Pre conception use of cannabis and cocaine among men with pregnant partners

Elisabeth Lobben Munch
Norwegian University of Science and Technology, Medical Studies, Trondheim, Norway

Svetlana Skurtveit
Norwegian Institute of Public Health, Oslo, Norway
Norwegian Centre for Addiction Research, University of Oslo, Oslo, Norway

Marte Handal (iD)
Norwegian Institute of Public Health, Oslo, Norway

Eva Skovlund (iD)
Norwegian Institute of Public Health, Oslo, Norway
Department of Public Health and Nursing, NTNU, Norwegian University of Science and Technology, Trondheim, Norway

Abstract

Background: Paternal lifestyle during sperm development can have an impact on foetal development. This study surveys demographic characteristics and lifestyle factors among expectant fathers who reported use of cannabis and cocaine in the six-month period before conception. We also study the associations between mothers' and fathers' use of cannabis and cocaine. **Methods:** This is a cross-sectional study from the Norwegian Mother and Child Cohort Study (MoBa) using self-reported data on demographic variables and cannabis and cocaine use six months before conception. Associations were assessed using logistic regression and chi-square tests. **Results:** A strong association was found between use of cannabis and cocaine and lifestyle habits such as alcohol and cigarette use. Alcohol consumption four or more times a week gave an adjusted odds

ratio (aOR) of 9.7 (95% CI 7.2–13.0) for cannabis and an aOR 21.6 (95% CI 11.5–40.3) for cocaine. There was also a strong association between maternal and paternal use of cannabis and cocaine. **Conclusion:** Use of cannabis and cocaine close to pregnancy seems to be closely linked to other risk factors, and further studies on how paternal drug use affects the foetus are warranted. The strong association between maternal and paternal use of cannabis and cocaine may be used to inform healthcare workers to make good risk assessments.

Background

Previous research on health among expecting parents has to a large degree focused on pregnant women and their lifestyle before, during and after pregnancy, and how it affects the foetus (Everett, Bullock, Longo, Gage, & Madsen, 2007; Huizink, 2014; Marroun et al., 2011; Pollard, 2000). Maternal lifestyle factors such as substance use may alter the developmental trajectory of the foetus and result in adverse outcomes. However, this is probably not only confined to maternal exposures, as paternal lifestyle during sperm development may also have an impact by inducing modifications or damage to the genetic material. Many illegal drugs might be harmful to the spermatogenesis, and sperm quality may be altered by chronic exposure to alcohol, nicotine and illegal drugs such as cannabis, cocaine, heroin, ecstasy and amphetamine (Pollard, 2000). Although spermatogenesis takes 72–81 days in humans, the sperms in the ejaculated sample resulting in pregnancy will be more of an average of events that happened approximately 10–12 weeks earlier (Adler, 1996). The period close to conception will therefore be a period of special interest with respect to paternal lifestyle.

Paternal marijuana use during the period of conception, pregnancy, and postnatally has been found to be significantly associated with sudden infant death syndrome (SIDS), adjusted for alcohol and cigarette use (Klonoff-Cohen & Lam-Kruglick, 2001). Human spermatozoa express the cannabinoid receptor type 1 and in vitro studies exposing human spermatozoa to marijuana extracts have demonstrated decreased sperm motility, viability and function (Whan, West, McClure, & Lewis, 2006).

Cocaine may increase the frequency of anomalies in the offspring (Pollard, 2000). A specific binding of cocaine to human spermatozoa has been demonstrated at high concentrations of cocaine, which supports the theory about the sperm acting as a vector to transport cocaine into the ovum (Yazigi, Odem, & Polakoski, 1991). Preclinical studies in mice have shown a decrease in biparietal diameter in offspring from male mice who had been chronically treated with cocaine inhalations before conception, as well as deficits in responsiveness to stimuli (He, Lidow, & Lidow, 2006). Behavioural depression following paternal cocaine exposure in mice, as well as a significantly decreased body weight in cocaine-exposed offspring has been reported (Killinger, Robinson, & Stanwood, 2012).

In a population-based study in Norway, cannabis was reported to be the drug of choice, and cocaine the second most commonly used illegal drug (Sandøy, 2015). In addition, following liberalization and even legalization of reactional cannabis use it may be anticipated that more men will engage in cannabis use possibly also during the period just before pregnancy. Also, contemporary cannabis products contain more of the active substance delta-9-tetrahydrocannabinol. Furthermore, use of cannabis for medical purposes is increasing. In Norway, little information

on cocaine use can be found in health surveys. However, in the large Norwegian Mother and Child Cohort, fathers to be were included and asked about use of cannabis and cocaine.

Risk pregnancies are important to discover. Women using illegal drugs might hesitate to inform healthcare professionals about their use. A strong spousal relation in cannabis use has previously been shown (el Marroun et al., 2008; Hopfer, Stallings, Hewitt, & Crowley, 2003). If an association between maternal and paternal drug use is confirmed, questioning about partners' use of drugs might be one way to identify possible risk.

Since knowledge about the use of illegal drugs in men who have pregnant partners is sparse, we aimed to study the use of cannabis and cocaine among fathers to be during the six months before conception, and to estimate the association between lifestyle characteristics and use of cannabis or cocaine. We also aimed to evaluate the association between paternal and maternal use of cannabis and cocaine.

Methods

The Norwegian Mother and Child Cohort Study

The Norwegian Mother and Child Cohort Study (MoBa) is a prospective population-based pregnancy cohort run by the Norwegian Institute of Public Health (Irgens, 2014; Magnus et al., 2016; Magnus et al., 2006). In the MoBa study, Norwegian pregnant women have answered detailed self-administered questionnaires several times during and after pregnancy in the period 1999–2008. Of all the women who received a postal invitation to MoBa, 40.6% consented to participate. The final cohort includes approximately 95,200 mothers and 114,500 children, as well as 76,600 fathers. The fathers answered a questionnaire between week 15 and week 20 of pregnancy, with detailed questions about lifestyle before and during pregnancy, including use of cannabis and cocaine (Magnus et al., 2016). Some of the

information in MoBa is obtained by linkage to the Medical Birth Registry of Norway, which is a nationwide register based on mandatory notification of all births or late abortions in Norway (Irgens, 2000).

Study population

The present study is based on questionnaires from 76,656 fathers. The fathers reported on use of cannabis, ecstasy, cocaine, heroin, and amphetamine, and were asked to tick one or more of the following boxes for each drug: never, previously, six months before pregnancy, or now (week 15–20 of pregnancy). We wanted to focus specifically on users of the two most commonly used illegal drugs, cannabis and cocaine, six months before pregnancy and to compare these men to those who had never used any illegal drugs. Fathers with missing information on cannabis and cocaine use were excluded, as were fathers who reported use of any illegal drug previously or during pregnancy, but not six months before conception, and also fathers who reported having used other illegal drugs in combination with cannabis or cocaine in the six-month period before conception. Our study population consists of 61,924 fathers using either cannabis (751) or cocaine (133) six months before pregnancy, and fathers who reported that they had never used any illegal drug (61,040).

Questionnaire

The questionnaire included detailed questions about cannabis and cocaine use, alcohol, smoking habits, prescribed drug use and other lifestyle details (http://www.fhi.no/enmoba). Information about demographic characteristics, lifestyle and health variables such as age, marital status, education, work, income, use of opioids and benzodiazepines, alcohol and smoking habits, as well as Hopkins Symptom Checklist (HSCL) score and whether the pregnancy was planned or not was given in pregnancy, but for this study it is assumed that this

information was unchanged compared to six months prior to conception. For education, only completed education was analysed. Those fathers who were undertaking more advanced education were counted in the group corresponding to their highest level of completed education. Symptoms of anxiety and depression were assessed in the questionnaire, based on a screening instrument designed to identify common psychiatric symptoms (e.g., fearfulness, hopelessness, feeling blue) – the five-item version (SCL-5) of the Hopkins Symptom Checklist (SCL-25) (Skovlund, Handal, Selmer, Brandlistuen, & Skurtveit, 2017). For each symptom the father was asked to tick on a scale from 1 to 4 if he was not bothered, a little bothered, quite bothered or very bothered. The SCL-5 scores were calculated as the mean value of the five items to generate an SCL-5 score ranging from 1 to 4. Presence of symptoms of anxiety and depression was defined as having a score ≥ 2.0. In our study, subjects with two or more missing items on the SCL-5 were assigned to missing. When only one item was missing, it was replaced by the sample mean value for that item (Skovlund et al., 2017).

The fathers' use of cannabis or cocaine six months before conception was compared to the mothers' use during the last month before conception. The mothers' questionnaire contained information on illegal drug use in the following categories: never, previously, one month before conception, during pregnancy, and after pregnancy. Although not identical with regard to time, the category one month before conception was considered to correspond most closely to the fathers' use six months before conception. We do not have information on fathers' use in the period between six months before and week 15–20 of the pregnancy.

Statistics

The proportion of users was tabulated according to the fathers' demographic characteristics and lifestyle factors. Logistic regression was used to identify associations between demographic variables and illegal drug use six months before conception. Unadjusted analyses were performed both for the entire study population ($n = 61,924$) and in the population for the adjusted analysis (full information on all covariates in the model; $n = 58,963$ for cannabis and $n = 58,377$ for cocaine). In the adjusted analysis for cannabis, all demographic and lifestyle variables were included simultaneously in the model. For cocaine, only statistically significant variables were included simultaneously in the final model, due to the low number of cocaine users. Chi-square tests were performed to study the association between mothers' and fathers' use close to pregnancy. Exact *p*-values are reported if the expected numbers are small. Statistical Package for the Social Sciences (SPSS) version 24 was used to analyse data.

Results

Cannabis

A total of 751 fathers (1.2%) reported use of cannabis as the only illegal drug used in the six-month period before pregnancy (Table 1). There was more cannabis use in the younger age group than in the population of fathers aged over 30 years, and there was more cannabis use if the father was not living with the pregnant mother. The proportion of cannabis users was lower in fathers who were employed, had higher levels of education, and higher incomes. There is a strong association between cannabis use and use of benzodiazepines and opioids, which is especially pronounced for benzodiazepines. Among fathers who smoked cigarettes sometimes or daily six months before conception, and drank weekly, there was more use of cannabis. From Table 1 it seems that when the pregnancy was planned, the proportion of cannabis users was lower than in non-planned pregnancies (0.9% vs. 2.7%). There was also a higher proportion of cannabis users among those who reported psychiatric symptoms.

Table 2 shows an association with young age, being single, having lower levels of

Table 1. Demographic and clinical characteristics and association with cannabis and cocaine use six months before conception. The Norwegian Mother and Child Cohort Study (MoBa)

	Never used any illegal drug (n = 61,040) n (%)	Cannabis (n = 751) n (%)	Cocaine (n = 133) n (%)
Age (years) n = 61,534			
< 24	2573 (96.4)	84 (3.1)	13 (0.5)
25–29	13,437 (98.0)	241 (1.8)	39 (0.3)
30–34	23,826 (98.6)	279 (1.2)	56 (0.2)
35–39	14,715 (99.2)	105 (0.7)	16 (0.1)
> 40	6106 (99.3)	35 (0.6)	9 (0.1)
Marital status n = 61,569			
Married	31,204 (99.2)	210 (0.7)	29 (0.1)
Co-habiting	28,424 (98.0)	479 (1.7)	87 (0.3)
Single	422 (92.1)	31 (6.8)	5 (1.1)
Divorced/separated/other	611 (94.6)	26 (4.0)	9 (1.4)
Education (complete) n = 61,924			
Unknown	1620 (98.2)	23 (1.4)	7 (0.4)
Lower secondary (9–10y)	2145 (96.8)	59 (2.7)	11 (0.5)
Upper secondary (12–13y)	26,937 (98.5)	355 (1.3)	69 (0.3)
Higher education (> 13y)	30,338 (98.8)	314 (1.0)	46 (0.1)
Work situation n = 61,559			
Student/intern	1503 (96.3)	52 (3.3)	5 (0.3)
At home/unemployed/laid off	1420 (95.8)	54 (3.6)	8 (0.5)
Employed	49,658 (98.9)	490 (1.0)	83 (0.2)
Self-employed	6980 (98.0)	114 (1.6)	27 (0.4)
Other	1123 (96.4)	33 (2.8)	9 (0.8)
Income n = 26,462			
< 200,000 NOK	2040 (94.6)	107 (5.0)	9 (0.4)
200,000–400,000 NOK	12,255 (98.0)	212 (1.7)	41 (0.3)
> 400,000 NOK	11,673 (98.9)	92 (0.8)	33 (0.3)
Benzodiazepines n = 61,924			
No	60,740 (98.6)	733 (1.2)	126 (0.2)
Yes	300 (92.3)	18 (5.5)	7 (2.2)
Opioids n = 61,924			
No	60,052 (98.6)	724 (1.2)	128 (0.2)
Yes	988 (96.9)	27 (2.6)	5 (0.5)
Smoking n = 61,774			
Never	33,116 (99.8)	61 (0.2)	11 (0.0)
Previously	12,387 (98.9)	112 (0.9)	23 (0.2)
Sometimes*	5627 (95.7)	215 (3.7)	39 (0.7)
Daily*	9762 (95.9)	362 (3.6)	59 (0.6)
Alcohol n = 61,562			
Never	1604 (99.9)	1 (0.1)	0 (0.0)
Less than weekly*	35,591 (99.2)	245 (0.7)	28 (0.1)
< 4 times a week*	22,244 (97.8)	424 (1.9)	81 (0.4)
≥ 4 times a week*	1248 (92.9)	76 (5.7)	20 (1.5)
Planned pregnancy** n = 61,213			
Yes	50,419 (98.9)	464 (0.9)	75 (0.1)
No	9919 (96.7)	280 (2.7)	56 (0.5)
Hopkins Symptom Checklist n = 61,384			
No psychiatric symptoms	59,004 (98.7)	681 (1.1)	120 (0.2)
Psychiatric symptoms	1469 (95.2)	61 (4.0)	13 (0.8)

Note. NOK = Norwegian Kroner.
*Six months before conception. **Maternal report.

education, not being employed, use of benzodiazepines and opioids, smoking, alcohol drinking, unplanned pregnancy and psychiatric symptoms. The adjusted analysis included 690 cannabis users with no missing information on covariates in the model and showed a strong association between lifestyle factors and reported cannabis use. Cigarette smoking sometimes or daily six months prior to conception showed very strong associations with adjusted odds ratios (aOR) of 17.5 (95% confidence interval [CI] 13.0–23.5) and 18.5 (95% CI 13.8–24.8), respectively, and alcohol consumption four or more times a week gave an aOR of 9.7 (95% CI 7.2–13.0) in the adjusted analysis. There was an association between whether the pregnancy was planned or not and use of cannabis or cocaine. Table 2 also shows an association between psychiatric symptoms and reported cannabis use.

Cocaine

Cocaine as the only illegal drug used was reported by 133 fathers (0.2%; Table 1). There were many similarities between fathers using cocaine and fathers using cannabis: young age, low income, low education, use of benzodiazepines or opioids, smoking and alcohol drinking, unplanned pregnancy and psychiatric symptoms. Table 2, where 123 cocaine users and 58,254 non-users had full information on all covariates, reveals elevated odds ratios for cocaine use among fathers not living with the pregnant woman, and for fathers using benzodiazepines (aOR 7.1, 95% CI 3.0–16.8). The strongest association was, like for cannabis, between reported cocaine use and lifestyle habits such as smoking, and especially alcohol use (aOR 21.6, 95% CI 11.5–40.3). There were also higher odds ratios for cocaine use in unplanned pregnancies and when the father reported psychiatric symptoms.

Association between fathers' and mothers' cannabis and cocaine use

A total of 54,226 women included in our study population had responded to the questions on cannabis and cocaine use. Table 3 shows a strong association between paternal and maternal cannabis and cocaine use ($p < 0.001$). When the father was a never user, 99.9% of the mothers were as well. When the father was using cannabis, 30% of the mothers were as well, and when the father used cocaine, 30% of the mothers used cannabis, and 16% used cocaine. Eight out of the 10 cocaine-using mothers in our study population had a partner who used cocaine as well. In the 122 mothers and fathers who both used cannabis or cocaine, there was a strong association for using the same drug ($p < 0.001$).

Discussion

This study has surveyed the use of cannabis and cocaine among expectant fathers. We focused our analyses on reported use six months before pregnancy, since this is a sensitive period for male reproductive cells. Strong associations between use of cannabis and cocaine, respectively, and lifestyle habits such as smoking and alcohol use were found. There was also a strong association between use of benzodiazepines and cocaine.

Cannabis has been reported to be the most commonly used illegal drug in Norway with cocaine as the second most common (Sandøy, 2015). In our study there were more cannabis users than cocaine users: 1.2% reported use of cannabis and 0.2% cocaine use six months prior to conception. In comparison, cannabis use during the last 12 months has been estimated at 6.1% and 2.6% during the last four weeks in Norwegian men, and reported cocaine use in young males was about 3.5% over the last 12 months (Sandøy, 2015). There are several reasons for the observed low prevalence in our study. First of all we have information on use in a shorter period (six compared to 12 months) and we only include expectant fathers who

Table 2. Association between demographic characteristics, lifestyle factors and use of cannabis and cocaine. Unadjusted and adjusted ^ odds ratios (OR)

	Cannabis only (95% CI) n = 58,963		Cocaine only (95% CI) n = 58,377	
	Unadjusted OR	Adjusted OR^	Unadjusted OR	Adjusted OR^
Age (years)				
< 24	2.80 (2.20–3.60)	1.10 (0.85–1.60)	2.00 (1.10–3.90)	0.75 (0.36–1.50)
25–29	1.50 (1.30–1.80)	1.30 (1.10–1.60)	1.30 (0.87–2.00)	1.10 (0.70–1.70)
30–34	1.00	1.00	1.00	1.00
35–39	0.62 (0.49–0.77)	0.54 (0.43–0.68)	0.51 (0.29–0.90)	0.43 (0.24–0.76)
> 40	0.49 (0.34–0.71)	0.31 (0.21–0.45)	0.55 (0.25–1.20)	0.24 (0.10–0.57)
Marital status				
Married	1.0	1.0	1.0	1.0
Co-habiting	2.5 (2.1–2.9)	1.8 (1.5–2.1)	3.5 (2.3–5.5)	2.6 (1.6–4.0)
Single	11.1 (7.4–16.5)	3.2 (2.0–5.0)	11.8 (4.1–34.0)	3.6 (1.2–11.0)
Divorced/separated/other	6.5 (4.2–9.9)	2.5 (1.6–4.1)	18.0 (8.4–38.6)	6.7 (2.9–15.6)
Education (complete)				
Unknown	1.40 (0.86–2.20)	0.96 (0.59–1.60)	1.40 (0.45–4.60)	***
Lower secondary (9–10y)	2.80 (2.10–3.70)	0.82 (0.59–1.10)	3.60 (1.90–7.00)	
Upper secondary (12–13y)	1.30 (1.10–1.50)	0.62 (0.52–0.74)	1.60 (1.10–2.40)	
Higher education (> 13y)	1.00	1.00	1.00	
Work situation				
Student/intern	3.50 (2.60–4.70)	2.40 (1.70–3.40)	2.20 (0.87–5.30)	1.40 (0.54–3.70)
At home/unemployed/laid off	4.00 (3.00–5.40)	2.20 (1.60–3.10)	3.30 (1.50–7.20)	2.00 (0.87–4.50)
Employed	1.00	1.00	1.00	1.00
Self-employed	1.60 (1.30–2.00)	1.70 (1.40–2.10)	2.30 (1.50–3.70)	2.40 (1.50–3.70)
Other	3.10 (2.20–4.50)	2.20 (1.50–3.30)	5.40 (2.70–10.70)	3.80 (1.80–7.90)
Benzodiazepines				
No	1.0	1.0	1.0	1.0
Yes	5.1 (3.1–8.3)	2.5 (1.4–4.4)	12.5 (5.8–27.0)	7.1 (3.0–16.8)
Opioids				
No	1.0	1.0	1.0	***
Yes	2.3 (1.6–3.5)	1.6 (1.1–2.5)	2.6 (1.1–6.4)	
Smoking				
Never	1.0	1.0	1.0	1.0
Previously	4.9 (3.5–6.8)	4.8 (3.5–6.6)	5.9 (2.8–12.5)	5.6 (2.6–11.8)
Sometimes*	21.4 (16.0–28.8)	17.5 (13.0–23.5)	21.9 (10.9–44.1)	16.1 (8.0–32.5)
Daily*	20.6 (15.5–27.2)	18.5 (13.8–24.8)	18.5 (9.4–36.3)	13.6 (6.8–26.9)
Alcohol				
Less than weekly*	1.0	1.0	1.0	1.0
< 4 times a week*	2.8 (2.4–3.3)	2.9 (2.5–3.5)	4.8 (3.1–7.4)	5.1 (3.2–7.9)
≥ 4 times a week*	9.4 (7.2–12.3)	9.7 (7.2–13.0)	21.0 (11.7–38.6)	21.6 (11.5–40.3)
Planned pregnancy**				
Yes	1.0	1.0	1.0	1.0
No	3.1 (2.6–3.16)	2.0 (1.7–2.4)	3.8 (2.6–5.4)	2.4 (1.6–3.6)
Hopkins Symptom Checklist				
No psychiatric symptoms	1.0	1.0	1.0	1.0
Psychiatric symptoms	3.7 (2.8–4.9)	2.1 (1.6–2.9)	4.8 (2.7–8.6)	2.4 (1.3–4.5)

Notes. CI = confidence interval, OR = odds ratio.
^All covariates included simultaneously in the model; fathers with missing values excluded (models included 690 cannabis users and 123 cocaine users).
*Six months before conception. **Maternal report. ***The variables education and use of prescribed opioids, were not statistically significant, and were excluded from the model.

Table 3. Association between paternal and maternal cannabis and cocaine use before conception in the MoBa study

n = 54,226		Maternal use of cannabis or cocaine the last month before conception n (%)		
Paternal use of cannabis or cocaine six months prior to conception		Never	Cannabis only	Cocaine only
	Never	53,822 (99.9)	27 (0.1)	1 (0.0)
	Cannabis only	227 (69.6)	98 (30.1)	1 (0.3)
	Cocaine only	27 (54.0)	15 (30.0)	8 (16.0)

reported use of a single illegal drug during the actual period. All polydrug users were excluded. Also the expectant fathers in the sample were or had been in relationships with a pregnant partner. This probably results in a selection of men with a lower prevalence of illegal drug use. The fact that many pregnancies were planned might also have reduced the prevalence of drug use close to pregnancy. Furthermore, our study did not cover the same time period as the population-based survey (Sandøy, 2015).

Whether the lower prevalence in our study reflects actual reduction in use close to pregnancy or is due to selection or information bias is hard to tell. In our adjusted analysis we found a weak association between planned pregnancies and less reported use of cannabis and cocaine. More cannabis use among mothers when the pregnancy was not planned has also been reported previously (el Marroun et al., 2008). However, in a previous survey of men's smoking and alcohol habits in relation to pregnancy it was found that fathers to be did not change their smoking habits, and that hazardous drinking was only slightly reduced (Everett et al., 2007). This behaviour might not differ for cannabis and cocaine, and the differences in estimated prevalence may indicate selection bias and possible underreporting of illegal drug use rather than change of habits. Underreporting is not uncommon, but self-reported tobacco use in mothers has been shown to be a valid marker for exposure in the MoBa cohort (Kvalvik et al., 2012).

Fathers with missing values on included covariates are excluded from the adjusted analyses. This might have led to selection bias, but since the proportion of missing values is small and there is very little difference between the proportion of missing vales in users of cannabis or cocaine, we believe this is not a major issue.

The participants in MoBa are not necessarily representative of the general population of pregnant women and their partners. It has previously been shown that there was a strong underrepresentation of smoking mothers in the cohort, compared to the rest of the pregnant population (Nilsen et al., 2009). Potentially also a smaller proportion of women who use illegal drugs themselves, or who have partners who use illegal drugs, consented to participate. And even if the woman participated, their partners might not have consented, leading to a similar selection whereby fathers in the study population have a healthier lifestyle than the whole population of fathers to be. There is also the possibility that fathers participating in MoBa did not answer truthfully. Due to illegal drug use being taboo, perhaps especially so in relation to pregnancy, there might be a tendency to underreport actual use.

Our study demonstrates cannabis and cocaine use to be strongly associated with lifestyle factors. The strongest association found was between paternal cannabis or cocaine use, and smoking and alcohol habits. It is also striking, but hardly surprising, that cocaine users in particular report more use of benzodiazepines. A strong association between cannabis and

cocaine use and marital status and work situation, respectively, was also demonstrated. In the population-based study, those who reported cannabis use the last 12 months also reported heavier alcohol consumption than the rest of the population (Sandøy, 2015).

Women who use cannabis during pregnancy often report paternal cannabis use as well and paternal cannabis use has been found to be the strongest predictor for maternal cannabis use (el Marroun et al., 2008). Overall there is a strong spousal correlation of cannabis use in families (Hopfer et al., 2003). This is of importance since maternal illegal drug use has been shown to be directly harmful to the foetus (el Marroun et al., 2009; Huizink, 2009, 2014). As we also observed a strong association between maternal and paternal cannabis and cocaine use close to pregnancy, it is of great concern that lifestyle advice in pregnancy is directed primarily to the mother. It seems natural to assume that it will be harder for the mother to quit her illegal drug use if the father continues his use, and it is therefore strongly recommended to also explicitly consider the father's lifestyle in pregnancy check-ups. The strong association may also give an opportunity to obtain information about possible risk pregnancies. Even though underreporting is considered to be pronounced for use of illegal drugs during pregnancy, it might be easier for the pregnant woman to give information about her partner's use of illegal drugs than about her own. Including questions about the partner's drug use in usual pregnancy care might therefore increase health professionals' opportunities to make good risk assessments.

The MoBa database is an excellent source of information on lifestyle before and during pregnancy, due to the detailed questionnaires and high number of participants. One of the reasons for inclusion of fathers in MoBa was the concern that environmental exposure of males can lead to damage or modification of the DNA of the foetus. An advantage of the long recruitment time is that the exogenous exposures may have changed over time, so the spectrum of exposures is very wide (Magnus & Stoltenberg, 2014).

This study on fathers' use of cannabis and cocaine during the months before conception is one of very few in this field, and is unique regarding the size of the study population. A further advantage is that the responses are given directly by the father, and not via maternal report.

Unfortunately, we do not have any information concerning the amount of cannabis and cocaine use. The response categories in the questionnaire do not contain information regarding frequency and we are thus unable to distinguish between onetime incidents and daily use. Among young men reporting cannabis use in the general population in Norway, 65% report that they only used cannabis up to 10 times, and 20% report that they have used cannabis more than 50 times (Sandøy, 2015).

Since there were few illegal drug users in the study population, especially cocaine users, the estimated odds ratios have wide confidence intervals. In any case, obvious and statistically significant associations have been demonstrated.

This study is the first step in a project that aims to study birth outcomes in pregnancies with paternal cannabis and cocaine use. Lifestyle of the expectant fathers must be put on the agenda, not only because their lifestyles might have a direct impact on spermatogenesis and potentially on the foetus, but also since the association between the paternal and maternal cannabis and cocaine use is proven to be so strong.

Conclusion

In this study 751 (1.2%) of expectant fathers reported use of cannabis as a single illegal drug six months prior to conception, whereas 133 (0.2%) reported use of cocaine only. There was a strong association between cannabis or cocaine use and lifestyle factors, especially smoking and alcohol habits. A strong association between maternal and paternal use of these drugs was also demonstrated, and it is therefore

recommended to explicitly consider the father's lifestyle in pregnancy check-ups.

ORCID iD

Marte Handal https://orcid.org/0000-0003-1773-0184
Eva Skovlund https://orcid.org/0000-0002-2997-6141

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