

ORIGINAL ARTICLE

PREGNANCY HEALTH AND OUTCOME IN TWO CITIES IN THE KOLA PENINSULA, NORTHWESTERN RUSSIA

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ABSTRACT

Objectives. The aims of the study were to compare the prevalence of selected maternal and lifestyle factors as well as the reproductive outcome of working women in two cities in Northwestern Russia (Mončegorsk and Apatity), and to assess the quality of pregnancy-outcome data obtained in an interview with registered information.

Study design. A retrospective questionnaire study in an interview format. Women (n=1696) from selected workplaces in Apatity and Mončegorsk participated (85% of those available). Information was collected about past pregnancies, including information about the pregnancy outcome, newborn, occupation, health and life-style.

Results. The investigated groups had experienced 7,254 pregnancies in total, corresponding to 4.3 pregnancies on average per woman. In both groups, about one-half of the reported pregnancies were terminated, and three-quarters of the women had undergone an induced abortion. Spontaneous abortions had been experienced by 23% of the women in the Apatity group, which was higher than in the Mončegorsk group (16%). Previous spontaneous abortions appear more likely to be disclosed than induced abortions. The smoking prevalence was 37% in the Mončegorsk group and 24% in the Apatity group. Thirteen percent of all participants had been diagnosed with a pelvic inflammatory disease.

Conclusions. Induced abortions were common in Northwestern Russia regardless of city of residency, and the majority of the abortions appear to have occurred after the women had their attainable or desired number of children. The proportion of pregnancies resulting in a spontaneous abortion was higher in the investigated group in Apatity than in Mončegorsk, which should be investigated further. This study also confirmed that smoking has become more widespread among women in the Kola Peninsula, as elsewhere in Russia. (*Int J Circumpolar Health* 2007; 66(2) 168-181)

Keywords: Russia, Kola Peninsula, pregnancy, abortion, maternal health

INTRODUCTION

More than 90% of the population in the Kola Peninsula (KP), in Northwestern Russia, reside in urban areas. Most of the towns and cities in the KP were founded because of the establishment of an industrial plant to mine and refine local ores for a range of metals, including nickel, iron, cobalt and lanthanides, as well as the mineral apatite. This industrialization occurred mainly in the 1930s, 1940s and 1950s, and involved a massive relocation of people to the KP. The population grew from less than 30,000 in 1930 to a peak of 1.1 million in 1990. Since then the population has decreased steadily, dropping below 0.8 million in 2005.

The cities of Mončegorsk and Apatity are located north of the Arctic Circle at about 68°N-33°E. They are situated about 90 km apart from each other, with no other urban settlements in between. In 1995, the populations were 66,200 and 74,500, respectively. Near Apatity and the neighbouring town of Kirovsk, there is apatite mining and refining, and a proportion of the workers commute between these two towns. Each has a hospital with a delivery department. The population of Apatity is also employed in various other large industrial enterprises, such as construction. The main employer in Mončegorsk is the local nickel refinery.

In 1995, Boris Revich from the Centre of Demography and Human Ecology in Moscow reported that the 3 most polluting cities among the 86 Russian cities of Northern Europe were located in the KP (1). During the last ten years studies have been carried out in parts of the region concerning maternal health, pregnancy outcome and nickel exposure. The studies have revealed high levels of air pollution (2,3); elevated urinary-nickel concentrations (4,5);

no measurable impairment of lung function due to sulphur dioxide (6); high abortion rates (7); possibly elevated incidences of congenital malformations among newborns (8); no association of genital malformations at birth after nickel exposure (9); a relatively low mean birth weight (4); a low proportion of the delivering women at elevated risk of adverse pregnancy outcomes due to high maternal age (7); different concentrations of essential and toxic elements in placentas when compared with communities in Northern Norway (10); a lower prevalence of atopic dermatitis (11,12) and allergic asthma (12); occupational exposures to potential harmful compounds (13,14); and a high proportion of female industrial workers (15). Some of the studies were based on the data in the Kola Birth Registry (KBR) (7,9,15). The KBR contains extensive data about all live births as well as stillbirths of at least 28 weeks of gestation. Spontaneous and induced abortions and life-style factors are not registered. Therefore, we decided to conduct a questionnaire investigation in two of the largest cities in the KP, Apatity and Mončegorsk.

The primary aim of the study was to compare the prevalence of selected maternal and lifestyle factors as well as the reproductive outcomes of working women in the two cities. The secondary aim was to assess the reliability of data acquired through an interview with data in a registry.

MATERIAL AND METHODS

Context

The investigation was carried out between 1996 and 2003. During the study period, the prenatal care in Russia was covered by basic health care insurance and without service fees.

All pregnant women were advised to visit a gynaecologist before 12 weeks of pregnancy. By law pregnant women are obliged to leave work after 30 weeks of pregnancy. Until 12 completed weeks of gestation, a woman can choose to have an abortion. Since 1991, induced abortion has been allowed from the 13th to the 22nd week providing there is a valid social reason for it. Stillborns before 28 weeks of gestation are considered to be spontaneous abortions (SA). The maternal care and benefits, as well as the regulations for induced abortion in Russia, have been described previously in some detail (15).

Population

The women were included based on certain workplaces. A list of names as well as a list of workers on holiday, sick leave and maternity leave was obtained from the personnel departments of the workplaces. After an initial interview, women were excluded from the study in the following situations (exclusion criteria): (a) young unmarried women who had not been sexually active; (b) newly wedded teenage women who had never been pregnant and with no indication of infertility; (c) women currently pregnant for the first time. Nickel refinery workers were included in Mončegorsk, and apatite workers were not included in Apatity. The workplace and participation details are outlined in Table I.

Participation

Most of the interviews were achieved during the first day of interviewing for a given department (up to 60% of the total number). The proportion of workers ineligible for participation in the study was highest in the kindergartens, where 7% did not fulfil the inclusion criteria. In any single workplace, up to 28% of the study popu-

lation was unavailable for the interview. Of the available workers, 86.2% (1,412 women) participated in Mončegorsk and 82.1% (284 women) participated in Apatity. The eligible, refusal and participation numbers are presented in Table I.

Questionnaire and method of interviewing

Three to 8 staff members of the KRLOH conducted interviews in each workplace (depending on the size of the enterprise) and a total of 11 were involved during the project (6 women and 5 men). The chief interviewer was a physician. Each participating woman, who had given an informed consent prior to inclusion, was asked to give detailed information about her newborns, spontaneous abortions and pregnancies, chronology of her abortions and deliveries, her life-style, occupation and living conditions, diseases she has had, as well as additional reproductive health information. All interviewers were trained. No definition of SA was put forward in the interview.

All the interviews in one workplace were conducted during 1 to 3 days. In the morning, the interviewing process started with the women involved in regular one-shift work. The women employed in an ongoing 3-shift cycle were interviewed in the middle of a shift, so that the following shift could be included in the same round of interviewing. Each interview took from 10 to 30 minutes. The women absent during the site visit were contacted and the interview was rescheduled (if they were not on a leave of long duration).

In 1999, additional questions about pesticide use and sports activities were added. However, the data from the added questions were not included in the present study since this information had not been systematically collected from the beginning of the study.

Table 1. Investigated groups of female workers (workplaces and participation).

Workplace	Total no of female workers	Not eligible ^a	Unavailable at study time ^b	Population available for participation	Refusals	No of interviews	Participation rate (%)	Time of interview
A. Mončegorsk								
Refining departments at nickel refinery	1024	33	185	806	89	717	89.0	1996, 1999
				207 ^c	123	84		1999
Non-refining departments	834	18	128	688	117	571	83.0	2002
Town bakery	21	0	5	16	5	11	68.8	1996
Town dairy	19	0	4	15	2	13	86.7	1996
Town kindergarten	48	3	6	39	4	35	89.7	1996
Town boarding school for handicapped children	65	3	7	55	6	49	89.1	1996
Administrative personnel in town hospital	22	0	3	19	4	15	78.9	1996
Total	2033	57	338	1638	227	1411	86.1	
B. Apatity								
Building company	87	2	10	75	11	64	85.3	1996
Dairy	25	0	5	20	3	17	85.0	1996
Heating and power station	83	2	9	72	15	57	79.2	1996
Kindergartens	43	3	6	34	4	30	88.2	1996
Design and planning firm	45	0	7	38	10	28	73.7	1996
Municipal office managers	19	0	4	15	3	12	80.0	1996
Agricultural enterprise	105	0	13	92	16	76	82.6	2003
Total	407	7	54	346	62	284	82.1	

^aThe following were not interviewed based on the inclusion criteria: (a) unmarried women who had not been sexually active; (b) young newly wedded women who had never been pregnant and with no indication of infertility; (c) women currently pregnant for the first time. ^b Workers on holiday, sick leave, maternity leave, etc. (please, notice that the regular duration of annual holiday is about 2 months). ^c The reinterviewing in 1999 (mainly in the technical and production departments) was perceived negatively by some of the workers, so 84 of the 207 women asked for a reinterview participated again. For those who were not reinterviewed, the information obtained in 1996 was used in the

The investigation was carried out by the Kola Research Laboratory for Occupational Health (KRLOH) in Kirovsk, Russia, in co-operation with the university in Tromsø, Norway.

The study was approved by the Regional Research-Ethics Board of the University of Tromsø, the McMaster University Research-Ethics Board, the Norwegian Data Inspectorate and the Murmanskaja Oblast Health Committee.

Quality of reported data

The reported information for each stillbirth

and live birth in the Mončegorsk group was linked to the KBR based on maternal name, address, age and date of birth of the newborn, and data concerning workplace, birth weight, gestational age (GA), gender and number of past spontaneous and induced abortions, which were verified against the data registered in the registry.

Analyses

The proportions and odds ratios were calculated using EpiInfo 6.

Table II. Descriptive statistics about the investigated groups.

Descriptor	Mončegorsk	Apatity
No of participants	1412 (83.3%)	284 (16.7%)
Average age (range)	41.1 (20-72)	45.8 (24-68)
Native of town of residence	648 (45.9%)	80 (28.2%)
Educational level		
< 9 years completed	12 (0.9%)	8 (2.8%)
Secondary ed. compl. (10-12 yrs)	1261 (89.3%)	197 (69.4%)
Higher ed. compl. (> 14 yrs)	139 (9.8%)	79 (27.8%)
Duration of employment (yrs)		
Total (SD)	21.3 (8.0)	21.6 (9.5)
Current workplace (SD)	11.4 (8.0)	12.3 (9.8)

Table III. Questionnaire based life-style factors of participants.

Factor	Mončegorsk	Apatity	OR ^a
Alcohol consumption			
do not drink	158 (11.2%)	79 (27.8%)	0.33 (0.24-0.45)
< once a week	1122 (79.5%)	194 (68.3%)	
1-2 times per week	118 (8.4%)	9 (3.2%)	
>2 times per week	14 (0.9%)	2 (0.7%)	
Prefer spirits	456 (32.3%) ^b	77 (37.6%) ^b	0.95 (0.69-1.30)
Cigarette smoking			
Never smoked	829 (58.7%)	201 (70.8%)	
Previous smoker	66 (4.7%)	16 (5.6%)	
Current smoker	517 (36.6%)	67 (23.6%)	1.87 (1.38-2.54)
1-5 cigarettes per day	69 (13.3%) ^c	12 (17.9%) ^c	
6-10 cigarettes per day	303 (58.6%) ^c	44 (65.7%) ^c	
11-15 cigarettes per day	103 (19.9%) ^c	10 (14.9%) ^c	
>15 cigarettes per day	42 (8.1%) ^c	1 (1.5%) ^c	

^a The Apatity group was used as the reference group. Cornfield 95 % confidence interval. Odds ratios (OR) were only estimated where relevant and the proportions differed. ^b Percent of drinkers. ^c Percent of current smokers.

RESULTS

Characteristics and life style factors

The average age and educational level were higher in the Apatity group, and a higher proportion of the participants in that group were not natives of the city of residency (Table II). Thirty-seven percent of the women in the Mončegorsk group smoked, compared with 24% in the Apatity group. Nine and 4%, respectively, drank alcohol at least once a week. Fourteen percent of all women did not drink alcohol at all. The majority of the smokers in both groups smoked 6 to 10 cigarettes per day (Table III).

Reproductive history

Details about the reproductive history of the study groups are presented in Table IV. The

investigated groups had experienced 7,254 pregnancies in total, which were 4.3 pregnancies on average per woman. Forty percent of the pregnancies were delivered. The majority of the women in both groups had been pregnant 1 to 4 times. In Mončegorsk, 77% of the women had undergone induced abortion and 53% of all pregnancies had terminated this way. In Apatity more pregnancies (6.7%) terminated as a SA than in Mončegorsk (4.8%), and more women had experienced a SA (23.2% versus 16.1%).

Reproductive health

Of the 220 women who reported infertility or having had experienced difficulties becoming pregnant, 138 had been medically examined (the woman and/or her husband) for this condition. Seventeen of the 40 men and 98

Table IV. Questionnaire-based reproductive history.

A. No of women	Mončegorsk	Apatity	OR ^a
No pregnancies	21 (1.5%)	7 (2.5%)	
1-4	1164 (84.1%)	162 (57.0%)	
5-9	204 (14.7%)	99 (34.9%)	
>9	16 (1.2%)	16 (5.6%)	
B. Pregnancies			
Total number (mean per women)	6001 (4.3)	1253 (4.4)	
Pregnancy outcomes ^b			
Livebirths	2420 (40.3%)	502 (40.1%)	1.01 (0.89-1.18)
Stillbirths	26 (0.4%)	4 (0.1%)	1.36 (0.45-4.54)
Spontaneous abortion	289 (4.8%)	83 (6.7%)	0.71 (0.55-0.93)
Induced abortion	3205 (53.4%)	652 (52.0%)	1.06 (0.93-1.20)
Medical abortions	11 (0.2%)	2 (0.2%)	
Extrauterine pregnancy	47 (0.8%)	10 (0.8%)	
No of women experienced ^c			
Livebirths	1374 (97.3%)	272 (95.8%)	
Stillbirths	25 (1.8%)	4 (1.4%)	1.26 (0.41-4.31)
Spontaneous abortion	227 (16.1%)	66 (23.2%)	0.63 (0.46-0.87)
Induced abortion	1088 (77.1%)	216 (76.1%)	1.06 (0.77-1.44)
Medical abortions	11 (0.8%)	2 (0.7%)	1.11 (0.23-7.27)
Extrauterine pregnancy	45 (3.2%)	8 (2.8%)	1.14 (0.51-2.64)

^aThe Apatity group was used as the reference group. Cornfield 95%-confidence level. Odds ratios (OR) were only estimated where relevant and the proportions differed. ^bThe denominator is the sum of all pregnancy outcomes. ^cThe denominator is the number of participants.

of the 133 women examined were medically confirmed to be infertile. Thirteen percent of women in both groups responded that they had abnormal menstrual cycles. The most common gynaecological diseases experienced were pelvic inflammations and leiomyoma of the uterus. A higher proportion of the Mončegorsk group had experienced benign dysplasia. The most prevalent chronic health impairment among the participants was hypertension and gastritis, the latter being more prevalent in the Mončegorsk subgroup. The women responded that they had smoked during 4% of the delivered pregnancies in Mončegorsk and 3% in Apatity, while 3% in Mončegorsk and 7% in

Apatity had drunk alcohol. Further details about the reproductive health outcomes are presented in Table V.

Discrepancies between reported data and registry data

Of the stillbirths and live births reported in the Mončegorsk group, 1,645 (67%) were also registered in the KBR, which corresponded to deliveries by 1,107 (78%) different women. More than one delivery was registered for 46.9% of the reporting women.

Details about the discrepancies between reported and registered data are presented in Table VI. Fifty-nine percent of the women

Table V. Questionnaire based reproductive health.

A. Women	Mončegorsk	Apatity	OR ^a
Menstrual cycle			
Normal ^b	1222 (86.5%)	246 (86.6%)	
Abnormal	190 (13.5%)	38 (13.4%)	1.01 (0.68-1.49)
Periodically absent	46 (3.3%)	3 (1.1%)	
Longer periods than normal	35 (2.5%)	4 (1.4%)	
Irregular	109 (7.7%)	31 (10.9%)	
Infertility	38 (2.7%)	12 (4.2%)	0.63 (0.31-1.28)
Infertility I (no pregnancies)	21 (1.5%)	7 (2.5%)	
Infertility II ^c	17 (1.2%)	5 (1.8%)	
Experienced difficulties becoming pregnant	142 (10.1%)	28 (9.9%)	1.02 (0.65-1.60)
Past or present gynaecological disease (ICD-10)			
Leiomyoma of uterus (D25)	188 (13.3%)	32 (11.3%)	1.21 (0.80-1.84)
Benign dysplasia (N60.9)	79 (5.6%)	7 (2.5%)	2.35 (1.03-5.6)
Salpingitis/oophoritis (N70.9)	180 (12.7%)	40 (14.1%)	0.89 (0.61-1.31)
Inflammatory disease of uterus (N71.9)	16 (1.1%)	2 (0.7%)	
Acute vaginitis (N76.0)	14 (1.0%)	1 (0.4%)	
Unsp. ovarian cysts (N83.2)	69 (4.9%)	14 (4.9%)	
Other ^d	95 (6.7%)	21 (7.4%)	0.73 (0.55-0.97)
B. Deliveries ^e			
Smoking during pregnancy	119 (4.3%)	17 (2.8%)	1.51 (0.89-2.62)
Drank alcohol during pregnancy	86 (3.1%)	39 (6.5%)	0.45 (0.39-0.69)
Smoked and drank alcohol during pregnancy	17 (0.6%)	8 (1.4%)	0.45 (0.18-1.12)

^a The Apatity group was used as the reference group. Cornfield 95%-confidence level. Odds ratios (OR) were only estimated where relevant and the proportions differed. ^b A menstrual cycle of 22-34 days with 3-6 days of bleeding was considered normal. ^c Experience of infertility due to inflammation. ^d One person could be counted more than once.

^e Pregnancies that terminated as induced abortion not included.

with one registered delivery recalled the birth weight of their newborn correctly, while the recall was correct for 61% of all reported deliveries. One-quarter of those not recalling the birth weight correctly missed by 50 grams or less. Fifteen women (0.9%) answered that they did not remember/did not know the birth weight of their children. In terms of gestational age, 41% did not recall it correctly, and 10 % of these reported a GA that was more than two weeks off. About one-quarter of the delivering women had a discrepancy in their reporting of induced abortions, while 8% had a discrepancy in reporting SA.

For 17% of the deliveries, the reported information about their workplaces during pregnancy was different than the information in the KBR, which had been derived from the gynaecological records. Of these, 3.6% had been registered as unemployed in the KBR but reported having a workplace in the interview.

DISCUSSION

Abortion

In the Soviet Union, and until the late 1990s in Russia, it was more common to induce a termination of a pregnancy than to deliver (16). Considering that an additional proportion of pregnancies ended with a SA, it was common for Russian women to have been pregnant five or more times. The Apatity and Mončegorsk groups were not different in this sense. The average lifetime pregnancy experience of the women in Mončegorsk was 4.3 pregnancies. Of these, 1.7 were delivered (99% alive) and 0.2 spontaneously aborted. These results confirm our previous finding in Mončegorsk based on registry data. Furthermore, 15.7% of the women registered in the KBR had experienced a previous SA (7), compared with 16.1% in the Mončegorsk group in the present study. In the previous study, we found that the

Table VI. Discrepancies between the data obtained in the interviews and the data in the birth registry for the Mončegorsk cohort ^a

Checked data	No of linked reports	Did not recall	No of reports with data	No of reports with a discrepancy
No of pregnancies	1645	0	1645	444 (26.9%)
Birth weight	1645	15	1630	641 (39.3%)
Gestational age	1645	0	1645	679 (41.3%)
Spontaneous abortion	1645	1	1644 ^b	129 (7.8%)
Induced abortion	1645	0	1645 ^b	405 (24.6%)
Gender	1645	0	1645	31 (1.9%)
Workplace	1645	2	1643	280 (17.0%)

^aA birth registry does not exist for the Apatity population. ^bThe figure signifies the number of delivering women who reported their number of previous abortions at the time of delivery.

average woman at the time of her last delivery had undergone 1.1 induced abortions and that 47% of the women had experienced an induced abortion (7), while the average woman in the Mončegorsk group in the present study, who was older, had experienced 2.3 induced abortions and that 77% of women had done so. Thus, the findings suggest that the majority of induced abortions occurred after the women had had their feasible number of children, which then confirms that induced abortion was a common tool of contraception/family planning (17,18). The induced-abortion laws have been relatively liberal (15), and the religious stigma surrounding the interruption of pregnancy that is found in many Western countries was more or less absent.

In evaluating the delivery and abortion figures, one should keep in mind that 39% of the women in the Mončegorsk group and 23% in the Apatity group were below 40 years of age at the time of the interviews. Thus, the average lifetime number of pregnancies for cohorts of Russian women beyond reproductive age was likely higher than the figure revealed in this investigation, and the same can be presumed concerning abortions.

Interestingly, a higher proportion of self-recognized pregnancies in the Apatity group terminated as SA. Taking into account that a larger proportion of this group had high education, it is possible that this group had greater awareness of the signs of pregnancy and early SA, or were more willing to report SA, than the Mončegorsk group. Differences in occupations between the two groups or divergence in perinatal care may also have had an influence. The proportions of pregnancies that ended in SA may not appear high as presented in Table IV, because the figures were deflated by the

inclusion of induced abortions in the denominator. When information about all conceptions is lacking, it is common to use only live births in the denominator, and the SA proportions were then 11.9% in Mončegorsk and 16.5% in Apatity. The latter rate seems high when compared with figures reported from Italy, for example (19).

The difference in SA, together with the higher average age in the Apatity group, likely explains why the average number of pregnancies experienced is higher in this group. Data concerning pregnancy health and outcome in Apatity have previously not been published, so it is unknown how well the figures about the studied group represent the population of the town. The main criterion behind the selection of participants from Apatity was that they were not working in the local apatite plant, meaning that the studied group was not representative of the general female population in Apatity in terms of employment and related exposures. Thus, a higher proportion of the women in the Mončegorsk group were employed in industry. Nevertheless, regardless of these mentioned biases, the history of SA in the investigated group of women in Apatity appears to differ from that of another group of women. For that reason the prevalence of SA in the Apatity group should warrant concern.

The data registered in the KBR about spontaneous and induced abortion are limited to the total number of such events at the time of delivery, based on medical records. Presumably, there was no tendency to report more spontaneous abortions than what actually occurred. At the time of a delivery, 8% reported a different number of past SA than what was registered in the KBR. Seventy-one percent of these reported less than what

was in the KBR or reported none at all. The remaining women who reported more might indicate that there are errors in the KBR and its source records.

It may also be presumed that one would not report more medical and induced abortions than one had, as long it was not a question of recall or keeping track of a high number (0.3% of the women registered in the KBR had more than 10 induced abortions). Women who have had more than one delivery may experience difficulties recalling, 10 to 15 years later, *when* their induced abortions occurred relative to their deliveries. The number of previous induced abortions is, for different individual reasons, likely not a topic women will want to recall. Nearly 25% reported a different number than what was registered and, surprisingly, of these, 68% reported more. About one-half of those reporting less, reported none at all. Eleven percent of the 309 women who reported that they had never had an induced abortion were registered in the KBR as having had 1 to 6 induced abortions. It is reasonable that the actual overall figure was higher than that recorded, as some of the induced abortions likely took place elsewhere than in Mončegorsk. Some women might have, by choice or due to circumstances, secured their abortions elsewhere. It is commonly known that women wanting to interrupt their pregnancy without their partners' knowledge are likely to seek help other than in the local public clinic. Furthermore, it was not uncommon during Soviet times to use hormone drugs to induce an abortion without consulting or involving a doctor. An explanation from the post-Soviet period is that medical doctors began to perform induced abortions for cash outside their regular medical jobs or practices. However,

such private activities might be expected to have been less prevalent in Mončegorsk than in major cities like Moscow and St. Petersburg. The latter development may have contributed to the decrease in the official induced abortion figures in Russia during the last decade. In the Soviet Union, it was illegal to terminate pregnancies outside the health care establishment, but it did happen (17).

Cigarette smoking

Smoking appears to be more common among women in the KP than in Russia as a whole (20). The lower prevalence and frequency of smoking found in Apatity compared with Mončegorsk suggests that this habit is not equally widespread throughout the peninsula, and that one's occupation and educational level have an impact. Smoking among women in Russia has risen since the dissolution of the Soviet Union (20), but few studies have been conducted to assess the regional smoking prevalence and frequency. In the 1994/1995 Norwegian-Russian Health Study, the prevalence of self-reported smoking in a cohort of 548 women in the age group 18 to 29 in the KP was 40.7%, while the prevalence among women in the same age group living in the Norwegian region right across the Russian-Norwegian border was 46.8% (21). Thus, it appears that smoking among women in the KP is approaching Norwegian levels. Smoking during pregnancy, although prone to recall bias, still appears to have been much less prevalent in the KP than in Norway (22,23).

Alcohol consumption

In a health study in Arkhangelsk (about 600 km to the southeast of Mončegorsk), 84% of the women in the age group 30 to 49 answered

that they drank alcohol (24), which is fairly similar to the prevalence of alcohol consumption among the women in our study (86%). The prevalence of frequent alcohol consumption was comparable to that found in Russia by Bobak et al. (1999). They also found a lower frequency of consumption among women with higher education (25), which might have been the explanation of the lower frequency of consumption in Apatity compared with Mončegorsk.

There have been few investigations mapping the prevalence of regular alcohol abuse or consumption during pregnancy. One difficulty in this sensitive topic is under-reporting of consumption by the subjects (26). In a previous investigation in the KP, where the questionnaire was administered through an interview by the midwife/gynaecologist, 36% of the pregnant women refused to answer the question about alcohol (27). Our findings also indicate that those who smoked or drank during pregnancy also had a stronger inclination for the other habit. In Mončegorsk, 14.3% of the smokers also drank alcohol, compared with 47.1% in Apatity, while 19.8% of those who drank also smoked (20.8% in Apatity). Thus, the direction of the connection showed no pattern. This inclination had also been found in a study based on the data in the KBR, where the co-occurrence found was even stronger. The explanation for the latter is probably that those data were based solely on observation of obvious signs rather than self-reports (7).

Diseases

The results confirm the findings in our previous study (7) that the prevalence of previous salpingitis and/or oophoritis is high in the Mončegorsk population. The present study revealed that the high prevalence of having

experienced this infection was also present in Apatity. These terms and diagnoses fall under the term of pelvic inflammatory disease (PID). A previous PID has been found associated with an increased risk of ectopic pregnancy (28) and infertility (29). The risk factors linked to PID include infections connected to abortions, age at first intercourse, intercourse without a condom, multiple sex partners, use of an intrauterine device (IUD) and sexually transmitted diseases (30,31). In an investigation in the U.S. among users of copper IUDs, 3.4% had PID (31). The relatively high proportion of the delivering women in Mončegorsk having had PID might be explained by the high rate of induced abortion, the use of the spiral-IUD and the sterility of the equipment and techniques used in terminating a pregnancy. In a feasibility study of female nickel workers and a control population (1995), 52% of respondents acknowledged they used a spiral-IUD (32), but this proportion was likely low during Soviet times (33). Since its dissolution, all other contraceptive methods have become available. Concerning chronic diseases, a posteriori we found that the proportion of workers in the agricultural enterprise with thyrotoxicosis was relatively high (13%).

Validity and bias

The questions posed by the interviewers had not been validated or tested prior to the first interviews, and modifications were made during the study period, which have affected the validity and reliability of the instrument. The rate of participation among the workers was considered to be satisfactory. The nickel refinery operates 24 hours a day, 12 months a year, so there are always groups of workers on holiday. The annual right to holidays from work in the north

was at least 45 days during Soviet times, which is a practice that still remains in factories and public services in the KP today. In other words, even though up to 20% of the female workers in some of the departments at the refinery were not available to participate, it is unlikely that this unavailability biased the representativeness of the participating groups from the refinery to any important extent. But, naturally, workers that were unavailable due to long sick leaves likely deflated the prevalence of risk behaviour and chronic disease and possibly impacted the comparability within and between the two study groups. Due to the enrolment procedure in this study, the two groups were not representative of the general female populations of the two towns in terms of occupational exposures, reproductive history, disease experience and life-style. Nevertheless, it is interesting that the induced abortion, gynaecological disease and extrauterine-pregnancy experiences of the two population groups were so similar, which suggests some analogy. Regardless, the data provide interesting insight into the two groups of women from these populations.

Although the oldest children of the interviewed women had become young adults at the time of the interviews, the women recollected their children's birth weights well. They had, however, a tendency to round off to the nearest 100 or 500 grams in their reporting, but only 9.2% of the reports were more than 250 grams off the weight actually recorded at birth — and some of these confused the birth weights of their different children. Considering that some of the reported births were stillbirths makes the women's recollections even more impressive. Part of the discrepancy for GA was likely caused by the registration procedures in the KBR. In the original records, the

staff at the delivery ward tended to record a range of weeks, for example, 37 to 38 weeks when the 38th week was not yet completed. GA should be registered as the number of completed weeks, in this example 37, while 38 weeks would have been registered in the KBR. Another explanation of the discrepancy is due to deliveries that occurred after 37 to 44 weeks of gestation, which is considered to be at term. The women then tended to report 40 weeks. In terms of workplace, a likely explanation for the discrepancy is that some women changed jobs during pregnancy, for instance, moving to Mončegorsk if the father-to-be resided there. The KBR contains data about all deliveries in Mončegorsk since 1973. Thus, the women's deliveries before 1973 in Mončegorsk or elsewhere did not link to the registry, which explains why a mere 67% of the reported births were registered.

Some of the information obtained during the interview can also be used to verify the KBR. Women who had occupations that involved periodical work at different places in the nickel refinery would likely report the exact department where she worked during the pregnancy, while the registry only contained information about the primary unit where she was employed. The discrepancies concerning the gender of the newborn were interpreted by looking at the given name of the newborn, which also was registered. Of the 31 records with a discrepancy, 12 (0.7%) were incorrect in the questionnaire database and 19 (1.2%) in the KBR. The latter is higher than the previously reported data-entry error rate in the KBR (15). In the KBR, only direct or obvious evidence that the pregnant women smoked was registered. Not surprisingly, therefore, only one of the 73 delivering women who reported that they smoked

during pregnancy could be traced in the KBR as smokers. This finding indicates that the non-clinical data in the KBR, which is not based on systematic evaluation or examination, markedly underestimated the prevalence. The data collected in Apatity could not be verified in the above fashion, as there was no birth registry for this city. On one hand, it seems reasonable to presume that the overall ability and willingness to recall information would have been similar to Mončegorsk. On the other hand, the willingness could have been different if there were particular or different occupational or local concerns in terms of pregnancy health.

Conclusions

The results of this study indicate that the majority of induced abortions in Northwest Russia occur after women have had their attainable or desired number of children and that induced abortions are common regardless of city of residency. The proportion of pregnancies resulting in spontaneous abortions was higher in the investigated group in Apatity than in Mončegorsk, which should be examined further. The findings also confirm that smoking has become widespread among women in the Kola Peninsula.

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