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# Exploration of dietary patterns and alcohol consumption in pregnant women in the UK: A mixed methods study

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ABSTRACT

*Background:* fetal Alcohol Spectrum Disorders is a term used to describe a range of physical, cognitive and behavioural deficits in the offspring of women who drank alcohol during pregnancy. A growing body of evidence suggests alcohol consumption in the presence of poor maternal nutrition may increase the risk of harm to the developing fetus.
*Objective:* to investigate relationships between maternal dietary patterns and alcohol consumption, and explore which factors influence women's decisions about what to eat and drink during pregnancy.
*Design:* a mixed methods study comprising a questionnaire (paper-based and online) and semi-structured, in-depth interviews with a sub-sample of women who completed the questionnaire.
*Participants:* women were eligible for inclusion if they were ≥16 years of age, pregnant and living in the UK and were recruited through antenatal clinics, specialist substance misuse antenatal clinics or via social media platforms; 350 women completed a questionnaire and a sub-sample of 6 women participated in an interview.
*Methods:* the questionnaire comprised the Alcohol Use Disorders Identification Test Consumption to measure alcohol consumption patterns and a Food Frequency Questionnaire to measure dietary intake. Dietary pattern analysis was conducted using Principle Components Analysis and linear regression models were used to explore relationships between dietary pattern scores and alcohol consumption. Analyses were adjusted for socio-demographic and lifestyle characteristics. Semi-structured, in-depth interviews were conducted face-to-face and analysed thematically.
*Findings:* two key dietary patterns were derived. Women who reported frequent alcohol consumption before and during pregnancy were more likely to adhere to the 'Prudent' dietary pattern compared to those who abstained. No relationships were observed between alcohol consumption and adherence to the 'Cafeteria' dietary pattern. Six key themes were identified through the qualitative analysis: (1) pregnancy as a time to review behaviour; (2) listen to your body – it will tell you what you need; (3) treats are still important – on special occasions; (4) social and cultural expectations constrain behaviour; (5) inconsistent or ambiguous information creates uncertainty; and 6) confidence increases following a successful pregnancy.
*Conclusions:* those who drink low levels of alcohol during pregnancy may have better quality diets compared to women who report no alcohol consumption. The reasons for this are complex and influenced by social context and previous pregnancy experience, which should be considered when healthcare professionals provide advice during this period.

## Introduction

Fetal Alcohol Spectrum Disorders (FASD) is a term used to describe a range of physical, cognitive and behavioural deficits in the offspring of women who drank alcohol during pregnancy (Mukherjee et al., 2006). The prevalence of FASD is estimated to be between 1.06 and 113.22 per 1000 live births globally (Roozen et al., 2016). In Canada, active case ascertainment estimated prevalence is 30.52 per 1000 live

*Abbreviations:* FASD, Fetal Alcohol Spectrum Disorders; ALSPAC, Avon Longitudinal Study of Parents and Children; CI, Confidence Interval; FFQ, Food Frequency Questionnaire; AUDIT-C, Alcohol Use Disorders Identification Test Consumption; PCA, Principle Components Analysis; NRES, National Research Ethics Service; NHS, National Health Service; UK, United Kingdom; HEI, Healthy Eating Index; SES, Socio-economic Status

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births and estimated to cost $169 million per year (Stade et al., 2007; SatCan., 2016).

It is widely accepted that FASD is caused by the teratogenic effects of ethanol on fetal development leading to brain damage and physical abnormalities (Riley et al., 2011), and a growing body of evidence suggests alcohol consumption in the presence of poor maternal nutrition may increase the risk of harm to the developing fetus. Animal models of FASD have indicated that particular micronutrients may mediate the relationship between ethanol and harm (Gutierrez et al., 2007; Thomas et al., 2010; Naseer et al., 2010; Hewitt et al., 2011). When pregnant rats were exposed to ethanol a protective effect from folate, choline, vitamin E and carotenoids was shown; their offspring had higher birth and brain weights (Thomas et al., 2009), less damage to their brain structure (Mitchell et al., 1999; Heaton et al., 2000; Marino et al., 2004), and showed fewer signs of cognitive and behavioural deficits associated with antenatal ethanol exposure (Thomas et al., 2009, 2010).

Similar findings have been reported in human populations. A significant reduction in maternal to fetal transport of folate was observed in pregnancies exposed to high levels of alcohol (Hutson et al., 2012), and multivitamin supplements may ameliorate some of the harm from antenatal alcohol exposure (Coles et al., 2015). These findings are particularly important as it has also been shown that, in the general population, health-risk behaviours, such as alcohol consumption and a poor diet, tend to co-occur and significantly increase the risk of chronic ill health (Padrão et al., 2007; Lanting et al., 2009).

Nutrient intakes provide valuable insight into the diet quality of populations. However, there are limitations to single nutrient analysis, which have been discussed in a number of review papers (Hu, 2002; Newby and Tucker, 2004). The effect of a single nutrient may be too small to detect on its own, and nutrients are not consumed in isolation; therefore, the measurement of a single nutrient may actually be a proxy for the effect of a group of nutrients which are consumed together. Dietary patterns provide a better reflection of 'true' dietary intake by focusing on how food and drinks are consumed together, which may be a more powerful indicator of diet quality (Hu, 2002).

While there are a number of studies exploring relationships between various aspects of alcohol consumption and dietary patterns in the general population (La Vecchia et al., 1992; Tjønneland et al., 1999; Chatenoud et al., 2000; Sieri et al., 2002; Ruf et al., 2005; Serfontein et al., 2010; Touvier et al., 2014), little research has been published on pregnant women. However, an analysis of data from the Avon Longitudinal Study of Parents and Children (ALSPAC) found that women who reported binge drinking during pregnancy were more likely to adhere to a diet characterised by high intakes of meat and processed foods, and low intakes of fresh fruit and vegetables (Coathup et al., 2017). Data were collected during pregnancy as part of ALSPAC more than 20 years ago and further research is needed with contemporary populations of pregnant women.

The implications of these findings are that interventions to reduce the risk of FASD may be more effective if they tackle co-occurring health-risk behaviours, particularly alcohol consumption and poor nutrition. This requires a better understanding of both the association between maternal alcohol consumption and dietary intake; and what influences women's choice of what they eat and how much alcohol they drink during pregnancy. Understanding these relationships and how these choices are made may facilitate identification of at risk populations of women and highlight targets for interventions to improve health behaviours. Therefore, the key objectives of this study were: (i) to derive maternal dietary patterns and explore their relationship to patterns of maternal alcohol consumption, before and during pregnancy and (ii) to gain insight into what factors influence women's choices about what they eat and drink during pregnancy through interviews with a subsample of women.

## Methods

A two-phase, explanatory design was implemented whereby quantitative and qualitative data were collected sequentially. Phase one comprised a cross-sectional survey of women who were pregnant, aged 16 or older and living in the UK, which included a purposely designed food frequency questionnaire (FFQ) that provided detailed data on levels of alcohol and micronutrient consumption and patterns of maternal diet. Phase two comprised semi-structured, in-depth interviews with a subsample of phase one participants to explore the attitudes, beliefs and concerns that produced these patterns.

### *Sample population*

#### *Inclusion criteria*

Initially, recruitment was through antenatal clinics in Gloucestershire, and women were eligible for inclusion if they were pregnant, aged 16 or older, attending an antenatal clinic for their 12-week scan and reported any alcohol consumption during their current pregnancy. Non-English speakers and women suffering severe morning sickness were excluded. Due to slow recruitment, two additional routes for recruitment were opened and eligibility criteria were widened. The second recruitment route was through specialist substance misuse clinics and women were eligible for inclusion if they were pregnant, aged 16 or older, living anywhere in the UK, at any gestation and reported any alcohol consumption during their current pregnancy. The third recruitment route was through social media and women were eligible for inclusion if they were pregnant, aged 16 or older, living anywhere in the UK, at any gestation and whether or not they reported any alcohol consumption during their current pregnancy.

#### *Recruitment procedures*

Recruitment was via three routes:

(1) Women attending their 12-week scan at five antenatal clinics across Gloucestershire were given a short screening questionnaire to complete by the clinic receptionist. The screening questionnaire included the Alcohol Use Disorders Test-Consumption (AUDIT-C) (Bush et al. 1998). Women were asked to complete this while they waited for their appointment and to place it in a sealed envelope and then into a sealed collection box. Women were recruited at this time as the vast majority of pregnant women in the UK attend an appointment at 12 weeks to have an ultrasound scan and blood samples taken, and most will have periods of waiting between these procedures when they can complete the questionnaire. Women who reported any alcohol consumption on the screening questionnaire were later sent a second questionnaire which included the FFQ and the AUDIT-C. The screening questionnaire was used only to identify women who were drinking at this point and the data collected at this stage were not included in the analysis. When women were sent the full study questionnaire, which included the FFQ, they were asked the same alcohol questions again. These were included in the current analysis.
(2) Women attending either of two specialist substance misuse antenatal clinics were informed about the study by their clinician. Women who were interested in participating provided their contact details and were contacted at a later date by the first author (VC). Women who wished to participate were sent a copy of the study questionnaire.
(3) An online version of the questionnaire was created and advertised on social media platforms (Twitter and Facebook). Women who chose to do so completed the questionnaire online.

In all three recruitment strands of recruitment, submission of a completed questionnaire implied consent (Fig. 1).