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Omega-3 deficiency associated with perinatal depression: Case control study

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Abstract

Women are depleted of omega-3 polyunsaturated fatty acids (n-3 PUFAs) during the perinatal period due to fetal diversion. An association has been shown between lowered n-3 PUFAs and depression in general. We therefore hypothesise that women with lower n-3 PUFA levels are at greater risk of depression during pregnancy. Sixteen depressed and 22 non-depressed women were recruited during the third trimester and fasting bloods were taken for plasma fatty acid analysis. High docosahexaenoic acid (DHA), high total n-3 and a low n-6:n-3 ratio were associated with significantly lower odds of depression. After adjustment for parity, age and education level, those with high DHA still had significantly lower odds of being depressed. Those with high total n-3 and a low n-6:n-3 ratio were also at significantly reduced risk of depression, although the magnitude of the difference was reduced. Study results quantified women with lower omega-3 PUFA levels as being six times more likely to be depressed antenatally, compared to women who had higher omega-3 PUFA levels. The prophylactic benefits of supplementation either prenatally or during pregnancy require close study to assess whether omega-3 PUFAs play a role in the prevention of perinatal depression.

Keywords: Depression; Pregnancy; Postnatal depression; Docosahexaenoic acids; Fatty acids; Unsaturated

1. Introduction

About 15% of women are estimated to experience perinatal depression (PND) (Evans et al., 2001) and about 40% have their onset antenatally which predisposes them to further depression postnatally (Green and Murray, 1994). Various theories have been postulated to explain the vulnerability of women to depression at such a time, including nutritional deficits. Not only are omega-3 polyunsaturated fatty acids (n-3 PUFAs) depleted perinatally but deficits have been shown to be associated with depression in general. The combination of these factors may make women more susceptible to PND, with neurobiological mechanisms previously overviewed by the authors (for more details, see Rees et al., 2005; Parker et al., 2006a for more details).

In the last 150 years, rapid expansion in Western populations has been associated with a change in diet, with n-3 PUFAs from oily fish, wild game and leaves being replaced by saturated fats from domestic animals and omega-6 (n-6) PUFAs from common vegetable oils (corn, safflower, sunflower, soybean, sesame and cottonseed oils) and other sources such as wheat germ. These changes have resulted in a large increase in the n-6:n-3 PUFA ratio in the general diet from 1:1 to more than 10:1 (Holub,

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2002). This has led to increased pro-inflammatory n-6 PUFAs and decreased anti-inflammatory long-chain n-3 PUFAs – docosahexaenoic acid (DHA) and eicosapentaenoic (EPA) – particularly in brain cell membranes.

In the perinatal period, studies have established that maternal n-3s are depleted (Al et al., 1994; Hornstra, 2000), with post-mortem studies confirming depletion is due to fetal accretion of n-3s (up to 67 mg per day) (Innis, 2003). This is in excess of the dietary intake of many women, with the median DHA intake of Western women estimated at 15 mg/day (Meyer et al., 2003) compared with 1000 mg/day in high fish-eating countries.

The levels of n-3 PUFA can be inferred by dietary assessment, but more accurately quantified by blood fatty acid analysis (Ross, 2007). Levels of n-3 PUFAs are decreased in depressed compared with non-depressed subjects in general (Parker et al., 2006a) as well as in postnatal depression (De Vriese et al., 2003; Otto et al., 2003; Hibbeln et al., 2003), while epidemiological studies have shown strong correlations between postnatal depression, seafood consumption and DHA in the mother's milk as well as similar results in general depression (Hibbeln, 1998; Hibbeln, 2002).

This study is the first to compare fatty acid blood levels in the antenatal period between depressed and non-depressed women.

2. Methods

Fig. 1 is a summary flow diagram of the study method.

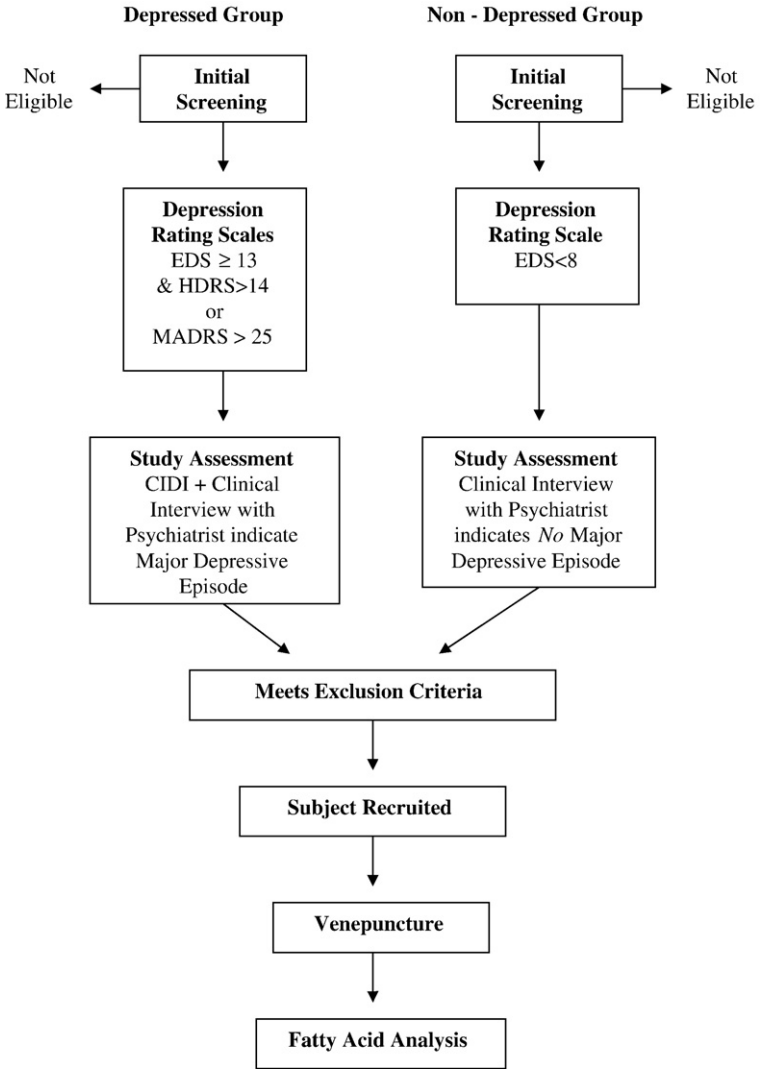

Fig. 1. Summary flow diagram of study method.