

Study is first to show that air pollutants increase risk of painful periods for women

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Dysmenorrhea, that is, frequent severe and painful cramps during menstruation from abnormal contractions of the uterus, is the most common of all gynecological disorders. It affects between 16-91% of

girls and women of reproductive age, of whom 2%-29% have symptoms severe enough to restrict their daily activity.

Now, for the first time, researchers from China Medical University Hospital in Taiwan have shown that long-term exposure to [air pollutants](#) such as nitrogen and carbon oxides and fine particulate matter greatly raises the risk of developing dysmenorrhea. Based on long-term data on [air quality](#) and [public health](#) from national databases, they show that the risk to develop dysmenorrhea over a period of 13 years (2000-2013) was up to 33 times higher among Taiwanese [women](#) and girls who lived in areas with the highest levels of air pollutants compared to their peers exposed to lower levels of pollutants. These results were recently published in the open access journal *Frontiers in Public Health*.

A common debilitating disorder with no known cure

Dysmenorrhea can be due to hormonal imbalances or to underlying gynecological conditions such as endometriosis, pelvic inflammatory disease, ectopic pregnancy, or tumors in the pelvic cavity. Symptoms are often life-long: they include cramps and pain in the lower abdomen, pain in the lower back and legs, nausea and vomiting, diarrhea, fainting, weakness, fatigue, and headaches. In addition to reducing quality of life, dysmenorrhea also has a major socioeconomic impact, as females with dysmenorrhea may be temporarily unable to work, attend school, or engage in leisure activities. Dysmenorrhea has no known cure, but its symptoms may be managed with anti-inflammatory drugs and hormonal contraceptives.

"Research has already shown that women who smoke or drink alcohol during their periods, or who are overweight, or have their first period very young, run a greater risk of dysmenorrhea. Women who have never been pregnant are likewise known to be at greater risk. But here we demonstrate for the first time another important risk factor for

developing dysmenorrhea: air quality, in particular long-term exposure to pollution. We don't yet know the underlying mechanism, but emotional stress in women exposed to air pollutants, or higher average levels of the hormone-like prostaglandins in their body, might be part of the answer," says one of the authors, Prof Chung Y. Hsu at the College of Medicine, China Medical University, Taichung, Taiwan.

The authors, led by Prof Chia-Hung Kao, the Director of the department of nuclear medicine and the Center for Positron Emission Tomography (PET) at China Medical University, studied de-identified health measures from a total of 296,078 women and girls (approximately 1.3% of the total population) between 16-55 years old. These data came from Taiwan's Longitudinal Health Insurance Database starting 2000 (LHID 2000), a representative subsample from Taiwan's nation-wide health insurance database.

The study sample exclusively included women and girls without any recorded history of dysmenorrhea before 2000. The authors looked for a long-term association between the risk of dysmenorrhea and air quality, in particular the mean exposure over the years to air pollutants—nitrogen oxide (NO_x), nitric oxide (NO), nitrogen dioxide (NO_2), carbon monoxide (CO), and particles smaller than 2.5 μm in diameter ('PM2.5') - obtained from the 'Taiwan Air Quality Monitoring Database' (TAQMD) of the Environmental Protection Agency.

Air pollutants are an important new risk factor

They found that from 2000- to 2013, 4.2% of women and girls in the studied sample were diagnosed with dysmenorrhea for the first time. As was expected from previous studies, younger women, women of lower incomes, and living in more urbanized areas tended to have a higher risk of developing dysmenorrhea over the study period. But importantly, the 'hazard ratio' (that is, the age- and year-specific risk) of developing

dysmenorrhea increased by 16.7 to 33.1 fold for women and girls from the 25% of areas with the highest yearly exposure to air pollutants, compared to those from the 25% of areas with the lowest exposure. NO_x, NO, NO₂, CO, and PM_{2.5} levels each contributed separately to the increased risk, but the greatest individual effect was from long-term exposure to high PM_{2.5}.

"Our results study demonstrate the major impact of the quality of air on human health in general, here specifically on the risk of [dysmenorrhea](#) in women and girls. This is a clear illustration of the need to for actions by governmental agencies and citizens to reduce air pollution, in order to improve human health," concludes Prof Hsu.

More information: Shih-Yi Lin et al, Increased Incidence of Dysmenorrhea in Women Exposed to Higher Concentrations of NO, NO₂, NO_x, CO, and PM_{2.5}: A Nationwide Population-Based Study, *Frontiers in Public Health* (2021). [DOI: 10.3389/fpubh.2021.682341](https://doi.org/10.3389/fpubh.2021.682341)

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