

Using Biomarkers to Identify Stress in Dementia Caregivers

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Dr. Yin Liu is a faculty affiliate of the Alzheimer's Disease and Dementia Research Center.

In China, it's common for multiple generations of a family to share a household. So when Yin Liu, assistant professor of Human Development and Family Studies, talks about living with her grandfather for the first part of her life, this is not immediately a profound detail. It takes on new meaning when Liu shares that her grandfather had Alzheimer's disease, and after Liu's mother could no longer provide care for him, Liu stepped in to fill the need herself.

"I had already graduated and had a job teaching at a college," she said, "and so I became a caregiver for my family."

Liu's intimate experience with dementia set her journey in academia in motion. After her grandparents passed away, Liu started to recognize how worthwhile it was to learn about the stresses of family caregiving and what it can do to a person's health. She decided she wanted to become a professor so she could continue teaching while researching in the field of gerontology.

"I wasn't sure what I really felt passionate about until much later, when I'd had the opportunity to experience life more," she said. "So I didn't get to grad school until I was in my thirties, but I appreciate that experience."

Now a researcher in gerontology and a faculty affiliate of the new Alzheimer's Disease and Dementia Research Center housed on USU campus, Liu is continuing to study caregiver stress through biomarkers—measurable,

biological indications of stress that the body produces as it moves day by day through challenges and difficulties. She was introduced to this topic while pursuing her graduate degree after coming to the United States. Liu's mentors were looking into the physiological aspect of stress experiences, especially among those who experience chronic stress related to family caregiving for individuals with dementia.

Although many adults report that caring for a loved one with dementia is both physically and emotionally taxing, typical self-report measures provide retrospective data about individual experiences, which can be difficult to compare. In an effort to obtain more objective data, the research team began to collect saliva samples from individuals who were caregivers for loved ones with dementia. By measuring the samples' level of cortisol, a hormone produced by the body in response to stress, researchers are able to gather objective physiological data on the stress these individuals experience.

"I was extremely lucky to be involved in that study as a research assistant," Liu said. "My dissertation was focused on three papers based on that study. That got me started on this research topic."

As she continues her research, Liu hopes to study hair samples rather than saliva. Hair is also a non-invasive method of gathering physiological data, but it can show weeks and months of stress rather than just the data from one day. Liu is currently pursuing funding from the National Institutes of Health to support this research.

Liu is also examining other factors related to caregiver health, such as quality of sleep, levels of physical activity throughout the day, and what type of support they have in caring for their loved ones. Though the study of hair samples is fairly new, other research trends indicate that caregivers' level of cortisol is relatively higher than levels of those who are not engaged in care. Chronic stress can have negative effects on cognitive functioning over time, meaning that caregivers may be at risk of becoming patients themselves in the future.

Another important factor in caregiver health and wellbeing, as well as outcomes for patients, is the quality and history of the relationship between the caregiver and their loved one. "That can be really important and have a deep implication on how the caregiving goes," said Liu. "Preserving that social relationship and getting the supports they need both before and after diagnosis might help those people to really thrive."

While Liu recognizes that her research might not seem valuable to someone who doesn't have experience with Alzheimer's disease or dementia, she hopes her work can be used to help all people live better lives, no matter what awaits them in the future. "I want to have a better quality of life for everybody when we grow old," she said. "We don't know whether we might have this disease or another disease, or no disease at all. But my research is meaningful for everybody because we all cherish our life."

An abridged version of this story was featured in Utah State Magazine in spring 2023.