered pain, hereby introducing a risk of an overestimated prevalence rate. But, a recently published longitudinal study found that persistent pain reporting in the general population was stable, and concluded that cross-sectional single-point measures of at least moderate pain gave valid prevalence estimates of chronic pain [30]. Consequently, in this population-based cross-sectional study a conservatively estimated prevalence rate of 6.2–11% female CPP and the associated demographic and clinical characteristics should be trustworthy, although measured by recall.

4.4. Conclusions and implications

We found an 11% prevalence (6.2% with moderate to severe pain) of CPP in a representative sample of women living in

Denmark. Although the reported prevalence is based on 48% of the invited sample, drop-out analyses found that non-respondents were similar to respondents. Therefore, we consider, the prevalence estimates representative for the total sample and generalisable to the general female population living in Denmark. Factors independently associated with CPP were age ≤49 years, birth outside of Denmark, former pelvic trauma and former pelvic surgery. However, as this study was cross-sectional, and relied on association-based analyses, causality remains unknown. No association was found between CPP and selected socioeconomic factors (residential area, educational level, occupational status, cohabitation status). In order to improve prevention and treatment of CPP in Denmark, high quality, population-based cohort studies and RCTs are essential. The demand for trustworthy CPP prevalence estimates might also inspire political attention and hereby facilitate funding for further development of treatment and research.

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Conflicts of interest

The authors confirm that there are no known conflicts of interest associated with this publication and there has been no financial support for this work that could have influenced its outcome.

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