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A MATHEMATICAL MODEL FOR SEX-RELATED DIFFERENCES IN STIMULATED HYPOTHALAMIC PITUITARY-ADRENAL AXIS DURING INDUCED GONADAL SUPPRESSION USING LOG-LOGISTIC DISTRIBUTION

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Abstract. In this paper, we presented four wide-spread log-logistic distribution parameters, using a quadratic level map to create a transmuted reliability function parameter. Normal men and women participants participated in this experiment. Fitness and CRH relaxation experiments have been conducted in an active hypo gonadal state. Ultimately, we lead to the realisation that the necessary statistical results have been collected and tested by medical solutions. In the end, we assume that the implementation component matches the statistical model and that the outcome is related to the medical study. This paper will become very useful in the therapeutic industry in the near future.

1. Introduction

Logistics distribution is very important in the area of survival analysis. The most simple form of the probability density function (pdf) is defined by

$$f(y) = \frac{1}{(1+y)^2} \quad y > 0 \tag{1.1}$$

Shah and Dave examined the distribution in some details [14], Tadikamalla and Johnson [**?**], O'Quigley and Struther [7], Ragab and Green [8], Balakrishnan, Malik and Puthenpura [1] calculated the logistical form with pdf known by the distribution

$$f(y:\alpha,\beta) = \frac{\beta\alpha^{\beta}y^{\beta-1}}{\left(\alpha^{\beta}+\alpha^{\beta}\right)^2} \; y > 0 \; , \alpha > 0, \beta \geq 1 \tag{1.2}$$

Where α is the parameter of the scale and β is the parameter of the form.

Olapade (2010) analyzed four wide-spread logistics distribution parameters in pdf format.

$$f(y) = \frac{\beta\theta\alpha^{\theta}y^{\beta-1}}{\left(\alpha+y^{\beta}\right)^{\theta+1}} \; y > 0 \; , alp > 0, \beta \geq 1 \; \theta > 0 \tag{1.3}$$

Where $\theta > 0$ is the extra form parameter with the position parameter $\mu = 0$. Its properties were defined and it claimed that some of theorems related to some other distributions.

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Aryal [16] has transformed the logistic model of Balakrishnan, Malik and Puthenpura [14], acquired its mathematical structure and shown its versatility in the study of performance.

2. Mathematical model and Assumptions

If a random number X performs four large logistic classification variables with the probability value noted in [7] and the cumulative probability function in [7].

$$F\left(X\right)=1-\left(\frac{\alpha}{\alpha+\ \alpha^{\beta}}\right)^{\theta}\ a>0 \tag{2.1}$$

If the scale parameter is α, the shape parameters are θ and β. The related transformed four parameters of the wide-spread log-logistic distribution, using the quadratic level map, are defined

$$M\left(X\right)=(1+\lambda)\ \ M\left(x\right)-\lambda M^{2}\left(x\right),[\lambda]\leq 1 \tag{2.2}$$

$$M\left(X\right)=\frac{(\alpha+\alpha^{\beta})^{\theta}x^{\beta-1}\{(1-\lambda)(\alpha+\alpha^{\beta})^{\theta}\}+2\lambda\alpha^{\theta}}{(\alpha+\alpha^{\beta})^{2\theta+1}},x>0 \tag{2.3}$$

and the equivalent pdf is known by

$$h(X)=\frac{\beta\theta\alpha^{\theta}x^{\beta-1}\{(1-\lambda)(\alpha+\alpha^{\beta})^{\theta}\}+2\lambda\alpha^{\theta}}{(\alpha+\alpha^{\beta})^{2\theta+1}},x>0 \tag{2.4}$$

The parameter $\lambda>0$ is the transmutation parameter. Due to the analytical structure, the ubiquitous logistic distribution of the transmuted four variables can be a useful model for describing the failure time of a given system m. The reliability function $r(s)$ is determined by the likelihood that the part will not fail before t.

$$r(s)=1-F(s).$$

The reliability function of the widespread log-logistic distribution of the transmuted four factors are determined by

$$r\left(s\right)=\frac{\left(1-\lambda\right)\alpha^{\theta}\left(\alpha+\ s^{\beta}\right)^{\theta}+\lambda\alpha^{2\theta}}{\left(\alpha+\ s^{\beta}\right)^{2\theta}}$$

3. Applications

It is objectively true that the ability to adapt to stress impacts of many subsequent pathophysiological and behavioural processes. Sex-related variations in stress response have been noted in research for even more than 40 years [2, 5, 6] and may start contributing to focus on sexual difference in the incidence of conditions such as anxiety [4]. Both basal and activated hypothalamic-pituitary-adrenal (HPA) activation was raised in female rats relative to malerats [3, 10, 15]; many, but not all [9], studies record increased stimulation of ACTH in female rats, and most have increased stimulation of cortisol [3, 5, 10]. These variations were assumed to reflect a growing influence of estradiol or a repressive effect of testosterone on the HPA axis.

Data from this research were collected during hypogonadal condition of a broader study exploring the impact of hypogonadism caused by leuprolide

acetate and hormone substitution (estradiol and progesterone in female, testosterone in male) on physiological and behavioural stimuli [11, 13].

The aim of this research was to evaluate gender disparities under approximately comparable hormonal circumstances, and distinctions were made between men and women during procedures conducted in the hypogonadal section of the leuprolide trials. Data compared hypogonadal to oestrogen situations during activity in women as well as during CRH in men have already been released [11, 12]. Pearson substance period correlation analysis were used to determine the relationship among testosterone, estradiol, and CBG baseline values and AUC, MAX, and MAX baseline levels for ACTH and cortisol.

FIGURE 1.

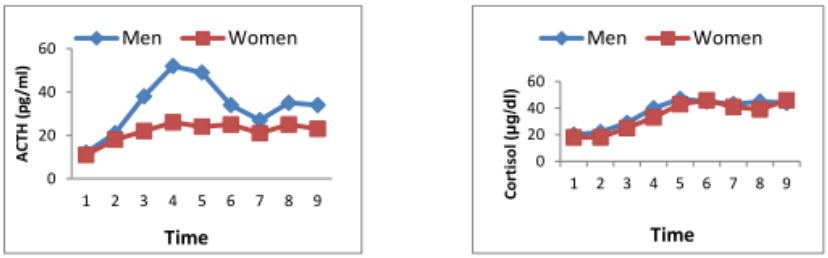


FIGURE 2.

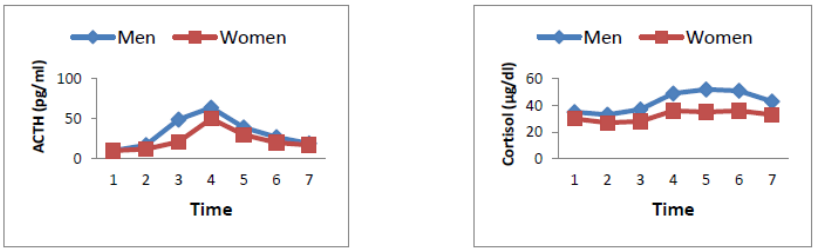
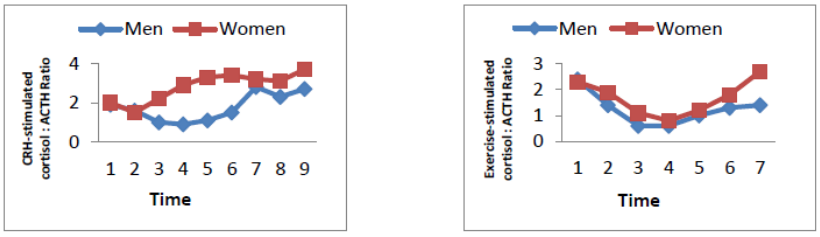


FIGURE 3.



An important time-based sex impact for CRH-stimulated ACTH was seen, indicating enhanced stimulation of ACTH in males vs. females. Post hoc

Bonferroni analyses at each time revealed substantial changes in men vs. women at 15, 30 and 60 min after CRH implementation Figure 3.

Sex variations in CRH-stimulated cortisol were also not important but the stimulated values during activity were substantially higher in males than females Figure 3 and 3.

No major variations were observed in the ratio of cortisol to ACTH, an indicator of adrenal reactivity, following either treatment. However, if the study was limited to the first 90 minutes after CRH administration, there was a substantial time impact of sex, largely due to the higher ratio of women to men Figure 3.

Finally, gender variations found under comparatively hypogonadal conditions can help to further clarify the physiology of the stress axis and the processes underlying sex differences in pressure pathophysiology.

4. Mathematical Results

FIGURE 4.

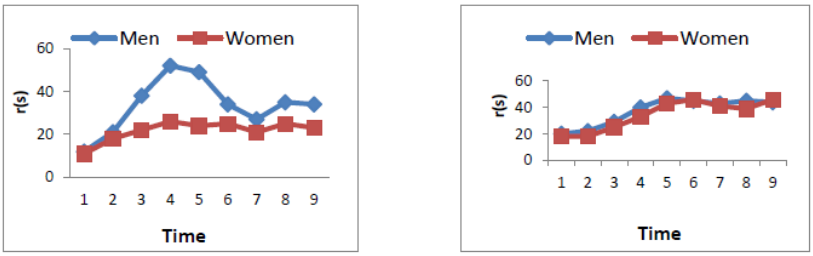


FIGURE 5.

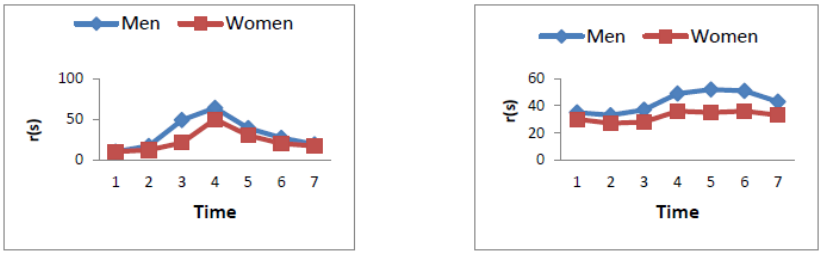
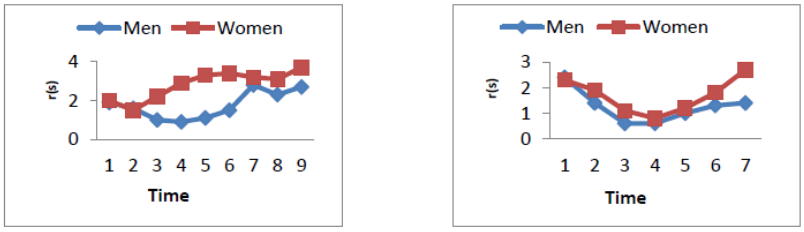


FIGURE 6.



5. Conclusion

A recent generalizability with the log-logistic distribution of four transmuted parameters has been adopted. Gender variations seen under compared hypo gonadal issues can help to further illuminate the physiology of the pressure axis and the functions influencing gender differences in stress pathology. The key results were induced ACTH and cortisol rates and the probability reliability function was plotted. Finally, we claim that the implementation component is well equipped with a likelihood function as linked to the research article.

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Conflict of Interests. The authors declare that there is no conflict of interests.

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