

Family intentions and personal considerations on postponing childbearing in childless cohabiting and single women aged 35–43 seeking fertility assessment and counselling

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STUDY QUESTION: What characterizes childless women aged 35 years and above seeking fertility assessment and counselling in relation to their reproduction and are there significant differences between single and cohabiting women?

SUMMARY ANSWER: Despite the women's advanced age and knowledge of the age-related decline in fecundity, 70% of the single women sought fertility assessment and counselling to gain knowledge regarding the possibility of postponing pregnancy.

WHAT IS KNOWN ALREADY: Recent studies have indicated an increasing demand for ovarian reserve testing in women without any known fertility problem to obtain knowledge on their reproductive lifespan and pro-fertility advice. Women postpone their first pregnancy, and maternal age at first birth has increased in western societies over the past two to four decades. Postponed childbearing implies a higher rate of involuntary childlessness, smaller families than desired and declining fertility rates.

STUDY DESIGN, SIZE, AND DURATION: Baseline data from a cross-sectional cohort study of 340 women aged 35–43 years examined at the Fertility Assessment and Counselling (FAC) Clinic at Copenhagen University Hospital from 2011 to 2014. The FAC Clinic was initiated to provide individual fertility assessment and counselling.

PARTICIPANTS/MATERIALS, SETTING, METHODS: Eligible women were childless and at least 35 years of age. All completed a web-based questionnaire before and after the consultation including socio-demographic, reproductive, medical, lifestyle and behavioural factors. Consultation by a fertility specialist included transvaginal ultrasound, full reproductive history and AMH measurement.

MAIN RESULTS AND THE ROLE OF CHANCE: The study comprised 140 cohabiting and 200 single women. The majority (82%) were well-educated and in employment. Their mean age was 37.4 years. Nonetheless, the main reasons for attending were to obtain knowledge regarding the possibility of postponing pregnancy (63%) and a concern about their fecundity (52%). The majority in both groups (60%) wished for two or more children. The women listed their ideal age at birth of first child and last child as 33 (± 4.7) years and 39 (± 3.5) years, respectively. Of the single women, 70% would accept use of sperm donation compared with 25% of the cohabiting women ($P < 0.001$). In general, 45% considered oocyte vitrification for social reasons, yet only 15% were positive towards oocyte donation. The two groups were comparable regarding lifestyle factors, number of previous sexual partners, pregnancies, and ovarian reserve parameters.

LIMITATIONS, REASONS FOR CAUTION: The women in the present study were conscious of the risk of infertility with increasing age and attended the FAC Clinic due to a concern about their remaining reproductive lifespan, which in combination with their high educational level could impair the generalizability to the background population.

WIDER IMPLICATIONS OF THE FINDINGS: The results indicate that in general women overestimate their own reproductive capacity and underestimate the risk of future childlessness with the continuous postponement of pregnancies.

STUDY FUNDING/COMPETING INTEREST(S): The FAC Clinic is a part of the ReproSund and ReproHigh collaboration that is 50% co-financed by EU-regional funding. This study also received funding through the Capital Region Research Fund. The authors have no conflict of interest.

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Introduction

The reproductive patterns have changed in the developed world in recent years (Benzies, 2008). Couples postpone family formation, and maternal age as well as paternal age at first birth has increased all over Europe in the past four decades (Schmidt et al., 2012). Postponed childbearing implies a higher rate of involuntary childlessness, smaller families than desired and declining fertility rates (Leridon and Slama, 2008; Joffe et al., 2009). Women and men in developed countries tend to overestimate their fecundity despite the awareness of declining fertility with increasing age (Virtala et al., 2011; Daniluk and Koert, 2013; Chan et al., 2015). This misapprehension of female fecundity is even more pronounced in men, who are also not aware of the negative impact of male age, smoking and obesity (Hammarberg et al., 2013). Recent studies have indicated an increasing demand for ovarian reserve testing in women with no known fertility problem to gain knowledge on their remaining reproductive life span (Seifer et al., 2015; Tremellen and Savulescu, 2014; Hvidman et al., 2015).

Studies have addressed the attitudes towards family formation and fertility awareness primarily in general terms among students, infertile couples and women and men of higher reproductive age (Lampic et al., 2006; Skoog Svanberg et al., 2006; Tydén et al., 2006; Virtala et al., 2011; Mortensen et al., 2012; Schytt et al., 2014; Chan et al., 2015).

The knowledge and considerations in relation to family intentions among older, childless women who themselves seek individual fertility assessment and advice in relation to their reproduction are unavailable.

The present study analysed the reasons why childless women aged 35 years and above have had the delay in childbearing—both possible biological reasons (earlier unsuccessful attempts of pregnancy, low egg reserve, concomitant diseases) and socio-demographic reasons (lack of partners, lack of consistency in relationships, pursuing a career) were explored. The women's knowledge on female age and related decline in female fertility, as well as similarities and differences between single and cohabiting women, were explored.

The study presents the women's considerations before and actions towards motherhood after the consultation at the Fertility Assessment and Counselling Clinic (FAC Clinic), University Hospital of Copenhagen, Rigshospitalet, Denmark (Hvidman et al., 2015).

Materials and Methods

The fertility assessment and counselling clinic

Data for the population-based cohort study was collected in relation to a consultation at the FAC Clinic at RH, Denmark (Hvidman et al., 2015).

Briefly, the FAC Clinic was established in August 2011 with the purpose of offering women and men with no known fertility problems assessment and

counselling on their present and future fertility. Couples who had already tried to conceive for more than a year were not seen, but informed to seek medical assistance and infertility investigation through the National Health Care system. The consultation at the FAC Clinic was free of charge and clients needed no referral to get an appointment. All completed a web-based baseline questionnaire (SurveyExact) before and after the consultation.

All women were examined by a fertility specialist, who performed a transvaginal ultrasound (antral follicle count [AFC], ovarian volume, pathology), uptake of a full reproductive history and anti-Müllerian Hormone (AMH) measurement. The women were informed of their potential risk factors, AFC and presumed ovarian reserve at the consultation. The women received the AMH answer by email approximately 2 weeks after the consultation. The email described the AMH value in relation to their ovarian reserve and whether it was within the normal range, higher or lower. The women were encouraged to contact the FAC Clinic by email/telephone if they had additional questions or needed further explanation of the results.

The concept of the FAC Clinic is described in detail in a previous paper (Hvidman et al., 2015).

Study population

A total of 397 women aged 35–43 were examined at the FAC Clinic from 1 August 2011 to 31 July 2014. Eligible women were defined as heterosexual, childless and at least 35 years of age.

The baseline questionnaire

The baseline questionnaire was partly based on the validated Swedish Fertility Awareness Questionnaire by Lampic et al. (2006) and a previous Danish study from our group (Bentzen et al., 2013). The questionnaire included items regarding socio-demographic background, reproductive and medical history, lifestyle and behavioural exposures, such as smoking, alcohol and exercise.

The women were asked to report their highest completed education, current job situation and household income in the baseline questionnaire. The average age of a Danish University Graduate is 28 years. The median income in Denmark is 39 400 €.

Assessment of health behavioural factors

Health behavioural factors such as smoking, alcohol and exercise were addressed again at the consultation. The women's smoking status was categorized as: non-smokers, a daily use of 1–10 cigarettes, or a daily use above 10 cigarettes. Alcohol consumption was categorized as: no alcohol units per week, 1–6 alcohol units per week or 7 or more alcohol units per week. Weight, height and body mass index (BMI) were measured at the consultation.

Previous Chlamydia infections, diagnosed endometriosis and use of contraception were addressed in both the baseline questionnaire and at the consultation.

The women were asked about their knowledge of the female fecundity in relation to age.

To clarify the women's family intentions, questions were asked about their current desire to have a child, if the women were actively trying to get pregnant, ideal/desired number of children and ideal maternal age at the birth of first and last child.

Furthermore, the women were asked what they personally thought would be the most important prerequisites, expected benefits and consequences in relation to motherhood (personal considerations). To identify the most important prerequisites for childbearing the women were asked to answer 15 statements on a five-point scale by (i) very important, (ii) important, (iii) of some importance, (iv) not very important or (v) not important at all (Lampic *et al.*, 2006). The statements primarily focused on relationship ('That I have a stable relationship'), job situation ('That I have a job that can be combined with children') and personal considerations ('That I feel mature'). Similarly, the expected benefits and consequences of motherhood were described by 15 statements in random order answered by a four-point scale: (i) agree, (ii) mainly agree, (iii) neither agree nor disagree or (iv) mainly disagree. Expected benefits could be 'personal development' or 'having children is the meaning of life'. Examples of statement in relation to consequences: 'That I have less time to job and career' and 'It will put a strain on my relationship'.

All women were additionally asked about their considerations towards fertility treatment (IVF/ICSI), adoption, and gamete donation (oocytes, sperm), if they were not able to achieve a spontaneously conceived pregnancy. Questions were formulated as: 'Would you consider sperm donation?' or 'Would you consider oocyte donation?' The questions were answered by a five-point scale: by (i) definitely yes, (ii) most likely, (iii) I don't know, (iv) probably not or (v) definitely not. The same scale was used in relation to their attitudes regarding social egg freezing.

The follow-up questionnaire: Knowledge and actions towards motherhood after the consultation at the FAC Clinic.

The questionnaire distributed after the consultation focused on their reasons for attending the clinic, knowledge acquisition and whether they expected to plan a pregnancy within the next 2 years.

To perform the motivational assessment we asked the following: 'What were your reasons for seeking fertility assessment and counselling?' The women were given six possible answers such as 'How long can I postpone childbearing?' and 'I am worried about my fecundity'. The women could choose more than one answer.

Knowledge acquisition was answered by a five-point scale: (i) definitely yes, (ii) some, (iii) neutral, (iv) no—only partly or (v) no—none. Similarly, whether they would bring forward the timing of pregnancy was answered by a five-point scale: (i) definitely yes, (ii) most likely, (iii) I don't know, (iv) probably not or (v) definitely not. The questions were formulated with an emphasis on the visit at the FAC Clinic, e.g. 'After your visit at the FAC Clinic would you bring forward the timing of pregnancy?'

Assessment of ovarian reserve parameters

The number of antral follicles was counted and grouped into three predefined categories: 2–4, 5–7 and 8–10 mm. The ovarian volume was measured by the formula for a prolate ellipsoid using the longest longitudinal (d1), antero-posterior (d2), and transversal diameters (d3): $\text{volume} = d1 \times d2 \times d3 \times \pi/6$ (Rosendahl *et al.*, 2010). Throughout the 3-year period the same team of five doctors examined the women.

The blood test for AMH was taken at the consultation. The serum AMH concentrations were measured at the Department of Clinical Biochemistry by an enzyme-linked immunosorbent assay (ELISA) (Immunotech, Beckman Coulter Generation I, Inc., Marseilles, France). The sensitivity was 0.7 pmol/l and the intra- and inter-assay coefficients of variation were 12.3 and 14.2% (Bentzen *et al.*, 2012).

Statistical analyses

Baseline characteristics were summarized as either mean and standard deviation (SD) of normally distributed outcomes, median and 90% population limit of non-normally distributed quantitative outcomes or number and percentage of categorical outcomes. Continuous variables were analysed by the two-sample *t* test and the non-parametric Mann–Whitney *U* test, whichever was most appropriate. Categorical variables were compared with Pearson's chi-squared or Fischer's exact test. Descriptive statistics was made with the statistical software SPSS (version 19, Chicago, USA) and Microsoft Office Excel 2010.

Ethics approval

All participants gave written informed consent according to the Declaration of Helsinki for Medical Research involving Human Subjects. The establishment of a biobank was approved by the Scientific Ethical Committee of the Capital Region of Denmark (journal number: H-1-2011-081). Permission to store data was granted by the Data Protection Agency at Rigshospitalet (journal number: 30-0728).

Results

Of the 397 women we excluded 57 from the analyses. Reasons for exclusion were: (i) lesbians ($n = 3$), (ii) unknown marital status ($n = 7$) or (iii) women with children ($n = 46$). In total, 340 women were included in the analysis (Fig. 1). The study comprised 140 cohabiting and 200 single childless women.

Before the consultation all answered the initial questionnaire. After the consultation 285 women were presented with and answered the questionnaire regarding reasons for attending the clinic, gain of knowledge and if they would change the timing of future pregnancies. A total of 55 did not fill in this questionnaire due to a short period with technical problems regarding the email distribution.

Socio-demographic characteristics

Table 1 shows that the mean age of the women was 37.4 years (SD 2.0). The majority were well-educated (298/340) with a higher education length of 3–6 years and 80% (277/340) were employed. Among the cohabiting women 84% (117/140) had a household income above

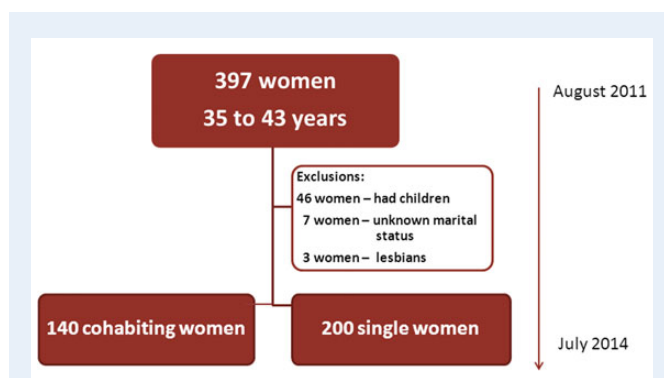


Figure 1 Flow-chart of the initial cohort of 397 women with exclusions.

Table I Demographic characteristics of the cohabiting and the single women.

	Total	Cohabiting	Single	P-values [†]
Number	340	140	200	
Age (years), mean (SD)	37.4 (2.0)	37.2 (2.1)	37.5 (2.0)	0.108 ^a
Clinical characteristics				
BMI (kg/m ²) mean, SD	23.4 (3.8)	23.1 (3.3)	23.4 (4.3)	0.779 ^a
Highest completed education, n,%				
Lower secondary grade/10th grade—age 6–15	2 (0.6)	1 (0.7)	1 (0.5)	0.141 ^b
High school degree/higher commercial examination/higher technical examination—age 15–18	9 (2.7)	5 (3.6)	4 (2.0)	
Skilled education within trade, business, office etc.—age 15–20	18 (5.3)	11 (7.9)	7 (3.5)	
Short further education, less than 3 years—age 18–25	12 (3.5)	4 (2.9)	8 (4.0)	
Medium further education, 3–4 years—age 18–25	95 (28.0)	29 (20.7)	66 (33.2)	
Long further education, more than 4 years—age 18–28	185 (54.6)	81 (57.9)	104 (52.3)	
Other education	18 (5.3)	9 (6.4)	9 (4.5)	
Current job situation				
Working	274 (80.8)	111 (79.3)	163 (81.9)	0.800 ^b
Employment and training scheme	3 (0.9)	2 (1.4)	1 (0.5)	
Temporary leave of absence due to sickness	7 (2.1)	2 (1.4)	5 (2.5)	
Leave (pregnancy, unpaid)	1 (0.3)	0	1 (0.5)	
Unemployed	30 (8.8)	14 (10.0)	16 (8.0)	
Student/apprentice	15 (4.4)	8 (5.7)	7 (3.5)	
Registered unfit for work	2 (0.6)	1 (0.7)	1 (0.5)	
Other	7 (2.1)	2 (1.4)	5 (2.5)	
Household income				
Less than 13 000 €	5 (1.5)	2 (1.4)	3 (1.5)	0.001 ^{*b}
Between 13 000 and 27 000 €	32 (9.4)	11 (7.9)	21 (10.5)	
Between 27 000 and 40 000 €	39 (11.5)	9 (6.5)	30 (15.0)	
Between 40 000 and 54 000 €	102 (30.1)	35 (25.2)	67 (33.5)	
Between 54 000 and 80 000 €	93 (27.4)	28 (20.1)	65 (32.5)	
Between 80 000 and 107 000 €	49 (14.5)	37 (26.6)	12 (6.0)	
Between 107 000 and 134 000 €	11 (3.2)	10 (7.2)	1 (0.5)	
More than 134 000 €	8 (2.4)	7 (5.0)	1 (0.5)	

Data are N (%) unless stated otherwise.

P-values [†]indicates the difference between the cohabiting (n = 140) and the single women (n = 200).

*Significant P < 0.05.

^aMann–Whitney U test.

^bPearson's chi-squared test.

40 000€. This proportion was 73% (146/200) among the single women. All the women were Caucasian.

Health behaviour and medicine

In general the participating women had a healthy life style (Tables I and II). As seen in Table II the two groups were comparable regarding BMI, smoking, alcohol consumption, use of antidepressants and a physically active life style.

Reproductive history and sexual behaviour

As displayed in Table III, one fourth of the women had a previous pregnancy (24.7%), but none resulted in a live birth. The majority only had one previous pregnancy, 60% of the cohabiting and 69% of the single women. Over 70% of the women had more than 10 previous sexual

partners (cohabiting 71.2% versus single 71.9%, P = 0.142). Likewise, the groups were comparable in relation to previous Chlamydia infections (cohabiting 29.9% versus single 29.1%, P = 0.877) and endometriosis (cohabiting 2.1% versus single 3.5%, P = 0.466). Significantly more single women used condoms as contraceptive methods (cohabiting 18.6% versus single 54%, P < 0.001), whereas more than one-third of the cohabiting women did not use any kind of contraception (cohabiting 35.7% versus single 21.5%, P < 0.001).

Ovarian reserve parameters and ovarian volume

We divided the women into subgroups of oral contraceptive users (OC users) and non-users when assessing AMH, AFC and ovarian

Table II Health behaviour and medicine use of the cohabiting and the single women.

	Total	Cohabiting	Single	P-values [†]
Number	340	140	200	
Cigarettes per day				
None, not daily	289 (85)	121 (86.4)	168 (84.0)	0.325
1–10 cigarettes	33 (9.7)	10 (7.1)	23 (11.5)	
> 10 cigarettes	18 (5.3)	9 (6.4)	9 (4.5)	
Alcohol consumption, units per week				
0–1	44 (13.6)	13 (9.7)	31 (16.3)	0.305
2–4	128 (39.5)	58 (43.3)	70 (36.8)	
5–9	113 (34.9)	48 (35.8)	65 (34.2)	
10–19	34 (10.5)	13 (9.7)	21 (11.1)	
> 20	5 (1.5)	2 (1.5)	3 (1.6)	
Active spare time				
Sedentary	40 (11.9)	22 (15.8)	18 (9.1)	0.302
Lightly active	164 (48.7)	65 (46.8)	99 (50.0)	
Active	131 (38.9)	51 (36.7)	80 (40.4)	
Competitive sports	2 (0.6)	1 (0.7)	1 (0.5)	
Drugs				
Never	182 (53.8)	76 (54.7)	106 (53.3)	0.889
Few times	101 (29.9)	42 (30.2)	59 (29.6)	
Several times	55 (16.3)	21 (15.1)	34 (17.1)	
Use of antidepressants				
Yes	24 (7.1)	7 (5.0)	17 (8.5)	0.217
No	314 (92.9)	132 (95.0)	182 (91.5)	
Stressful job				
Always	4 (1.2)	1 (0.7)	3 (1.5)	0.56
Almost always	12 (3.6)	6 (4.3)	6 (3.0)	
Often	46 (13.6)	23 (16.4)	23 (11.6)	
Sometimes	166 (49.1)	69 (49.3)	97 (49.0)	
Rarely	110 (32.5)	41 (29.3)	69 (34.8)	

Data are N (%).

P-values [†]indicates the difference between the cohabiting (n = 140) and the single women (n = 200) by Pearson's chi-squared test.

volume. Table IV shows that the mean AMH was 16 pmol/l among the OC users and non-users ($P = 0.567$). There was no significant difference in AMH between cohabiting and single women among OC users ($P = 0.538$) and non-users ($P = 0.231$). The same tendency was found in relation to total AFC. The mean total AFC was 12 among OC users and 13 among non-users ($P = 0.536$). Similarly, no difference between cohabiting and single women was detected when dividing into subgroups (cohabiting OC users versus single OC users, cohabiting non-users versus single non-users) ($P = 0.718$ and $P = 0.688$).

We found significant difference between OC users ($n = 71$) and non-users ($n = 269$) in relation to the AFC subclasses of 5–7 mm ($P = 0.015$) and 8–10 mm ($P < 0.001$). Additionally, the OC users had significantly smaller ovaries than non-users ($P < 0.001$) (Table IV).

Table III Reproductive history and sexual behaviour of the cohabiting and the single women.

	Total	Cohabiting	Single	P-values [†]
Number	340	140	200	
Previous pregnancies				
Yes	84 (24.7)	35 (25.0)	49 (24.5)	0.949 ^b
No	245 (72.1)	100 (71.4)	145 (72.5)	
Don't know	11 (3.2)	5 (3.6)	6 (3.0)	
Number of pregnancies				
1	55 (16.2)	21 (15.0)	34 (17.0)	0.499 ^b
2	18 (5.3)	7 (5.0)	11 (5.5)	
3	8 (2.4)	4 (2.9)	4 (2.0)	
≥ 4	2 (0.6)	2 (1.4)	0	
Previous sexual partners				
0–1	2 (0.6)	2 (1.4)	0	0.142 ^b
2–4	23 (6.8)	6 (4.3)	17 (8.5)	
5–9	71 (21.0)	32 (23.0)	39 (19.6)	
10–19	116 (34.3)	52 (37.4)	64 (32.2)	
> 20	126 (37.3)	47 (33.8)	79 (39.7)	
Previous chlamydia				
No	237 (70.5)	96 (70.1)	141 (70.9)	0.877 ^b
Yes	99 (29.5)	41 (29.9)	58 (29.1)	
Diagnosed with endometriosis				
No	330 (97.1)	137 (97.9)	193 (96.5)	0.466 ^b
Yes	10 (3.0)	3 (2.1)	7 (3.5)	
Contraception				
Oral contraceptives	66 (19.4)	31 (22.1)	35 (17.5)	0.220 ^b
Vaginal P-ring	5 (1.5)	3 (2.1)	2 (1.0)	0.383 ^c
Progestin only tablets	5 (1.5)	2 (1.4)	3 (1.5)	0.649 ^c
Diaphragm	4 (1.2)	3 (2.1)	1 (0.5)	0.303 ^c
Hormonal IUD	6 (1.8)	2 (1.4)	4 (2.0)	0.566 ^c
Copper IUD	5 (1.5)	1 (0.7)	4 (2.0)	0.652 ^c
Condoms	134 (39.4)	26 (18.6)	108 (54.0)	0.001 ^{a,b}
Rhythm method/Withdrawal	74 (21.8)	35 (25.0)	39 (19.5)	0.130 ^b
No contraception	93 (27.4)	50 (35.7)	43 (21.5)	0.001 ^{a,b}

Data are N (%).

P-values [†]indicates the difference between the cohabiting (n = 140) and the single women (n = 200).^aSignificant $P < 0.05$.^bPearson's chi-squared test.^cFisher's exact test.

Family intentions

Table V shows that the cohabiting and single women differed regarding the desire for a pregnancy at the time of the consultation (cohabiting 59.7% versus single 45.2%, $P = 0.024$) and whether they were actively trying to get pregnant (cohabiting 30.4% versus single 2.5%, $P < 0.001$). The majority (60%) desired two or more children in both groups (mean 1.8 children) and listed similar maternal ideal ages for the birth of their first and last child, 33.2 and 39.4 years, respectively.

Table IV Ovarian reserve parameters of the cohabiting ($n = 140$) and the single women ($n = 200$).

Groups	Total		Cohabiting		Single		P-values [†]
	Total OC users	Total non-users	OC users	Non-users	OC users	Non-users	
Number, %	71	269	34	106	37	163	
Endocrine parameters (serum)							
Anti-Müllerian Hormone, pmol/L	16.0 (4.9–49.9)	16.0 (4.0–44.0)	21.0 (6.5–47.0)	16.5 (3.3–49.0)	14.0 (4.2–50.8)	15.0 (4.1–40.8)	0.567
Sonographic characteristics							
Antral follicle count:							
Total	12 (4.2–25.0)	13 (6.0–26.0)	15 (7.5–41.0)	13.5 (5.0–26.0)	11.0 (3.8–19.2)	12 (6.0–26.6)	0.536
2–4 mm	9 (2.8–20)	7 (3.0–18.3)	10 (3–22.8)	9 (3–23)	8 (1.2–17)	6 (2–17.5)	0.163
5–7 mm	2 (0–8.3)	4 (0–9)	4 (0–17.8)	3 (0–9.0)	1 (0–6.8)	4 (1.0–9)	0.015*
8–10 mm	0 (0–3)	1 (0–4)	0 (0–2.9)	1 (0–4)	0 (0–3.0)	1 (0–4)	0.001*
Right Ovarian volume	2.9 (1.2–7.0)	5.6 (2.6–10.4)	3.3 (1.3–7.5)	5.2 (2.2–11.2)	2.5 (0.8–6.5)	6.0 (2.7–11.5)	0.001*
Left Ovarian volume	2.5 (0.7–7.5)	4.6 (2.0–10.0)	2.9 (0.9–7.4)	4.7 (2.2–9.4)	1.9 (0.7–7.7)	4.6 (2.0–10.8)	0.001*

Data are median (90% population limit).

OC users = oral contraception and vaginal ring.

P-values [†] indicates the difference between the OC users ($n = 71$) and the non-users ($n = 269$) by Mann–Whitney U test.

*Significant $P < 0.05$.

Personal considerations in relation to childbearing

The primary reason for seeking fertility assessment and counselling among the single women was to gain knowledge on how long the women could postpone childbearing (70%), which is displayed in Table VI. Among the cohabiting women the two main reasons were also to gain knowledge about the possibility of postponing pregnancy (54%) and a check because it was available (56%). Overall, both groups listed 'feeling mature' as the most important prerequisite for childbearing (89%). Significantly more cohabiting women listed a 'stable relationship' (cohabiting 93.7% versus single 67.0%, $P < 0.001$) and 'to have a partner to share the responsibility' (cohabiting 83.5% versus single 67.0%, $P < 0.001$) as an important prerequisite to childbearing. Besides maturity the most important issues for the single women were 'to have a job that can be combined with children' (78%) and access to day care (68%). In general, the women were aware of the declining female fecundity with age as 72% answered correctly when asked about the most fertile age.

Expected benefits and consequences of motherhood

Table VII shows that the cohabiting and single women expected identical benefits of motherhood. The most important being 'personal development' (89%) and 'to give and receive love' (86%). Half of the women considered children 'as the meaning of life' and one fourth anticipated that their 'everyday life would be better' with children. The main concerns about childbearing were 'less time to myself' (82%) and 'less time to job and career' (76%).

Attitudes towards fertility treatment, gamete donation and social freezing

Table VIII shows that in general, both groups were positive towards IVF/ICSI, since 77% would definitely or most likely consider this

option if they were not able to conceive spontaneously. Additionally, 66% favoured the use of social freezing and almost half would consider having the procedure performed (45%). The groups differed in relation to sperm donation, as 70% of the single women would consider it compared with only 25% of the cohabiting women ($P < 0.001$). Both groups were more prone to consider adoption (25%) rather than oocyte donation (15%).

Knowledge and actions towards motherhood after consultation at the FAC Clinic

More than half had increased their knowledge about possible risk factors for infertility after the consultation (cohabiting 56.3% versus single 51.9%, $P = 0.312$) and would bring forward the timing of pregnancy (cohabiting 53.0% versus single 53.9%, $P < 0.001$). Furthermore, the far majority (88%) expected to become pregnant within the next 2 years. The proportion was higher among the single women compared with the cohabiting women, although this was not significant (cohabiting 84.4% versus single 92.7%, $P = 0.159$).

Discussion

Our results display the paradoxes that despite the women's high mean age of 37.4, a rather good awareness of the declining female fecundity with age, and a wish of two children, the main reason for seeking fertility assessment and counselling was to gain information on the possibility of postponement of pregnancy. Only few would consider oocyte donation which could indicate a general overestimation of their own reproductive ability and an underestimation of the risk of future infertility with further postponement of pregnancies. Nonetheless, almost 90% expected to get pregnant within the next 2 years after the consultation.

The cohort of cohabiting and single childless women above 35 was overall comparable in terms of demographic characteristics, health

Table V Family intentions of the cohabiting and the single women.

	Total	Cohabiting	Single	P-values [†]
Number	340	140	200	
Current desire to have a child				
Yes	173 (51.2)	83 (59.7)	90 (45.2)	0.024 ^{a,b}
No	57 (16.9)	17 (12.2)	40 (20.1)	
Don't know	108 (32.0)	39 (28.1)	69 (34.7)	
Trying to get pregnant				
Yes	42 (14.7)	38 (30.4)	4 (2.5)	0.001 ^{a,b}
No	243 (85.3)	87 (69.6)	156 (97.5)	
Ideal/desired number of children				
1	74 (22.2)	25 (18.1)	49 (25.1)	0.396 ^b
2	176 (52.9)	81 (58.7)	95 (48.7)	
3	21 (6.3)	8 (5.8)	13 (6.7)	
4	1 (0.3)	0	1 (0.5)	
5	1 (0.3)	1 (0.7)	0	
Don't know	60 (18.0)	23 (16.7)	37 (19.0)	
Ideal maternal age at the birth of first child, mean, SD				
For you	33.2 (4.7)	33.1 (4.4)	33.3 (4.9)	0.750 ^a
In general (personal opinion)	28.7 (2.8)	28.8 (2.6)	28.6 (3.0)	0.576 ^a
Ideal maternal age at the birth of last child, mean, SD				
For you	39.4 (3.5)	39.3 (3.4)	39.5 (3.5)	0.386 ^a
In general (personal opinion)	37.7 (3.8)	37.4 (4.0)	37.9 (3.7)	0.227 ^a

Data are N (%) unless stated otherwise.

P-values [†]indicates the difference between the cohabiting (n = 140) and the single women (n = 200).^aSignificant P < 0.05.^aMann–Whitney U test.^bPearson's chi-squared test.

behaviour, reproductive history, sexual behaviour and ovarian reserve parameters. Additionally, they had similar family intentions, prerequisites for childbearing and reasons for seeking counselling. The single and cohabiting women differed in attitudes towards sperm donation, but had equal considerations regarding adoption, oocyte donation and social freezing.

Earlier studies primarily focused on younger women's intentions and attitudes towards parenthood which remain unchallenged due to a theoretical approach to the future intended actions (Lampic *et al.*, 2006; Skoog Svanberg *et al.*, 2006; Tydén *et al.*, 2006; Peterson *et al.*, 2012). To our knowledge this is the first study comparing childless single and cohabiting women of advanced age seeking fertility assessment and counselling. Thus our study includes those women who are already personally challenged by the situation of having advanced age and no children. The majority thought that the ideal age of first delivery was below their present age. Therefore it is important to understand why these women ended up in this situation, which prerequisites they feel have to be fulfilled before getting pregnant and which actions towards motherhood they considered. Similarly, women may not always have control or choice over their childbearing. An Australian study demonstrated that women's circumstances are influential in their childbearing desires and outcomes, and many women do not have children due to health concerns, a lack of a partner or a partner who is not willing to have children (Holton *et al.*, 2011).

In coherence with previous studies, we find that well-educated women postpone childbearing despite the knowledge of declining fecundity (Eriksson *et al.*, 2012; Peterson *et al.*, 2012), and tend to overestimate both their fecundity and the success rate of fertility treatment (Lampic *et al.*, 2006; Bunting and Boivin, 2008; Maheshwari *et al.*, 2008b; Daniluk and Koert, 2013). Information alone is insufficient to change behaviours, but may contribute to more informed decisions (Benzies, 2008). The vast majority of our cohort plans to have children within 2 years, yet these statements are in need of a confirmative follow-up, which is currently ongoing. The planned 2-year follow-up will also verify and validate the concept of fertility assessment and counselling requested by these women.

A recent study about the educational efficacy of a fertility awareness website showed significantly increased knowledge scores after the web-based intervention, but a tendency to return to pre-intervention levels after 6 months of follow-up (Daniluk and Koert, 2015). A recent Swedish RCT of individual Reproductive Life Planning in relation to contraceptive counselling showed a significantly increased knowledge of reproduction in the intervention group (Stern *et al.*, 2013). Hence, we would advocate that individual fertility assessment and counselling provided by the FAC Clinic is a unique opportunity to generate a more substantial impact at the personal level as the women is presented with their own risk factors and a status of their remaining ovarian

Table VI Personal considerations in relation to childbearing among the cohabiting and the single women.

	Total	Cohabiting	Single	P-values [†]
Number	340	140	200	
Reasons for seeking counselling				
How long can I postpone childbearing	215 (63.2)	75 (53.6)	140 (70)	0.001 ^{*,a}
Check—because it was possible	189 (55.6)	112 (56.0)	77 (55.0)	0.783 ^a
Worried about my fecundity	178 (52.4)	73 (52.1)	105 (52.5)	0.543 ^a
Knowledge - how to optimize my chances	121 (35.6)	65 (32.5)	56 (40.0)	0.167 ^a
Currently trying to get pregnant	59 (17.4)	46 (32.9)	13 (6.5)	0.001 ^{*,a}
Due to a doctor's recommendation	21 (6.2)	9 (6.4)	12 (6.0)	0.820 ^a
Thoughts about difficulties to get pregnant				
Yes	312 (92.0)	131 (93.6)	181 (91.0)	0.483 ^a
No	18 (5.3)	5 (3.6)	13 (6.5)	
Don't know	9 (2.7)	4 (2.9)	5 (2.5)	
Knowledge—at what age are women most fertile				
15–19	64 (18.8)	25 (17.9)	39 (19.5)	0.397 ^a
20–24	245 (72.1)	98 (70.0)	147 (73.5)	
25–29	27 (7.9)	15 (10.7)	12 (6.0)	
30–35	3 (0.9)	2 (1.4)	1 (0.5)	
36–45	0	0	0	
Don't know	1 (0.3)	0	1 (0.5)	
Important or very important in relation to childbearing**				
That I feel mature	161 (89.4)	69 (87.3)	92 (91.1)	0.143 ^a
That I have a stable relationship	141 (78.8)	74 (93.7)	67 (67.0)	0.001 ^{*,a}
That I have a job that can be combined with children	137 (76.5)	59 (74.7)	78 (78.0)	0.784 ^a
That I have a partner to share the responsibility	133 (74.3)	66 (83.5)	67 (67.0)	0.001 ^{*,a}
That I have access to day care	117 (65.4)	48 (61.5)	69 (68.3)	0.853 ^a
That I have children before I get 'too old'	117 (65.0)	51 (64.6)	66 (65.3)	0.856 ^a
That I have a stable and good income	106 (58.9)	46 (58.2)	60 (59.4)	0.468 ^a
That I have a permanent employment	89 (49.4)	42 (53.2)	47 (46.5)	0.836 ^a
That I have been able to travel and be flexible before childbearing	78 (43.6)	45 (57.0)	33 (33.0)	0.017 ^{*,a}
That I have children before my partner gets too old	69 (38.5)	39 (49.4)	30 (30.0)	0.001 ^{*,a}
That I have completed my studies	60 (33.3)	31 (39.2)	29 (28.7)	0.605 ^a
That I have a home of suitable size	52 (28.9)	30 (38.0)	22 (21.8)	0.141 ^a
That I have a career and have achieved a certain position at work	25 (13.9)	14 (17.7)	11 (10.9)	0.616 ^a
Because my friends and family have had kids or are expecting	6 (3.3)	3 (3.8)	3 (3.0)	0.429 ^a
Because our family expects us to have kids	4 (2.2)	2 (2.6)	2 (2.0)	0.978 ^a

Data are N (%).

P-values [†] indicates the difference between the cohabiting (n = 140) and the single women (n = 200).

*Significant P < 0.05.

**Listed as 'very important' or 'important' on a five-point scale: (i) very important, (ii) important, (iii) of some importance, (iv) not very important or (v) not important at all.

^aPearson's chi-squared test.

reserve with an AMH result. At best the FAC Clinic hopes to counteract the western tendency of postponement of childbearing (Tremellen and Savulescu, 2014; Hvidman et al., 2015).

Both cohabiting and single women were mainly positive towards social egg freezing in terms of free accessibility and having the procedure performed. In Denmark, oocyte freezing in public clinics is only allowed on a medical indication such as premature ovarian insufficiency and cancer. The procedure is available in private clinics by user payment.

A recent study of oocyte bankers and non-bankers concludes that oocyte freezing does not seem to influence the reproductive choices of the women (Stoop et al., 2015). The study found similar positive attitudes towards insemination with donor sperm and a reluctance to use donated oocytes in a cohort of 86 women with a mean age of 36.7 (SD 2.62). A cross-sectional study of 2000 Canadian childless women with a mean age of 28.1 (SD 7.0) likewise displayed a sparse willingness to use oocyte donation (24.7%), yet more willingly towards IVF (67.9%),

Table VII Expected benefits and consequences of motherhood among the cohabiting and the single women.

	Total	Cohabiting	Single	P-values [†]
Number	340	140	200	
Expected benefits of motherhood**				
Personal development	159 (88.8)	68 (87.2)	91 (90.1)	0.283
To give and receive love	154 (86.0)	64 (82.1)	80 (89.1)	0.452
Another perspective of importance in life	145 (81.0)	63 (80.8)	82 (81.2)	0.383
New interests in life	114 (63.7)	50 (64.1)	64 (63.4)	0.458
Having children is the meaning of life	93 (52.5)	39 (50.0)	54 (54.5)	0.802
More/closer contact to my family	76 (42.7)	32 (41.6)	48 (43.6)	0.648
I will feel more complete as a woman	74 (41.3)	35 (44.9)	39 (38.6)	0.498
We will become a real family	71 (39.7)	42 (53.8)	29 (28.7)	0.001*
It will strengthen the relationship with my partner	65 (36.5)	37 (47.4)	28 (28.0)	0.001*
The 'everyday life' will be better	48 (26.8)	20 (25.6)	28 (27.7)	0.394
Expected consequences of motherhood**				
That I have less spare time to myself	147 (82.1)	63 (80.8)	84 (83.2)	0.101
That I have less time to job and career	136 (76.0)	59 (75.6)	77 (76.2)	0.056
That I will have an inferior economic situation	71 (39.7)	28 (35.9)	43 (42.6)	0.242
It will put a strain on the relationship	53 (29.6)	33 (42.3)	20 (19.8)	0.001*
I will have an inferior status on the labour market	44 (24.7)	15 (19.5)	29 (28.7)	

Data are N (%).

P-values [†] indicates the difference between the cohabiting (n = 140) and the single women (n = 200) by Pearson's chi-squared test.

*Significant P < 0.05.

**Listed as 'agree' or 'mainly agree' on a four-point scale: (i) agree, (ii) mainly agree, (iii) neither agree nor disagree or (iv) mainly disagree.

social egg freezing (34.5%) and sperm donation (31.2%) (Daniluk and Koert, 2012).

Although generally well educated, the women maintain the perception of having 'pregnancy-capable' oocytes despite advanced age, when it comes to their own fecundity. This ambiguity is also displayed in the responses regarding ideal age of first child. The women in our study (mean age 37.4) believed the maternal ideal age in general was 28.7 years for the birth of the first child and 37.7 for the last child. Their own ideal age for the birth of the first child would have been 33.2 and 39.4 years. Again, the women's general view on family planning and motherhood does not cohere with their actions. It is possible the women maintain the idea of an ideal age despite the knowledge of they will not be able to achieve it. These findings are in accordance with the study from Daniluk and Koert, where the women indicate 26.8 years as the ideal maternal age for the birth of first child, but do not expect to have their first child until the age of 32.4 (Daniluk and Koert, 2012). The similarity between cohabiting and single women regarding the age of last birth may be explained by the socially accepted deadline of 40 years as previously described by Billari *et al.* (2011).

The single and cohabiting women in our study had similar family intentions in regards to number of children (mean of 1.8 children). For the majority of the participating women's advanced age will presumably be an obstacle for achieving this, as primiparous 35-year-olds on average give birth to 1.5 children and only 8 out of 100 primiparous 40-year-olds will have two children (Andersson *et al.*, 2008). Smaller families than anticipated is a well-known consequence of the postponement of parenthood as infertility and miscarriage increases with age (Maheshwari *et al.*, 2008a; Joffe *et al.*, 2009; Schmidt *et al.*, 2012). Furthermore,

there is a known discrepancy between intended and achieved births. A recent study of 22 European countries found an average fertility achievement rate of 61% in a 3-year period ranging from 32 (Greece) to almost 100% (Turkey and the UK) (Harknett and Hartnett, 2014).

A central question is why many women and men fail to fulfil intentions of childbearing. Earlier research listed lack of partner as the most prominent reason for remaining childless at advanced age (Tough *et al.*, 2007; Cooke *et al.*, 2012).

Contrary to the results of previous studies (Proudfoot *et al.*, 2009; Baldwin *et al.*, 2014; Schytt *et al.*, 2014) having a partner was not the most important prerequisite for childbearing. Among the single women, personal circumstances such as maturity, the ability to combine work and children and access to day care were considered more important than having a partner. Although both single and cohabiting women were well educated, only few mentioned career as an important factor in relation to childbearing. The conditions provided by the Nordic Welfare States in terms of paid maternity leave; increased child allowances; grants for day care; free school and health care, gives an opportunity to raise a child as a single parent. Furthermore, medically assisted reproduction is available to single, lesbian and cohabiting women in Denmark. Childless women below the age of 40 years are entitled to government funded treatment for their first child. Additionally, the use of donated semen is allowed without any additional costs at the public clinics. In Denmark, women aged 40–46 years can receive treatment at private clinics with intrauterine insemination (IUI) covered by government funding, whereas the semen and *in vitro* fertilization are paid by the patients. The use of double-donation combining donated oocytes and semen is not allowed for the same patient. Furthermore,

Table VIII Attitudes towards fertility treatment, gamete donation and social freezing among the cohabiting and the single women.

	Total	Cohabiting	Single	P-values [†]
Number	340	140	200	
Would you consider IVF/ICSI if you are not able to achieve a spontaneously conceived pregnancy?				
Definitely yes	109 (32.2)	52 (37.1)	57 (28.6)	0.226
Most likely	118 (34.8)	44 (31.4)	74 (37.2)	
I don't know	87 (25.7)	31 (22.1)	56 (28.1)	
Probably not	19 (5.6)	9 (6.4)	10 (5.0)	
Definitely not	6 (1.8)	4 (2.9)	2 (1.0)	
Would you consider sperm donation?				
Definitely yes	71 (21.0)	12 (8.7)	59 (29.5)	0.001*
Most likely	103 (30.5)	22 (15.9)	81 (40.5)	
I don't know	98 (29.0)	53 (38.4)	45 (22.5)	
Probably not	38 (11.2)	28 (20.3)	10 (5.0)	
Definitely not	28 (8.3)	23 (16.7)	5 (2.5)	
Would you consider oocyte donation?				
Definitely yes	10 (3.0)	3 (2.2)	7 (3.5)	0.117
Most likely	39 (11.6)	15 (10.8)	24 (12.1)	
I don't know	127 (37.7)	45 (32.4)	82 (41.4)	
Probably not	89 (26.4)	37 (26.6)	52 (26.3)	
Definitely not	72 (21.4)	39 (28.1)	33 (16.7)	
Would you consider adoption?				
Definitely yes	16 (4.7)	7 (5.1)	9 (4.5)	0.351
Most likely	69 (20.5)	35 (25.4)	34 (17.1)	
I don't know	161 (47.8)	58 (42.0)	103 (51.8)	
Probably not	52 (15.4)	22 (15.9)	30 (15.1)	
Definitely not	39 (11.6)	16 (11.6)	23 (11.6)	
Would you consider to deselect having children?				
Definitely yes	1 (0.3)	1 (0.7)	0	0.804
Most likely	53 (15.9)	23 (16.5)	30 (15.5)	
I don't know	166 (49.8)	67 (48.2)	99 (51.0)	
Probably not	51 (15.3)	22 (15.8)	29 (14.9)	
Definitely not	62 (18.6)	26 (18.7)	36 (18.6)	
Should 'social freezing' be accessible to all?				
Definitely yes	113 (33.3)	48 (34.3)	65 (32.7)	0.756
Most likely	112 (33.0)	48 (34.3)	64 (32.2)	
I don't know	87 (25.7)	34 (24.3)	53 (26.6)	
Probably not	22 (6.5)	7 (5.0)	15 (7.5)	
Definitely not	5 (1.5)	3 (2.1)	2 (1.0)	
Would you consider 'social freezing'?				
Definitely yes	74 (21.8)	31 (22.1)	43 (21.6)	0.36
Most likely	80 (23.6)	31 (22.1)	49 (24.6)	
I don't know	131 (38.6)	55 (39.3)	76 (38.2)	
Probably not	46 (13.6)	17 (12.1)	29 (14.6)	
Definitely not	8 (2.4)	6 (4.3)	2 (1.0)	

Data are N (%).

P-values [†] indicates the difference between the cohabiting (n = 140) and the single women (n = 200) by Pearson's chi-squared test.

*Significant P < 0.05.

surrogacy is illegal in Denmark and this may partly explain why an increasing number of heterosexual women of advanced age with the knowledge of the age-related declining female fecundity choose solo motherhood with donor insemination. In Denmark, 1% of the birth cohort is born by single women with the use of medically assisted reproduction (Salomon *et al.*, 2015). Although recent research has stated that solo motherhood is not the preferred choice for these women, as most women expect and prefer to have children in a nuclear family setting (Frederiksen *et al.*, 2011; Daniluk and Koert, 2013; Salomon *et al.*, 2015). A recent Danish study of 184 single women seeking assisted reproduction with the use of donor semen contradicted the previous assumptions of a selected well educated group as 30% of the women had none or a short education length (Salomon *et al.*, 2015), which underlines that the opportunity of solo motherhood is considered regardless of education and income level.

The cohabiting women and single women expected the same benefits of motherhood in terms of personal development, the loving relationship between mother and child, and another perspective of the important things in life. Their concerns of the consequences of motherhood primarily focused on the loss of freedom as well as less time to job and career. In combination with the rising proportion of women undergoing tertiary education the expectations of content in life has changed (Schmidt *et al.*, 2012). Modern women strive for a workable combination of relationship, career and childrearing (Mills *et al.*, 2011). Women want the same—regardless of marital status. Yet, the single women of advanced age experience social stigmatizing when not fulfilling the norm to establish a family with husband and children in their late twenties or early thirties (Birch Petersen *et al.*, 2015).

The question is, whether the single women in our cohort, are obliged to underreport the importance of a partner due to their present situation. Furthermore, they are highly aware of the ‘biological clock’ and seek consultation in order to postpone pregnancy—presumably to gain more time to find a suitable father and partner (Salomon *et al.*, 2015). On the other hand our results may underline that within a good welfare system being a single mother is more easily overcome and waiting for ‘Mr. Right’ seems less important. This circumstance could moreover explain the difference in attitude towards sperm donation in the two otherwise comparable groups. In all, 70% of the single women have considered this possibility compared with one fourth of the cohabiting women. As 93% of the single women expect to get pregnant within 2 years after the consultation, several could be compelled to solo-motherhood due to the pressure of the age-related decline in fertility.

Screening healthy individuals implies a risk of false positive and negative findings (Moynihan and Smith, 2002; Tremellen and Savulescu, 2014; Hvidman *et al.*, 2015). False ‘positive’ findings must be considered in relation to AMH, as intra-individual variation in AMH values have been described as well as reduced values in oral contraceptive users (Bentzen *et al.*, 2012; Overbeek *et al.*, 2012). Hence, a presumed low ovarian reserve can cause concerns and influence the personal decision-making regarding actions towards motherhood. False ‘negative’ findings can induce a feeling of security and encourage women to postpone pregnancy even longer, which ultimately can lead to infertility and involuntary childlessness. Therefore, fertility assessment and counselling should be performed cautiously by fertility experts.

Limitations

Attendance to the FAC Clinic is based on self-referral, which could imply a potential selection bias, which is underlined by the high proportion of our cohort planning to have children in the near future despite their single status. Furthermore, there may be a selection bias towards the more well-educated individuals most prone to postpone childbearing (Mills *et al.*, 2011). On the other hand, the visit at the FAC Clinic is fully reimbursed hence all individuals from all social layers are able to come.

During the build-up of the electronic questionnaire the answer possibility ‘Disagree’ in relation to expected benefits and consequences of motherhood was unfortunately not included. Hence, a four-point scale was used instead of a five-point scale. We primarily focused on ‘Agree’ and ‘Mainly Agree’ in our results, yet the missing answer possibility could imply a selection bias.

Conclusion

The consequences of postponement of childbearing in terms of involuntary childlessness, infertility and smaller families than desired are serious not only for the individual but also for the society in developed countries. The Fertility Assessment and Counselling Clinic was initiated to provide women and men with information about their current fertility status in order to prevent the aforementioned. Our study suggests that for women of advanced age with knowledge of the age-related decline in fecundity, childbearing may be based on a choice independent of marital/civil status. The question is whether this new approach could help women to make pro-fertility choices in due time. Nevertheless, the long-term effects of fertility assessment and counselling remains yet to be validated.

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Authors’ roles

All authors contributed to the design of the study. K.B.P. wrote the first and successive drafts of the paper. K.B.P. carried out the statistical analysis. All authors contributed to the interpretation of results, critically revised the draft for intellectual content and approved the final manuscript.

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Conflict of interest

None declared.

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