



Segmental hair analysis to assess effectiveness of single-session motivational intervention to stop ethanol use during pregnancy



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ABSTRACT

Background: This study aimed to test the effectiveness of single-session motivational intervention to stop ethanol use during pregnancy using segmental hair analysis of ethyl glucuronide to objectively verify drinking behavior before and after intervention.

Methods: 168 pregnant women attending Hospital del Mar (Barcelona, Spain) for antenatal visit were included in the study and randomly assigned to one of two conditions: single-session motivational intervention (MI; $N=83$) or single-session educational control condition (ECC; $N=85$). Ethyl glucuronide was measured in maternal hair divided into three segments of 3 cm each corresponding to the three different gestation trimesters by a validated liquid chromatography tandem mass spectrometry method. Concentrations of EtG <7 pg/mg, between 7 and 30 pg/mg and ≥ 30 pg/mg in each segment were used to assess total abstinence, repetitive moderate drinking and chronic excessive consumption in the previous three months.

Results: About a third of pregnant women self-reporting no ethanol consumption during gestation showed hair EtG values corresponding to ethanol drinking. Single-session MI helped in decreasing alcohol consumption during pregnancy as assessed by lower hair EtG concentrations in 2nd and 3rd trimesters. However, it did not significantly increase complete abstinence in pregnant women who previously showed hair EtG compatible with ethanol consumption.

Conclusions: Pregnant women did not correctly self reported ethanol consumption during gestation, while hair EtG was essential to correctly identify drinking patterns. Single-session MI was not enough to stop ethanol use during pregnancy. Interventions at any visit during pregnancy are strongly recommended.

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1. Introduction

Newborns exposed to maternal ethanol during pregnancy can develop a spectrum of physical, cognitive and behavioral disabilities known as fetal alcohol spectrum disorders (FASD), whose most severe form, including morphological abnormalities, is defined as fetal alcohol syndrome (FAS; Memo et al., 2013).

Despite increasing public awareness of the harmful effects of drinking during pregnancy, many women consume ethanol in various degrees while pregnant. Surveys performed in North-American

countries have reported that approximately 15–30% of women continue to drink ethanol throughout pregnancy (Ebrahim et al., 1998; Flynn et al., 2003). In European countries, ethanol consumption during pregnancy is a relevant problem with estimated prevalence ranging from 3.5 to 53.9% (Derauf et al., 2003; Raymond et al., 2009; Wurst et al., 2008). In particular, prevalence studies performed in South Europe countries, revealed an unsuspected 40% gestational ethanol consumption in Barcelona (Spain; Garcia-Algar et al., 2008) and 4–29.4% pregnancy drinking in different provinces of Italy (Pichini et al., 2012).

Effective interventions that assist pregnant women to stop ethanol consumption are essential to prevent the serious sequelae of intrauterine ethanol exposure. Indeed, since the amount and the type of ethanol which can pose at risk a neonatal outcome are unknown, the only way to prevent the eventuality of FASD is

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avoiding ethanol drinking while pregnant and when planning to have a baby (Muckle et al., 2011).

Outcomes of interventions performed during pregnancy to stop prenatal ethanol use varied depending on the type of intervention.

Single-session Motivational Intervention (MI) is a low cost methodology that has been validated in studies concerning reduction of ethanol consumption and ethanol-related problems in primary health care (Colom et al., 2014) including pregnancy, when no harmful patterns of ethanol consumption (e.g., chronic excessive consumption) are identified (Jones et al., 2013; O'Donnell et al., 2014; Stade et al., 2009). MI is a person-centered counseling style that increases a person intrinsic motivation for change through the spirit of partnership, acceptance, compassion, and evocation (Chang et al., 2005; Handmaker et al., 1999; Osterman and Dyehouse, 2012; Osterman et al., 2014). Using a single-session MI to decrease ethanol consumption during pregnancy, Chang et al. (2005) found a significant reduction in those women who received the intervention. Similar to the prevalence studies, the effectiveness of brief interventions for ethanol cessation is usually evaluated by maternal self-report data. Self-reports are often misleading for a variety of reasons (e.g., social desirability bias, recall bias, and/or fear that the child may be taken away; Czeizel et al., 2004; Manich et al., 2012). For this reason, Handmaker et al. (1999) accurately evaluated the efficacy of a single-session MI intervention using a biomarker of recent ethanol consumption such blood ethanol concentration. Indeed, information provided from an unbiased biomarker is essential to correctly assess eventual changes in drinking behavior before and after a certain intervention. Currently, there are several measurable biomarkers available for detecting gestational ethanol consumption (Joya et al., 2012, 2015a). Ethyl glucuronide (EtG) quantification in maternal hair is a useful tool for the objective evaluation of ethanol consumption over extended time periods such as that of pregnancy (Crunelle et al., 2014). Maternal hair testing of EtG can distinguish between abstinence, repetitive moderate (social) drinking, and chronic heavy drinking (Albermann et al., 2011; Kintz and Nicholson, 2014; Pragst et al., 2010; Pragst and Yegles, 2008; Wurst et al., 2008). This can be made using cut-offs recently established by the Society of Hair Testing (Kintz, 2014). Concentrations of EtG < 7 pg/mg hair and ≥ 30 pg/mg hair in the 0–3 cm hair segment have been used to assess total abstinence assessment and chronic excessive consumption in the previous three months respectively, with repetitive moderate drinking lying in the interval 7–30 pg EtG per mg hair.

The purpose of the current study was to assess the effectiveness of a single-session MI administered at first trimester of pregnancy in order to stop eventual ethanol use among pregnant women from Hospital del Mar (Barcelona, Spain) using hair EtG as reliable biomarker to disclose maternal ethanol consumption before and after the intervention.

2. Methods

2.1. Study design

A sample size calculation was made using the institutional program GRANMO (<http://www.imim.es/ofertadeserveis/software-public/granmo/>). Considering a previously disclosed prevalence of 45% mothers drinking during pregnancy (Garcia-Algar et al., 2008) and an error margin of 7.5%, a minimum sample size of 165 participants was obtained.

A total of 168 pregnant women attending Hospital del Mar (Barcelona, Spain) for antenatal visits were enrolled for the study during 2014. The inclusion criteria in the study required the consensus to participate in the study and a maternal hair length of

minimum 9 cm at delivery. Indeed, considering a mean hair growth of 1 cm per month, the required length covered the whole gestation period. The study was approved by the Institutional Ethical Committee (CEIC-IMAS, project number 1333/2012) and was conducted in accordance with the Declaration of Helsinki. Signed informed consent was obtained from the pregnant mothers. The applied questionnaire regarding ethanol use was the Spanish translation of the AUDIT questionnaire (Colom et al., 2014; Wurst et al., 2008). Briefly, ethanol consumption data included ethanol type and amount plus container size and quantity. Since none of the pregnant women resulted with hazardous alcohol use, at the first antenatal visit, participants were randomly assigned by computer to one of two conditions: Motivational Intervention (MI; $N=83$) or an Education Control Condition (ECC; $N=85$).

The goal of single-session MI was to provide personalized feedback of risk, motivate the woman to change target behaviors, decrease her temptation to engage in risk behavior and increase her confidence to avoid it, develop change plans, and encourage her to attend the contraceptive counseling visit (Chang et al., 2005; Handmaker et al., 1999; Osterman and Dyehouse, 2012; Osterman et al., 2014). Furthermore, the normal advises for eating, drinking, health screenings, family planning, prevention of sexually transmitted infections and exercise recommended for women of childbearing age were transmitted to all the participants.

The group of pregnant women assigned to the ECC condition only received the above reported normal advices.

Since women presented at first antenatal visit at least after the first month of gestation, but more often during the second month and had to be firstly recruited for the study and then engaged for a further visit, single session interventions were usually administered between the half and the end of first pregnancy trimester.

At post-partum interview, mothers completed the Ethanol Timeline Follow-back for ethanol consumption from the time of study enrolment until delivery with quantity-frequency questions about personal consumption of beer, wine, whiskey, gin, or other spirits since study enrolment (Collins et al., 2008). Then, a piece of hair was collected. Hair strand was then stored at room temperature in a plastic bag until analysis. Samples were analyzed blind of the intervention.

2.2. Hair EtG determination

Hair specimens were divided into three subsequent 3 cm segments corresponding to the three pregnancy trimesters. Segment one from 0 (root) to 3 cm (proximal segment corresponding to the last trimester of gestation); segment two from 3 to 6 cm (central segment); and segment three from 6 to 9 cm (distal segment corresponding to the first pregnancy trimester) were analyzed separately.

EtG was measured in each hair segments by ultra-high performance liquid chromatography–tandem mass spectrometry (UHPLC–MS/MS) using a validated methodology (Joya et al., 2015b).

2.3. Statistical analysis

Descriptive statistics of hair EtG were performed using mean, median, geometric mean and percentiles. Preliminary association between sociodemographic, life style characteristics of pregnant women with fetal exposure to ethanol were done by Student's *t* test for continuous variables and Chi-square test for dichotomous variables or multinomial logistic regression for categorical variables. Statistical significance was set at $p < 0.05$. Database management and statistical analysis were performed with SPSS v 14.0 (SPSS, Chicago, IL, USA).

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