

A Mathematical Model Based on the Chi-Square Distribution for the Impact of Psychological Stress on Gene Activity of the Clock-related Genes hPER1 and hPER2 Among Humans

C. Senthilkumar^{1*} and A. Leema Rose²

¹Department of Mathematics, Government Polytechnic College, Aranthangi-614616, Tamil Nadu, India

²Department of Mathematics, Auxilium College of Arts & Science for Women, India

*Corresponding author: mat.senseven7@gmail.com, anto.leema14@gmail.com

ABSTRACT

In this study, we introduce a new parameter, $k > 0$, to establish a generalized chi-square distribution. We discuss some of the distribution's features, such as the moment-generating function and characteristic function in terms of k . The circadian clock is a self-sustaining time-keeping mechanism that regulates behavioral, biochemical, and physiological rhythms. Stress is connected with an increase in the glucocorticoid cortisol in humans and is thought to be a major component in the genesis of many mental health issues. Depending on the subjective experience of chronic stress, acute psychosocial stress alters the expression of hPER1 and hPER2. We use the chi-square distribution model to investigate the effect of acute stress on the gene expression levels of these two genes, which differ significantly between patients with high chronic stress and those with low chronic stress. Finally, we infer that the application element coincides with a mathematical model. In the future, this work will be useful in the medical profession.

Keywords: Circadian Clock, Cortisol, Chi-Square Distribution

