Work as a hairdresser and cosmetologist and adverse pregnancy outcomes

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Background Hairdressers and cosmetologists are commonly exposed to chemicals, poor posture and psychological stress that may increase the risk of adverse pregnancy outcomes.

Aims To assess whether work as a hairdresser and cosmetologist during pregnancy increases the risk of low birth weight, preterm delivery, small for gestational age (SGA) and perinatal death.

Methods The 1990–2004 Finnish Medical Birth Registry was used to identify all singletons of hairdressers (n = 10 622) and cosmetologists (n = 2490) and those of teachers (n = 18 594) as the reference group. The main outcomes were sexual differentiation measured as the probability of female gender, low birth weight, preterm delivery, SGA and perinatal death. Logistic regression analysis was used to estimate odds ratios (ORs) adjusted for maternal age, parity, marital status and maternal smoking during pregnancy.

Results In logistic regression, the risk of low birth weight (adjusted OR 1.44, 95% CI 1.23–1.69), preterm delivery (adjusted OR 1.21, 95% CI 1.07–1.38), SGA (adjusted OR 1.65, 95% CI 1.38–2.07) and perinatal death (adjusted OR 1.62, 95% CI 1.01–1.60) was higher in hairdressers than in teachers. In cosmetologists, the risk of SGA (adjusted OR 1.53, 95% CI 1.10–2.12) and perinatal death (adjusted OR 1.36, 95% CI 0.62–2.98) was elevated. There were no substantial differences in the sex distribution.

Conclusions This study provides evidence that work as a hairdresser or cosmetologist may reduce foetal growth. Work as a hairdresser may also increase the risk of preterm delivery and perinatal death.

Key words Cosmetologists; hairdressers; low birth weight; preterm delivery; small for gestational age; work exposure.

Introduction

Workers in the hairdressing and cosmetology professions are predominantly female, and many are of child-bearing age. There are >9000 chemicals in cosmetics products [1]. Hairdressers use a wide range of products including shampoos, permanent wave solutions, hair dyes, straighteners, bleaches and hair sprays. Cosmetologists typically perform pedicures, manicures, facials and other beauty treatments. Although handling fewer chemicals, they often share the same working environment as their hairdresser colleagues. In some cases, employees perform both roles interchangeably. Aside from exposure to chemicals, hairdressers and cosmetologists work involves physical exertion, long periods of standing, adoption of awkward postures and the psychological stress that can be associated with ensuring employer and client satisfaction. As the occupational hazards identified may increase the risk of adverse pregnancy outcome for hairdressers and cosmetologists [2], a nationwide, registry-based study was conducted to assess whether work as a hairdresser and/or cosmetologist increases the risk of adverse reproductive outcomes, including perinatal death, sex ratio, low and high birth weight, pre- and post-term delivery and small for gestational age (SGA). Teachers were selected as a reference group.

Methods

The Finnish Medical Birth Registry has collected nationwide information on all the deliveries since 1 January 1987. The source population included all women who gave birth between 1 October 1990 and 31 January 2004 in Finland and the study population comprised all singleton births of mothers working as hairdressers,
cosmetologists and teachers [3]. Permission for use of the confidential registry information was given by the National Research and Development Centre for Welfare and Health (STAKES), as required by national data protection legislation.

Teachers were considered a suitable reference group for assessing the effects of prenatal, especially chemical exposures at work, as, although aspects of teaching may be considered stressful and at times ergonomically challenging with intermittent moving and handling, there is typically less or no exposure to chemicals.

A question on the mother’s occupation was added to the data collection form in October 1990. The original data were collected in text format and coded using the Finnish Classification on Occupation, based on the International Standard Coding of Occupations.

The main health outcomes were foetal sexual differentiation, growth and duration of pregnancy and perinatal death. We used the occurrence of female infant as a measure of sexual differentiation. Two different measures of foetal growth were applied: low birth weight (<2500 g) and SGA. SGA was defined according to the Finnish population-based growth curves. The preterm delivery definition applied when length of gestation was <37 weeks. Gestational age is practically always verified at the maternity care clinics by ultrasound examination during the 18th week of gestation. Perinatal death was defined as ‘death occurring during late pregnancy [at 22 completed weeks (154 days) of gestation or the time when the birth weight is normally 500 g] up to seven completed days of life’ (the Finnish version of the World Health Organization definition).

We estimated the prevalence of the reproductive outcomes with 95% confidence intervals (CIs) based on the binomial distribution. Odds ratio (OR) was the measure of effect. We used logistic regression analyses to estimate adjusted ORs for the relations between maternal occupation and risk of the studied pregnancy outcomes. The basic adjustment was used for the following covariates, maternal age, parity, marital status and maternal smoking during pregnancy.

Results

The study population comprised singletons of all Finnish hairdressers \( (n = 10\, 622) \), cosmetologists \( (n = 2490) \) and teachers \( (n = 18\, 594) \) who gave birth between 1990 and 2004 (Table 1). Hairdressers and cosmetologists were on average younger, had experienced fewer pregnancies, were more often single or cohabiting and smoked more commonly during pregnancy.

The prevalence of girls was higher among the newborns of cosmetologists (49.3%), but lower among the newborns of hairdressers (48.4%) compared with the reference group (48.8%).

The prevalence of low birth weight (<2500 g) was 3.3% among the newborns of hairdressers, 2.8% among the newborns of cosmetologists and 2.4% among the newborns of teachers (Table 2) with corresponding adjusted ORs of 1.44 (95% CI 1.23–1.69) for hairdressers and 1.20 (95% CI 0.92–1.58) for cosmetologists compared to the reference group (Table 3).

Preterm deliveries were more common among newborns of hairdressers (4.8%) and less common among cosmetologists (3.7%) compared to newborns of teachers (4.2%) with adjusted OR of 1.21 (95% CI 1.07–1.38) for hairdressers.

The prevalence of SGA babies was 2.1% among newborns of hairdressers, 1.9% of cosmetologists and 1.3% among the newborns of teachers. The corresponding adjusted ORs were 1.65 (95% CI 1.38–2.07) for hairdressers and 1.53 (95% CI 1.10–2.12) for cosmetologists.

The risk of perinatal death was increased among the infants of both hairdressers (0.5%) and cosmetologists (0.5%) compared with the infants of teachers (0.4%). After adjustment for confounding, the OR was 1.62 (95% CI 1.01–2.60) for infants of hairdressers and 1.36 (95% CI 0.64–2.17) for infants of cosmetologists (Table 3).
Discussion

After adjustment of potential confounding, hairdressers had from 20 to 65% higher risk for these pregnancy outcomes compared to teachers. Cosmetologists were at a 50% higher risk for having SGA babies compared with teachers and their newborn’s risk of perinatal death was elevated although could be explained by chance.

The coverage of the Finnish Birth Registry is almost 100% minimizing selection bias [3]. Maternal occupation, recorded since 1990, is likely to include misclassifications, but the error is likely to be random. The outcome information was based on standardized measurements on birth weight and ultrasound-based gestational age. The information on smoking in pregnancy from the Finnish Medical Birth Registry was compared with corresponding smoking information collected in a questionnaire in 1996–97 in the Prenatal Environment and Health Study and smoking information abstracted from medical records [4]. The agreement was excellent in both comparisons with the kappa statistics of 0.84 (0.81–0.87) and 0.89 (0.86–0.91), respectively.

The type of study questions determines the optimal reference group. To elaborate the role of occupational chemical exposures among hairdressers and cosmetologists, the reference group should constitute women with similar background and working conditions as hairdressers and cosmetologists, except without chemical exposures of interest. After thorough considerations, we selected teachers as the reference group. Although a small proportion may be exposed to solvents while teaching metalwork, woodwork, art, design or other crafts, teachers are usually exposed to low levels of chemicals. Both hairdressers and teachers stand a lot and their work can be psychologically stressful. There are several physical, chemical, biological and psychosocial factors both at work and outside work which may influence the risk of the studied pregnancy outcomes, and thus influence the comparison between hairdressers, cosmetologists and teachers. Occupational exposures can be considered as part of the overall work exposure and thus they are occupational determinants of interest rather than potential confounders. Any differences in determinants of the studied pregnancy outcomes outside work would be considered as potential confounders. Due to the nature of the study, we have a limited amount of information on these factors.

Chemicals associated with reproductive toxicity in animals, such as acrylamides, ethyl methacrylate, propylene glycols 1-butyl alcohol, cetrimonium bromide, benzyl
alcohol p-methyl aminophenol sulphate and m-phenylenediamine, dibutyl adipate, parabens and pyrocatechol among others, are widely used in beauty salons and nail bars. The concentrations of these chemicals in the products handled have been thought to be low enough to negate any reproductive risk in man [5]. The difference in function of the yolk sac present in rats and mice compared to the placenta in humans means that the direct transfer of conclusions from animal studies may not be valid [6].

In a study of Finnish hairdressers [7–9], long hours in salons with poor ventilation exacerbated exposure. However, the levels did not exceed the threshold limit value hygiene standards. Mixing persulphate resulted in air measurement of 30 µg/m³, 20 times higher than the general concentrations in air. Peak concentration for volatile organic compounds was 45 µg/m³ for permenting and 25 µg/m³ for dyeing. Ammonia concentrations in the breathing zone measured between 1.4 and 3.5 µg/m³ depending on the processes. Other work has identified scope for the chemicals in use to be potentiated by each other or additional unspecified biochemical factors leading to an indirect association with adverse pregnancy outcomes [10–12].

We identified four previous epidemiological studies that have compared the risk of adverse pregnancy outcomes among hairdressers with other workers as reference groups [12–15]. A Dutch [12], Swedish [13] and the present Finnish epidemiologic study showed an increased risk for measures of intrauterine growth, whereas ours is the first study to also show an increased risk of premature birth. None of the available studies provide evidence of feminization and effect estimates for perinatal death were not given. An explanation for the differences between the study-specific effect estimates is the use of different reference groups. The Swedish studies used all other newborns or a sample from a general population [13,14], the Dutch study clothing sales clerks [10, 12] and the Danish study shop assistants [15]. The Swedish study addressed the question whether hairdressers have more adverse pregnancy outcomes on average and the reference group includes women in different occupations as well as housewives. Few studies have explored the prevalence of adverse pregnancy outcomes for retail assistants working in general stores or clothing [16]. However, previous studies have identified chemical hazards, physically demanding work, stress and long hours of standing which could impact on pregnancy outcome. Furthermore, in garment manufacture, it is recognized that there is an increased risk of extended time to pregnancy and adverse pregnancy outcomes possibly due to volatile fluorinated organic compounds, formaldehyde, mutagenic amines, flame retardants and carriers for dyes. Other research has shown that textiles made of cotton may contain chlorinated dioxins and furans such as hepta- and octochlorinated HpCDF, HpCDD, OCDF and primarily OCDD [17–21]. Based on this evidence, the use of retail assistants may not represent an unexposed reference group.

We identified two previous epidemiological studies on the risk of pregnancy outcomes among cosmetologists. Herdt-Losavio et al. [22] studied 15 003 New York State licensed cosmetologists and 4246 licensed realtors and 12 171 mothers from the general population as reference groups. They reported an increased risk of low birth weight among newborns of cosmetologists compared with both newborns of realtors and newborns in general population. In a study of 8356 North Carolina cosmetologists, the risk of spontaneous abortions was increased with an adjusted OR of 1.4–2.0 [23].

Our results provided further evidence that work as a hairdresser or cosmetologist during pregnancy may be harmful to foetal development.

**Key points**

- Hairdressers and cosmetologists may have several occupational hazards which have been linked to adverse pregnancy outcomes.
- Work as a hairdresser or cosmetologist may reduce foetal growth.
- Work as a hairdresser may also increase the risk of preterm delivery and perinatal death.

**Conflicts of interest**

None declared.

**References**