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Extreme heat affects fertility, birth outcomes: NUS study

Rising temperatures could further reduce Singapore's resident total fertility rate, which dipped below 1 in 2023. The study's researchers advise men who are planning to conceive in one to three months to avoid going outdoors on extremely hot days and to sleep in cooler environments. ST PHOTO: SHINTARO TAY

Men aged 25 to 35 most impacted by heat, study of over 800 sperm samples finds

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Punishing hot weather affects not only a person's health or work productivity but also affects couples' fertility and birth outcomes, a project by the National University of Singapore (NUS) found.

Rising temperatures could further reduce Singapore's resident total fertility rate, which dipped below 1 – a record low – in 2023. The rate refers to the average number of babies each woman would have during her reproductive years.

Researchers from the NUS Yong Loo Lin School of Medicine studied sperm samples from 818 men that were already stored at the National University Hospital's (NUH) andrology section.

The scientists then traced the men's exposure to extreme heat – or when a day's average temperature exceeds 29.8 deg C – by looking at weather records 90 days before they provided semen samples at NUH.

The team found that those who were exposed to extreme heat during the three months had a 46 per cent higher risk of low sperm count, and a 40 per cent increased risk of low sperm concentration. The reproductive cells were also found to be less motile and more sluggish.

These findings were more pronounced for men between the ages of 25 and 35, who tend to be at the stage of entering fatherhood, said research fellow Samuel Gunther, one of the researchers in the team.

The fertility and heat research is part of Project HeatSafe, which brings together several studies and fieldwork by NUS researchers and partners over 3½ years to investigate how rising temperatures affect the health and productivity of people here and in the region – with a focus on outdoor workers.

"Conventionally, findings suggest that sperm quality decreases as one ages, but what we found in this study was that it was men in their (prime) reproductive time between 25 and 35 who were the most impacted by heat," said Dr Gunther at a media briefing on March 18, where Project HeatSafe researchers gave a round-up of their projects.

"So just because you're a young male, don't think you're invincible, and don't think you're not also vulnerable to these impacts. Moving forward, the climate is going to get hotter. And that is also something that we need to bear in mind in family planning."

Given the low fertility rate in Singapore, the researchers advised men who are planning to conceive in one to three months to avoid going outdoors on extremely hot days and to sleep in cooler environments.

They should also avoid saunas, hot baths and tight underwear during that period.

The 818 sperm samples came from men who had issues with conceiving, and a small portion of them were patients undergoing chemotherapy who wanted to preserve their sperm.

Heat is known to affect reproductive cells – it can lower sperm count and motility, and affect women's ovulation cycle and egg quality.

However, the links between extreme heat and fertility have not been well studied in tropical countries such as Singapore, added Dr Gunther.

While some may say the 818 men came from a biased group, the study was about linking sperm quality with heat exposure, said Associate Professor Chan Shiao-Yng from the medical school's Department of Obstetrics and Gynaecology, who was also involved in the study.

"We found that at certain periods of the sperm life cycle, heat had a little bit more adverse impact (on it) than others," she added.

The fertility study also scanned the birth records of more than 31,000 women, showing that pregnant women tend to take more protective measures, such as ramping up air-conditioning.

Avoiding extreme heat during the third trimester of pregnancy was, therefore, associated with a lower risk of premature births.

Prof Chan added: "We need to identify in future work the specific behavioural changes that actually make a difference to clinical outcomes. Then we can come up with guidelines that can be implemented across the board (for pregnant women)."

Other HeatSafe projects involved profiling the heat strain risk of about 160 construction workers through temperature pills, chest straps, skin temperature buttons and smartwatches. Among the 160, four of them showed signs linked to heat strain.

In mid-2023, the project visited a worksite to trial education and cooling interventions. These included enforcing breaks, carrying cool water in insulated bottle sleeves, and wearing new breathable uniforms.

For the HeatSafe researchers – led by Associate Professor Jason Lee from NUS Medicine – one heat-related injury is one too many. To further protect workers at high risk of heat illnesses, the team is looking at monitoring them with the help of wearables, said Prof Lee, director of the Heat Resilience and Performance Centre at NUS Medicine.

Moving forward, the team is also hoping to look into the heat strain risk of gig workers, such as food delivery riders.

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