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ALCOHOL AND FOETAL DAMAGE

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Abstract — Heavy alcohol consumption (more than 80 g per day) in pregnancy is associated with the foetal alcohol syndrome. More moderate consumption is reported to result in increased rates of spontaneous abortion, still birth and congenital malformation as well as growth retardation. There may be functional deficits in early childhood. In the light of current knowledge abstinence from alcohol before and during pregnancy is advisable.

INTRODUCTION

The adverse effects of alcohol on the foetus have been suspected since antiquity (see the review by Warner and Rosett, 1975) but the first detailed study was carried out in the Liverpool jail by Sullivan (1899). He studied the children born to chronic drunkards and noted that the rates of still birth and death in infancy were much higher than among the children of non-alcoholic blood relatives. Furthermore, he also reported that the prognosis for subsequent children got worse with increased duration and severity of alcohol abuse. A number of later French publications especially that of Lemoine *et al.* (1968) were overlooked by the scientific world and it was not until the first English language account of a characteristic pattern of malformations in the offspring of chronic alcoholic mothers now known as the foetal alcohol syndrome (FAS) (Jones *et al.*, 1973) that interest in the whole field was rekindled.

FOETAL ALCOHOL SYNDROME

As in so many syndromes there is no single diagnostic feature and no specific biochemical, chromosomal or pathological test. The diagnosis rests on the recognition of a constellation of morphological and behavioural features in the offspring of mothers who drank excessively in pregnancy. It occurs only when the mother drinks consistently more than 80–100 g of

alcohol daily and it has not been described after a single binge. The characteristics are (Clarren and Smith, 1978; Colangelo and Jones, 1982; Streissguth and Martin, 1983):

- (1) Prenatal and postnatal deficiency. Catch-up growth is generally not achieved at later ages even with proper nutrition and a favourable environment.
- (2) Defects in the central nervous system, including microcephaly, and most serious of all, mental retardation. Functional symptoms include irritability and hypotonia in infancy and poor co-ordination and hyperactivity in early childhood. A wide range of IQ values is found with a correlation between the severity of physical characteristics and the severity of intellectual handicap. A variety of brain malformations, including neuroglial heterotopia, have been described in cases coming to autopsy. Most follow-up studies have indicated little if any improvement in IQ, but recently more encouraging results have been reported (Spohr and Steinhausen, 1984).
- (3) Distinctive facial features, which include short palpebral fissures, flat midface, indistinct philtrum, thinned vermilion of the upper lip and a short, upturned nose. This cluster of features results in a distinctive face readily recognised by a trained observer but the appearances tend to become less prominent in later childhood.

- (4) Congenital anomalies are more common than usual in FAS children and include defects in the eye, heart, kidney and skeleton.

IS IT A SYNDROME?

As there is no definitive diagnostic test, the very existence of the syndrome has inevitably been questioned. Criticisms include the variable and unpredictable incidence among the offspring of alcoholic mothers (about one in three children may be affected), the similarity of the facial features to other syndromes in which the cause is known, such as foetal hydantoin exposure, and the lack of control in diagnosis for other confounding variables. These and other criticisms are discussed by Abel and Sokol (1983) who conclude that the evidence persuades in favour of this diagnostic entity and leaves little room for doubt.

OTHER CHILDREN OF ALCOHOLIC MOTHERS

Although the FAS has attracted much interest, it is becoming increasingly apparent that maternal alcoholism is related to a whole spectrum of effects (Streissguth and Martin, 1983). Studies have shown cognitive or intellectual deficits in children without the characteristics of FAS born to alcoholic mothers as well as increased risk of perinatal death, increased risk of epilepsy, and abnormal EEG activity. Such changes are now often referred to as foetal alcohol effects (FAE).

PREVALENCE

The incidence of FAS varies widely between countries and ethnic groups and it is estimated at 1/1000 live births in Northern France, 1/600 in Sweden and 1/750 in Seattle, U.S.A. In the U.K. cases appear to be concentrated in areas where heavy drinking and poor nutrition are common. Thus Beattie *et al.* (1983) describes 40 cases from the West of Scotland and a number of cases have been reported from Liverpool (Poskitt *et al.*, 1982) and Belfast (Halliday *et al.*, 1982). The incidence of foetal alcohol effects is more difficult to quantitate but the figures for the sum of FAS together with FAE will clearly be substantially greater.

BINGE DRINKING

Although the Carthaginians forbade the consumption of wine on the wedding night, there is no evidence that binge drinking causes FAS. In our own prospective study 49 females were identified who had taken at least 100 g of alcohol in one session during the first trimester of pregnancy and none of the 47 infants born to these women had any features of FAS. Two of the 47 females spontaneously aborted and other authors have described the association between binge drinking and miscarriage.

MODERATE DRINKING IN PREGNANCY

As heavy drinking causes such marked and serious damage to the foetus, it is natural that attention has focused on the possible harmful effects of more moderate drinking in pregnancy. There are many surveys both retrospective and prospective. In some the accuracy of the history of alcohol consumption is suspect or inadequate; in others the analysis of the data does not take account of other important variables such as smoking, previous obstetric history, maternal weight, nutritional status and caffeine consumption. These studies have been subjected to a number of critical reviews (Barrison *et al.*, 1981; Abel, 1982; Russell, 1982; Streissguth and Martin, 1983; Stein and Kline, 1983; Barrison *et al.*, 1985) and only the main conclusions will be presented here. It seems that the following are among the harmful effects of moderate alcohol consumption.

(a) Spontaneous abortion

Two studies were published in the *Lancet* in 1980 (Harlap and Shiono, 1980; Kline *et al.*, 1980). The first suggested that as little as 1-2 drinks per day significantly increased the abortion rate in the second trimester, and the second showed that women who had a spontaneous second trimester abortion were twice as likely as controls to report drinking at least twice per week. The results of the several prospective studies under way will hopefully throw further light on the risk of such low levels of alcohol consumption.

(b) Foetal malformation

Ouellette *et al.* (1977) found an increased

frequency of foetal abnormalities (14%) in moderate drinkers (less than 45 g absolute alcohol per day) compared with 9% in non drinkers. Some, but not all, other studies in the literature confirm these findings.

(c) *Foetal growth retardation*

Our own studies (Wright *et al.*, 1983) have shown that as little as 100 g per week in the first trimester doubles the risk that the baby will be less than the 10th centile for weight compared with light or teetotal mothers. A number of well-conducted studies also show a significant association between moderate alcohol consumption and reduced birth weight (Little, 1977; Sokol *et al.*, 1980; Kuzma and Sokol, 1982; Rosett *et al.*, 1983; Mills *et al.*, 1984).

(d) *Postnatal behavioural and development effects*

A number of studies particularly those from Seattle indicate adverse effects on the behaviour pattern (such as habituation and sucking pressure) of neonates born to mothers who drank moderate amounts of alcohol in pregnancy (up to 45 g per day) (Streissguth *et al.*, 1984). Follow-up studies at 8 months and 4 years show continuing abnormalities in reaction time and attention after adjustment for variables such as diet, education and family stress. Whether these changes will have any detectable long-term significance remains to be determined.

MECHANISMS OF DAMAGE

There is now no doubt as a result of the clinical and animal studies that alcohol is a teratogen but the mechanism of damage remains controversial. Certainly alcohol crosses into the foetus and there is evidence that the amniotic fluid may act as a reservoir following maternal ingestion such that the foetus would be exposed for a longer time period than would be predicted from maternal blood levels (Brien *et al.*, 1983). It is unknown whether alcohol itself or its main metabolite acetaldehyde is harmful. Alternatively, alcohol may act indirectly by altering the biochemical milieu in one of many ways (Henderson *et al.*, 1981) such as interfering with zinc metabolism or the hormonal balance. It is quite possible

that different mechanisms are operative at different times of gestation and this whole field was surveyed recently (Ciba Foundation, 1984).

EXTENT OF PROBLEM IN BRITAIN AND CURRENT RECOMMENDATIONS

The proportion of mothers found to be drinking more than 100 g alcohol per week was 16% in Leamington Spa (Davis *et al.*, 1982) 20% in West London (Wright *et al.*, 1983) and 5.9% in Edinburgh (Plant, 1984). If the indications from current research are correct then these women are placing their foetus at some risk. In our survey 4.8% mothers were drinking more than 50 g of alcohol daily and were therefore at risk of hepatic damage. Very few mothers seemed to drink 80–100 g per day or more and thus risk delivering a child with foetal alcohol syndrome.

It will be clear that while heavy alcohol consumption is definitely harmful, there is no certain data on which to identify a safe lower limit if any. However, guidelines are required now and both the American Surgeon General (1981) and the Royal College of Psychiatrists (1982) have advised women not to drink alcohol in pregnancy. Until further information is available this is certainly the safest course and it is also advisable not to drink when pregnancy is being planned.

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