Women who eat fried food before conceiving are at risk of developing gestational diabetes during pregnancy

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New research published in *Diabetologia* (the journal of the European Association for the Study of Diabetes) shows that women who eat fried food regularly before conceiving are at increased risk of developing gestational diabetes during pregnancy. The research is led by Drs Cuilin Zhang and Wei Bao, Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD, part of the US National Institutes of Health) Rockville, MD, USA, and colleagues.

Gestational diabetes (GDM) is a complication that can arise during pregnancy, and is characterised by abnormally high blood glucose during the pregnancy (especially in the final 3 months). It can lead to increased birthweight of the child, as well jaundice and other complications. When left untreated, it can cause complications or stillbirth. Women who have GDM are more likely to later develop full blown type 2 diabetes.

Recently, frequent consumption of fried foods has been linked to a higher risk of overweight and obesity in two Mediterranean cohorts. However, there are few prospective epidemiological studies examining the association of fried food consumption with other health outcomes, including GDM. Thus in this new study, the authors examined the association between prepregnancy fried food consumption, both at home and away from home, and the risk of subsequent GDM.

The authors included 21,079 singleton pregnancies from 15,027 women

in the Nurses' Health Study II (NHS II) cohort. NHS II is an ongoing prospective cohort study of 116,671 female nurses in the USA aged 25–44 years at the start of study in 1989. The participants received a questionnaire every two years regarding disease outcomes and lifestyle behaviours, such as smoking status and medication use. Since 1991 and every four years thereafter, NHSII investigators have collected diet information, including consumption of fried foods at home and away from home, using a validated food frequency questionnaire (FFQ).

For fried food consumption, participants were asked "how often do you eat fried food away from home (e.g. French fries, fried chicken, fried fish)?" and "how often do you eat food that is fried at home?" Both questions had four possible frequency responses: less than once per week, 1–3 times per week, 4–6 times per week, or daily. The researchers analysed fried food consumption at home and away from home separately, as well as total fried food consumption. In addition, they asked the participants what kind of frying fat/oils they usually used at home, with the possible responses as follows: real butter, margarine, vegetable oil, vegetable shortening, or lard.

The authors documented 847 incident GDM pregnancies during 10 years of follow-up. After adjustment for age, parity, dietary and non-dietary factors, the risk ratios for developing GDM among women who consumed total fried foods 1–3, 4–6, and 7 or more times per week, compared with those who consumed less than once per week, were 1.13, 1.31, and 2.18 respectively (thus a more-than-doubling of risk for 7 times or more per week or more compared with less than once per week).

The association persisted after further adjustments were made for varying body-mass index (BMI). After this, the risk ratios of GDM among women who consumed total fried foods 1-3, 4-6, and 7 or more times per week, compared with those who consumed less than once per

week, were 1.06, 1.14, and 1.88 respectively (thus an 88% increased risk for 7 or more times per week compared with less than once per week).

The authors say: "The potential detrimental effects of fried food consumption on GDM risk may result from the modification of foods and frying medium and generation of harmful by-products during the frying process. Frying deteriorates oils through the processes of oxidation and hydrogenation, leading to an increase in the absorption of oil degradation products by the foods being fried, and also a loss of unsaturated fatty acids such as linoleic and linolenic acids and an increase in the corresponding trans fatty acids such as trans-linoleic acids and trans-linolenic acids."

They add: "Frying also results in significantly higher levels of dietary advanced glycation end products (AGEs), the derivatives of glucose-protein or glucose-lipid interactions. Recently, AGEs have been implicated in insulin resistance, pancreatic beta-cell damage, and diabetes, partly because they promote oxidative stress and inflammation. Moreover, intervention studies with a diet low in AGEs have shown significantly improved insulin sensitivity, reduced oxidant stress, and alleviated inflammation."

When analysed separately, the authors found that there was a statistically significant association of GDM with fried food consumption away from home, but not with fried food consumption at home. The authors say: "Deterioration of oils during frying is more profound when the oils are reused, a practice more common away from home than at home. This may partly explain why we observed a stronger association of GDM risk with fried foods consumed away from home than fried foods consumed at home."

Overall, the authors conclude: "We observed that frequent fried food consumption was significantly and positively associated with the risk of

incident GDM in a prospective cohort study. Our study indicates potential benefits of limiting fried food consumption in the prevention of GDM in women of reproductive age. Further studies are warranted to confirm our findings and to discover the underlying mechanisms."

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