

**Japan EMF Information Center**  
**Rapid Response Group**  
**Professor Michael H. Repacholi\***  
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**Paper**

Li D-K, Chen H, Odouli R. Maternal exposure to magnetic fields during pregnancy in relation to the risk of asthma in offspring, *Arch Pediatr Adolesc Med*, 2011; published online August 1, 2011. Doi:10.1001/archpediatrics.2011.135

**Summary**

The authors' explored whether there is an association between asthma in offspring and maternal exposure to magnetic fields (MF) during pregnancy. In this Californian prospective cohort study pregnant women had a 24-hr measurement of their MF exposure during the 1<sup>st</sup> or 2<sup>nd</sup> trimester and then 626 offspring were followed for as long as 13 years. The risk of asthma increased significantly with each 1-mG-increase in maternal MF exposure and this effect was more pronounced in firstborn children and in children with a maternal history of asthma. This study, while having a number of concerns, strengths and weaknesses, is the first to show such an association. The findings should be confirmed with larger studies.

**Discussion**

This epidemiologic study has several strengths. Exposure to MFs was obtained from measurements carried out prior to the diagnosis and are thus not prone to recall bias. Since this is a prospective study the outcome cannot affect the likelihood of participation and thus bias from selective participation is minimized. In all children, asthma was clinically diagnosed and confirmed within 12 months. Diagnosis was done without knowledge of the exposure status and thus diagnosis misclassification is unlikely to be related to exposure.

Nevertheless, the study has also limitations. In the following is discussed whether these limitations are likely to have produced a false positive finding. Exposure to MF is based on a 24-h measurement during a day in the first or second trimester of pregnancy. It is unknown whether such a relatively short measurement represents average exposure during pregnancy and how much it is influenced by MF levels at the workplace or at home. There is no data presented on how often families have changed residence during pregnancy and how such a change would affect the exposure assessment. Thus, some extent of exposure misclassification seems unavoidable in this study. Due to the prospective design exposure misclassification is not expected to differ between asthmatic and non-asthmatic children resulting in non-differential exposure misclassification. Such errors tend to shift risk estimates to unity than producing false positive findings. Interestingly the study found higher

risks for children whose mother stated to have conducted the measurements on a typical day. This may be supportive of a true association.

As in each observational study, confounding is of concern. The study was originally designed to investigate the effects of MF exposure during early pregnancy on miscarriage. A potential relation with asthma was not the priority hypothesis. Thus, information on several potential risk factors for asthma was not collected and was unavailable for the analysis (e.g. social contacts, previous virus infection, exposure to environmental tobacco smoke, air pollution exposure, diet or exposure to allergens). Whether these factors are actually related to MF exposure and thus have to be considered as confounding factors is unknown. At least, some risk factors for asthma have been considered in the study such as maternal age, race, education, smoking during pregnancy, and a history of asthma. Interestingly, adjusted risk estimates were somewhat larger than crude estimates. This suggests that confounding does not play a major role for the analysis. If a relevant confounder is missed in this study it has to be strongly associated with MF exposure and to be a strong risk factor for asthma, in order to produce a risk estimate of the observed magnitude. Many aspects of the analyses, such as selection of cut points and exposure metrics are problematic and might have artificially created an observed association.

Of note, 21% of the study participants were diagnosed with asthma although very strict diagnosis criteria were applied as cases had to be diagnosed at least twice within one year. This seems to be rather high. At least it is higher than the asthma prevalence of 13% for US children younger than 18 years as cited in the paper's introduction. Possibly this is suggestive of a selective study population. This might explain the observed results; although a plausible explanation how such type of bias produce a false positive finding is not easily conceivable.

This is the first cohort study on the association between MF exposure and asthma. A link between MF exposure and asthma was not the priority hypothesis of the study and no known biological mechanism explains the observed association. It has to be considered the possibility that the observed association occurred by chance. The authors may have noted this interesting and novel association in their dataset, which has not been observed in any study before, and decided to publish it. It can be speculated that an absence of an association would not have been published (publication bias). Thus, before any conclusions about causality can be made, the observed association has to be confirmed with other studies. In the view of the numerous ongoing studies on childhood asthma it should be feasible to address this question in other studies. Possibly exposure assessment would have to rely on cruder proxies such as distance to power line.

The study also offers the possibility to speculate whether there is indeed a true association between MF exposure and asthma. If the association is real, it seems likely that the immune system is involved. It would be interesting to further investigate whether asthma and childhood leukemia share a common underlying biological mechanism. This seems actually likely as asthma and atopy (predisposition toward developing certain allergic hypersensitivity reactions) are negatively correlated. Thus, further studies should clarify whether MF exposure affects the immune system in children. In this context both might be relevant:

maternal exposure during pregnancy or early childhood exposure. Because in the present study only maternal exposure was measured, it does not allow separating the effects of these two exposure measures, which are likely to be correlated.

\* Professor Michael H. Repacholi

- Department of Information Engineering, Electronics and Telecommunications, "La Sapienza" University of Rome, Italy.
- Former Coordinator of the Radiation and Environmental Health Unit, World Health Organization(WHO) .