Journal of Epidemiology and Community Health, 1983, **37**, 63–65

Alcohol use, conception time, and birth weight

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SUMMARY Predictors of birth weight and birth length were studied using sociodemographic data collected from 2259 women who resided in Funen County, Denmark, and delivered a healthy child during the period 1978–9 at Odense University Hospital. Low birth weight was significantly related to tobacco use in the year of delivery ($p < 0.01$), alcohol use during the same period ($p < 0.05$), and a delay in conception of over six months ($p < 0.01$). Smoking history and a delay in conception were also significantly associated with short birth length ($p < 0.01$ and $p < 0.01$, respectively).

The adverse effects of alcohol during pregnancy are well documented.[1] Retarded prenatal and postnatal growth and developmental psychomotor disabilities are features characterising the fetal alcohol syndrome. These effects are estimated to occur in 33% of children of alcoholic mothers.[2] Increasingly, interest has focused on the effects of more moderate alcohol consumption during pregnancy. A significant association between moderate alcohol use and low infant birth weight has been reported for a small selected sample of American women.[3] In the present study data from a large sample of Danish women have been used to re-examine the issue of alcohol use and birth weight. In addition the present study investigated the relation between the time necessary for parents to achieve conception and the weight and length of their newborn.

Subjects and methods

The subjects were women who resided in Funen County, Denmark, within the catchment area of Odense University Hospital, and delivered a healthy child during 1978–9 at the hospital. Mothers of infants with a gestational age under 258 days were excluded as were mothers of infants who had either died or had been in hospital for a serious illness or accident after birth. In addition diabetic mothers and mothers of twins were excluded. A total of 2620 eligible women were identified through the hospital's inpatient register. Birth weight (to the nearest 50 g) and birth length (to the nearest centimetre) were obtained from the register for the entire group of infants born to these women during the study period.

Sociodemographic information was obtained from 2259 women (86% of those in the identified sample) using a self-administered, mailed questionnaire. Women were contacted up to three times in an effort to enlist their co-operation. The information was collected as part of a study whose main objective was not the examination of alcohol use. On the basis of the questionnaire data each woman could be classified as a smoker or a non-smoker in the year of delivery of her child and placed in one of four categories according to her consumption of alcohol during the same period. Alcohol consumption was assessed in drinks per week, with one drink equivalent to either one beer, one glass of wine, or one schnapps (an alcohol content of about 10 g each). In addition, data concerning the woman's educational status, prior use of oral contraceptives, age, parity, and time needed to conceive the pregnancy were obtained.

Results

Multiple regression equations were computed for birth weight and birth length as the dependent variables. Smoking history, alcohol consumption, oral contraceptive use, conception time, woman's age, parity, and education were included as the independent variables in both models. As shown in the table, low birth weight was significantly related to tobacco use in the year of delivery ($p < 0.01$), alcohol use during the same period ($p < 0.05$), and a delay in conception of over six months ($p < 0.01$). Smoking history and a delay in conception were also significantly associated with short birth length ($p < 0.01$ and $p < 0.01$).

Figure 1 shows the relationships between drinking habits and birth weight and length. The deviations from the mean are adjusted for the effects of the other variables in the multiple regression model.[4] The figure shows increasingly negative deviations

Regression of birth weight and birth length on maternal alcohol and tobacco use in the year of delivery and other related variables (n = 2259)

Variables	Birth weight (g)		Birth length (cm)	
	Coefficient	significance	Coefficient	significance
Smoking*	−218·0	p <0·01	−0·9	p <0·01
Alcohol consumption†	−37·6	p <0·05	−0·1	NS
Oral contraceptives‡	16·4	NS	0·05	p <0·05
Delay in conception§	−77·3	p <0·01	−0·2	p <0·05
Mother's age	7·6	p <0·01	0·03	p <0·01
Parity	9·5	NS	0·04	NS
Mother's education‖	4·6	NS	−0·05	NS
Constant	3391·6		52·3	

*Smoker: yes = 1, no = 0.
†Total ounces a week: 0 = 0, 1–4 = 1, 5–9 = 2, 10 or more = 4.
‡Previous use: yes = 1, no = 0.
§Conception time: under six months = 0, six months or longer = 1.
‖Education: under 10 years = 0, 10–12 years plus unknown = 1, 13 years or more = 2.

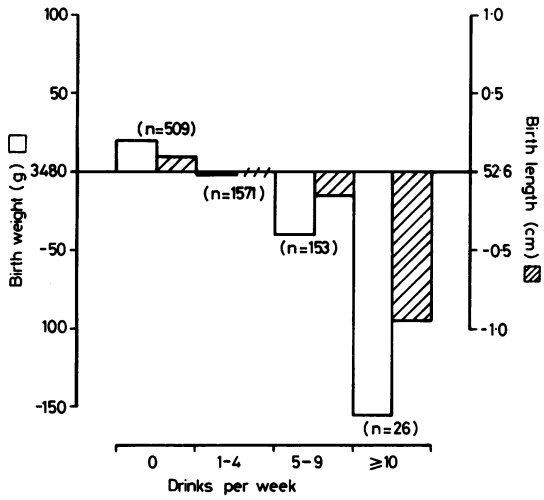

Fig 1 *Mean deviations from mean birth weight and mean birth length by maternal alcohol consumption in the year of delivery (adjusted for maternal age, parity, smoking history, and length of time needed to conceive).*

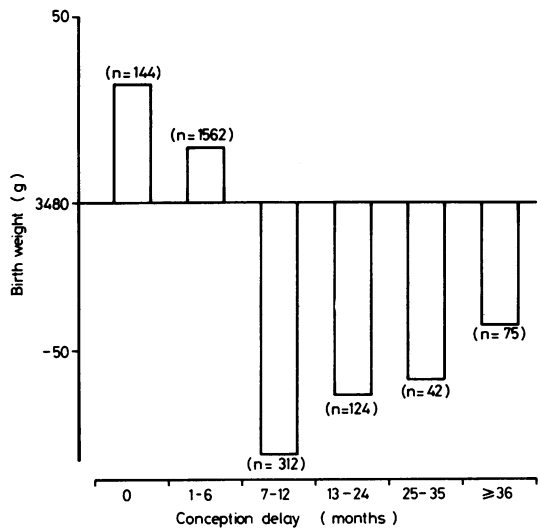

Fig 2 *Mean deviations from mean birth weight by number of months needed to achieve conception (adjusted for maternal age, parity, and smoking and drinking histories).*

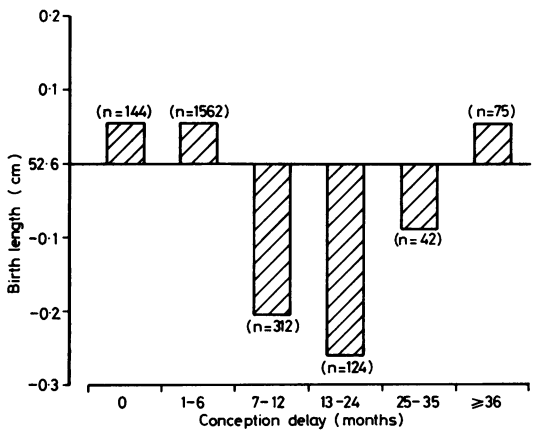

Fig 3 *Mean deviations from mean birth length by number of months needed to achieve conception (adjusted for maternal age, parity, and smoking and drinking histories).*

from mean birth weight and length with greater consumption of alcohol, as measured in drinks per week in the year of delivery.

The relationships between conception time and birth weight and length were also examined. The birth weight of infants conceived after a delay of more than six months ranges from 35 to 68 g below the mean weight of 3480 g for all study infants (fig 2). A less clear picture is observed for conception time and birth length. Birth length deviations ranging from 0·2 to 0·3 cm below the mean length of 52·6 cm were observed for the children of parents needing seven to 24 months to achieve conception (fig 3). A smaller negative deviation from the mean birth length was seen for infants conceived after two to three years. The birth length of infants conceived after three or more years was slightly above the mean and was of the same magnitude as that observed for infants conceived either within six months after cessation of contraceptive measures or conceived despite the use of contraceptive measures. Taken together the two figures imply non-linear relationships between conception time and birth weight and length.

Discussion

The present study supports the idea that alcohol, even in low doses, can affect birth weight. Figure 1 indicates that even relatively low doses of alcohol affect birth weight and length. This result holds for both birth weight adjusted for the effects of maternal smoking, age, parity, and conception time and for unadjusted birth weight (not shown). The finding is in contradiction to results from a French study where birth weight unadjusted for potential confounders was not associated with low alcohol doses (defined as less than 40 centilitres of wine a day).[5] The "low dose" in the French study (which ranges up to 28 drinks a week) is above the highest category of alcohol consumption (ten or more drinks a week) in the present study. The health implications of a low-dose effect of alcohol cannot be evaluated from the present study as the good general health of the infants was one of the prerequisites for inclusion in the study material. The present association between alcohol and low birth weight might still be confounded by tobacco use since the adjustment procedure used only two categories of smoker (smoker and non-smoker). Thus the association might be subject to residual confounding. On the other hand, the present results were very similar to those reported by Little.[3]

More and more scientific attention is focusing on aetiological exposures associated with undesirable reproductive outcomes, from infertility to spontaneous abortion, stillbirth, and childhood cancer. The low birth weight of children born to mothers with a conception delay indicates that low birth weight should probably be included as an outcome of interest in such studies. An association between moderate drinking and low birth weight is of considerable importance from a biological point of view even though its significance in a public health context is unknown. Further studies are needed to establish the potential harmful effects of moderate drinking on the fetus. Very detailed information of smoking and drinking habits will be necessary. Of particular importance will be the ability to establish the effect of drinking and smoking before and during pregnancy.

An earlier study reported no significant differences between the birth weight of infants of a group of 212 previously infertile women and a control group.[6] This is not surprising as birth weight was examined as a categorical variable in three broad groups (<2500 g, 2500–3500 g, and >3500 g). Such an approach does not provide the sensitivity to detect the smaller differences observed in the present study. Furthermore, it is difficult to examine the issue of the relationship between conception delay and birth weight using a group of medically treated infertile women, since treatment of infertility in and of itself may influence birth weight.

Birth weight and length were compared for infants born to women who responded to the questionnaire and women who did not. The mean birth weight (3458 g) for the group of non-respondents was statistically different ($0{\cdot}01 < p < 0{\cdot}05$) from the mean birth weight (3480 g) of respondents, as tested by Student's t test. There was no significant difference at the 0·05 level between the mean birth length of respondents and non-respondents (52·6 cm and 52·4 cm, respectively). Bias could be introduced if the reasons for non-response were related to both the dependent and independent variables in the regression models. No data are available to examine response rate as a function of tobacco use or alcohol consumption. The relatively high overall response rate of the study would tend to minimise the effects of any potential bias. If non-respondent bias does exist the present study's findings are probably underestimated.

This work was supported by grants from the Danish Medical Research Council (No 12–1712 and No 12–3352). We thank Professor K Kristoffersen, head of the department of obstetrics and gynaecology, Odense University Hospital, for his co-operation.

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