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Male and female alcohol consumption and live birth after assisted reproductive treatment: a nationwide register-based cohort study

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KEY MESSAGE

With prospectively collected data from a nationwide Danish register-based cohort, this study examined the association between pre-conceptional male and female alcohol consumption and the probability of obtaining a live birth after assisted reproductive treatment. Results showed no statistically significant associations between alcohol consumption and the analysed outcomes.

A B S T R A C T

The objective was to assess the potential association between female and male alcohol consumption and probability of achieving a live birth after assisted reproductive treatment. From a nationwide Danish register-based cohort information on alcohol consumption at assisted reproductive treatment initiation was linked to information on births and abortions. From 1 January 2006 to 30 September 2010, 12,981 women and their partners went through 29,834 treatment cycles. Of these, 22.4% and 20.4% led to a live birth for female abstainers and heavy consumers (>7 drinks/week), respectively. Concerning men, 22.6% and 20.2% of cycles resulted in a live birth for abstainers and heavy consumers (>14 drinks/week), respectively. No statistically significant associations between alcohol consumption and live birth were observed. Adjusted odds ratios from trend analyses were 1.00 (95% confidence interval (CI) 0.99–1.01) and 0.99 (95% CI 0.97–1.01) for every one-unit increase in female and male weekly alcohol consumption at assisted reproductive treatment initiation, respectively. In conclusion, this study did not show significant associations between male or female alcohol consumption and odds of live birth after assisted reproductive treatment.

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Introduction

The fertility rate is declining in most European countries. The decrease is primarily due to changes in socioeconomic conditions, including effective contraception, and women and men having their first child at a greater age (Schmidt et al., 2012). Infertility is categorized as a reproductive disease defined as failure to achieve a clinical pregnancy after a minimum of 12 months of regular unprotected sexual intercourse (Zegers-Hochschild et al., 2009). Representative population surveys have shown a cumulative prevalence of infertility ranging from 16% to 26% among participants who have tried to have children (Schmidt, 2006). On average 56% of infertile couples in developed countries seek medical care (Boivin et al., 2007).

Owing to the human and economic costs associated with assisted reproductive treatment, it is clinically relevant to investigate how to optimize the probability of achieving a live birth following each cycle. Alcohol consumption has been shown to affect both female and male fertility, but it is unclear from what level of consumption the effect occurs (Anderson et al., 2010). Consumption of alcohol is a common behaviour in the Danish population and fewer than one in six women of childbearing age report not drinking alcohol (Danish Health Authority and National Institute of Public Health, 2013; Kristiansen et al., 2008). The Danish Health Authorities recommend that women who are trying to conceive avoid alcohol as a precaution. However, different studies have shown that 51–73% of women drink alcohol prior to initiating fertility treatment, less than half of the consumers reduce their intake for treatment (Gormack et al., 2015), and about half continue to consume alcohol during treatment (Domar et al., 2012).

The potential effect of alcohol on reproductive outcomes, including those of assisted reproductive treatment, could be explained by biological mechanisms suggested in previous research. Significantly more lower quality embryos were found among women consuming more than 2 drinks/day, compared with women consuming fewer (Wdowiak et al., 2014). No consistent association between total alcohol consumption in the week prior to semen sampling and semen quality has been found (Jensen et al., 2014a), but a habitual intake of more than five units/week has been shown to reduce semen quality (Jensen et al., 2014b).

Few studies have investigated the association between alcohol consumption and live birth after assisted reproductive treatment, and the results are inconsistent. In a study of 221 couples undergoing IVF or gamete intra-Fallopian transfer, Klonoff-Cohen et al. (2003) found no statistically significant effect of female consumption on live birth, but for men, the probability of achieving a live birth decreased with every additional daily drink (12 g). By contrast, another study by Rossi et al. (2011) which included 2545 couples undergoing IVF found that female participants who consumed 4 drinks/week (50 g) or more had a 16% lower probability of live birth compared with women who consumed less. The association with male consumption was not statistically significant. Odds of live birth were found to be 21% lower among couples in which both partners consumed at least 4 drinks/week, compared with couples where both consumed less (Rossi et al., 2011).

Based on the above findings we postulated that both independent and combined male and female alcohol consumption negatively affect the probability of achieving a live birth after assisted reproductive treatment. Thus, the aim of the present study is to investigate how pre-conception alcohol consumption is associated with the probability of achieving a live birth after assisted reproductive treatment.

Materials and methods

Study population

All Danish women permanently living in Denmark and undergoing at least one embryo transfer with IVF, intra-cytoplasmic sperm injection (ICSI) or frozen embryo transfer (FER) treatment with autologous oocytes in the period from 1 January 2006 to 30 September 2010 were eligible for this study.

Information on weekly alcohol consumption and additional lifestyle information was continuously collected at the couples' initial visits to the fertility clinics before each treatment cycle. Some clinics obtain information on alcohol intake from questionnaires completed by patients before the clinic visit, while for others the information is collected verbally by the clinic staff. The collected information is recorded in the IVF Register, which contains information on all registered assisted reproductive treatments performed in Denmark. Information on all births and abortions in Denmark is collected in the Danish Medical Birth Registry (MBR) and the Danish National Patient Register. Data were linked, using the Central Person Registration number, which is a unique personal identification code provided to all Danish citizens (Thygesen and Ersboll, 2011).

Collection of outcomes was continued up to 30 June 2011. For women achieving a live birth, number of days between date of embryo transfer and date of birth was calculated. If the difference was 140–308 days (20–44 weeks), we considered the outcome a result of that specific assisted reproductive treatment. The calculated difference was compared with the reported gestational age (GA) from the MBR by subtracting the GA from the calculated difference. Births with differences of 0–29 days were included in the study (Petersen et al., 2013). For 30 births no GA was reported, but as these had a calculated difference between embryo transfer date and date of birth of 140–308 days, they were included in the study. One birth recorded as a live birth 138 days after embryo transfer, with a difference between calculated difference and GA of 4 days was accordingly considered the outcome of that specific assisted reproductive treatment and was included in the study.

Observations with identical female serial numbers and embryo transfer dates were considered treatment doublets, as the same woman cannot have several embryo transfers on the same day. Because differences were found between the doublet observations, exclusion had to be performed by prioritization. We prioritized observations including alcohol information on both partners, and if there were several, the observation with the largest value for the woman. If none of the observations contained information on both genders, observations with female consumption – and among these the observation with the largest value – was prioritized. In total, 1309 doublets were excluded.

Treatments with a pre-implantation genetic diagnosis (PGD) indication or diagnosis (n = 1929) were excluded from the dataset, as the primary reason for PGD is genetic disease and not necessarily infertility. These treatments are thereby not comparable to treatments for infertile patients.

Most of the women underwent more than one cycle and information on alcohol consumption could vary across the registered treatments. When handling missing information on female alcohol

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