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ORIGINAL RESEARCH

To study the effect of high level of the Hormone Cortisol in Cognitive Impairment In Parkinson's Disease

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ABSTRACT

Aim: To study the effect of high level of the Hormone Cortisol In Cognitive Impairment In Parkinson's Disease.

Methods: This study was done in the department of medicine after taking the ethical permission from the institute. We studied the level of morning plasma cortisol in 50 patients with Vascular Parkinsonism (VP). The relationship between increased morning plasma cortisol and cognitive impairment was determined. The results of the study were statistically analyzed. Cortisol was determined in all blood samples of patients of the category. A (study category) and category B(Control category). The control category consisted of 50 volunteers.

Results: Male duration was greatest in 4-8 years with 13(41.94 percent), followed by 0-4 years with 10(32.25 percent) and more than 8 years with 8(25.81 percent). In women, the length is highest between 0 and 4 years (57.89%), followed by 4-8 years and more than 8 years (5(26.32%) and 3(15.79%), respectively. The normal levels of cortisol were seen in 17 patients (34%), substantial increases in cortisol were observed in 27 patients (54%), and cortisol elevations were reported in 6 individuals (12 percent). The relationship between the value of cortisol and the assessment of cognitive impairment was determined. In the main category, a statistically significant moderate inverse correlation was determined between plasma cortisol level and cognitive impairment in VP. When studying cortisol levels in VP, its significant increase is noted than in the control ($p < 0.05$).

Conclusion: Increased cortisol levels in Parkinson's disease and findings in aged people may have a crucial role in cognitive impairment and over the course of the illness, affecting the efficacy of VP treatment.

Key words: Parkinson's disease, cortisol hormone, cognitive disorders

INTRODUCTION

The scientific literature clearly shows that older persons have substantial diversity in cognitive capacity. As a result, several researchers were especially interested in determining the numerous elements that may contribute to this unequal ageing phenomena. Different patterns of glucocorticoid (GC) secretion have also been seen in older people, with some

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individuals achieving very high levels of GCs while others maintain moderate levels. Cortisol levels are elevated in many disorders, including infectious diseases linked with ageing, depression and depression-related ailments, and even those with no recognised cause or treatment. According to recent research, the insular cortex and the hormone cortisol exhibit symptoms of parkinsonism. Dopaminergic alterations at the island level may be connected with personality changes (search for novelty) and indications of hemisphere neglect. [1]

Parkinson's disease (PD) has no recognised aetiology, however acute severe stress has been proposed as a probable precipitant.[2] Elevated cortisol levels in Parkinson's disease animal models have been linked to dopaminergic cell death and motor impairment. Higher cortisol levels have been linked to sadness, anxiety, Alzheimer's disease, and Parkinson's disease.[3-6]

The organism must revert to a homeostatic baseline condition after an increase in GCs. To do this, GCs use their liposoluble qualities to pass the blood-brain barrier and bind to the pituitary and hypothalamic regions to provide negative feedback. Importantly, GC receptors are abundant in different brain areas. Mineralocorticoid receptors (MR or Type I) and glucocorticoid receptors are the two kinds of GC receptors (GR or Type II). They vary from one another in terms of affinity and distribution across the different brain areas. GCs have a considerably greater affinity for MRs than GRs. This suggests that throughout the morning period, GCs occupy more than 90% of MRs but only 10% of GRs. When exposed to a stressor and/or at the circadian peak of GC secretion, however, MRs are saturated and roughly 70% of the GRs are occupied. [7] Furthermore, the distribution of the two types of GC receptors in the brain differs. In reality, MRs are only found in the limbic system, while GRs are found in both subcortical and cortical areas, with a preference for the prefrontal cortex. [8]

In brief, GC receptors are located mostly in the amygdala, prefrontal cortex, and hippocampus. Given that the amygdala is critical for emotional processing, the prefrontal cortex is involved in executive functions, and the hippocampus is well-known for its role in learning and memory, scientists had a good reason to investigate the role of stress and stress hormones on the various cognitive functions served by these brain regions. Interestingly, the effects of GCs on cognitive function are extremely diverse and rely on a variety of variables, one of which is the length of GC exposure. Thus, the acute effects of GCs on memory differ significantly from the chronic ones. Endocrine abnormalities of the hypothalamic-pituitary-adrenal system have been documented frequently in individuals with Alzheimer's disease (AD) and Parkinson's disease (PD). However, there is little information available on the daily secretory structure of cortisol in these important neurodegenerative disorders. [9]

A subset of Parkinson's disease (PD) patients experience impulsive compulsive behaviours (ICB), which are linked to antisocial behaviour. Dopamine agonist treatment typically activates [10] ICBs, and there is accumulating evidence relating the aetiology of these ICBs to the development of drug addictions.[11,12] Previous research has shown decreased cortisol levels in impulsive non-PD subjects.[13] [14] On that premise, we sought to determine the function of rising cortisol levels in cognitive impairment in Parkinson's disease.

MATERIAL AND METHODS

This study was done in the department of medicine after taking the ethical permission from the institute. We studied the level of morning plasma cortisol in 50 patients with Vascular Parkinsonism (VP). The relationship between increased morning plasma cortisol and cognitive impairment was determined. The results of the study were statistically analyzed. Cortisol was determined in all blood samples of patients of the category. A (study category) and category B(Control category). The control category consisted of 50 volunteers. The concentration of cortisol was studied by enzyme immunoassay on an automatic analyzer EL 808 Ultra Microplete Rider (BIO-TEC Instruments, Inc) using standard sets of reagents "Steroid IFA-cortisol-01" series No. 061P and "Non-extraction IGF-1 ELISA DSL-10-2800

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".The reference values of the norm of cortisol were 50 - 250 mg / ml. To assess cognitive status, we evaluated on the MMSE scale, MOCA test.

STATISTICAL ANALYSIS

For all types of statistical analysis, the differences were calculated. statistically significant at the achieved level of significance $p < 0.05$

RESULTS

Table 1 Showed, the most affected age for Parkinsonism is among the age category ed more than 60 years with 66% followed by age category 40-60 with 26% and very few cases with 8% in the 20-40 age category .

Table 1: Age distribution in Parkinsonism disease

Duration of disease (years)	Number (50)	Percentage
20-40 year	4	8%
40-60 year	13	26%
More than 60 years	33	66%

Table 2 shows the duration of vascular Parkinsonism illness in patients by gender. It shown that men are more affected by this condition than females. Men's duration was greatest in 4-8 years with 13(41.94 percent), followed by 0-4 years with 10(32.25 percent) and more than 8 years with 8(25.81 percent). In women, the length is highest between 0 and 4 years (57.89%), followed by 4-8 years and more than 8 years (5(26.32%) and 3(15.79%), respectively.

Table 2: Vascular Parkinsonism disease duration in gender of patients

Duration of disease (years)	Male =31	Female =19
0-4 year	10(32.25%)	11(57.89%)
4-8 year	13(41.94%)	5(26.32%)
More than 8 years	8(25.81%)	3(15.79%)

Table 3: Cortisol hormone levels in the patients morning blood serum in the immunofluorescent method

Cortisol hormone levels	Category A (50)	Category B (50)
50 – 250mg / ml	17(34%)	35(70%)
250 – 500mg / ml	27(54%)	11(22%)
500 - 900mg / ml	6(12%)	4(8%)

Table 3 shows that normal levels of cortisol were seen in 17 patients (34%), substantial increases in cortisol were observed in 27 patients (54%), and cortisol elevations were reported in 6 individuals (12 percent).

Table 4: The main and control category scored differently on the Mini Mental State Examination (MMSE) scale

(MMSE) scale	Category A (50)	Category B (50)
Below than 10	7(14%) 18.1±1.9	1(2%) 18±2.0
Between 11- 19 points	10(20%) 17.77±4.1	12(24%) 18.22±1.9
Between 20- 23 points	12(24%) 22.54±1.3	19(8%) 22.62±4.6

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 03, 2023

Between 24-27 points	13(26%) 26.1±2.1	5(26%) 25.98±1.2
Between 28- 30 points	8(16%) 28.59±3.8	13(26%) 29.1±1.3

Table 5: Cognitive impairment in patients with cortisol hormone levels greater than 250 mg / mL

Parameter	**Male**			**Female**		
Indices	**R**	**CI**	**P**	**R**	**CI**	P
Disease duration	0.02	-0.106-0.223	0.5	0.3	-0.64-0.93	0.3
Cortisol level in plasma mg / ml	0.30	-2.641-0+2229	0.02*	0.24	-0.07-0.287	0.03*
MMSE	-0.42	-0.07-0.291	0.4	-0.2	-0.1238-0.3441	0.3
Phase on the Hoehn and Yahr Scales	0.051	0.116-0.226	0.7	0.01	0.234-0.5675	0.5

Note: * - validity of data between male and female genders (P<0,05)

Table 6: Spearman's rank correlation coefficient. The relationship of cortisol levels and indicators of cognitive impairment

	Category A (50)	**Category B (50)**
MMSE	r=-0.47 p=0.04	r=0.79 p=0.03
MOCA test	r=-0.12 p≥0.05	r=0.71 p=0.03

The value of cortisol and the evaluation of cognitive impairment were shown to be related. A statistically significant moderate negative connection was found between plasma cortisol level and cognitive impairment in VP in the major category. Cortisol levels in VP were found to be significantly higher than in the control (p 0.05).

DISCUSSION

We investigated the impact of elevated blood cortisol levels on cognitive function in vascular parkinsonism in this clinical experiment. Although we only employed short neuropsychological questionnaires to measure cognitive ability in this investigation, the findings of more complete surveys might influence clinical trial outcomes. The biomarker findings varied from those predicted; theoretically, this is connected with cortisol as a stressed biomarker. It is a lesser-studied biomarker, yet it is a promising potential for future study. Furthermore, stress has been linked to neurodegeneration, with the dopaminergic system being especially vulnerable. Cortisol, according to the research, is a reliable biomarker for evaluating stress in Parkinson's disease patients. [15]

It is impossible to say whether variations in cortisol are a cause or a consequence of impulsive compulsive behaviours in this research. However, in adolescents and adults, impulsiveness, carelessness, and violent behaviour have been linked to lower cortisol levels. 13 Increased corticosterone levels caused by prolonged immobilisation stress or acute dexamethasone treatment are linked to both accelerated A plaque development and tau protein phosphorylation, demonstrating a link between AD neuropathology biomarkers and stress hormones. [16]

Despite indications of a link between cortisol levels and cognitive decline, the involvement of GCs in the neuropathology of Alzheimer's disease remains unknown. In fact, in addition to

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the link between high cortisol levels and Alzheimer's disease, new research has demonstrated that GCs accelerate AD pathogenesis and may worsen cognitive impairments. [17]
Although there is an increase in the hormone cortisol in certain instances of Parkinson's disease, cognitive impairment is not always present. According to these findings, late-life depression was linked to a considerably higher chance of major cognitive loss in the near term. Cortisol dysregulation may contribute to the pathophysiology of cognitive impairment. [18] Our results are consistent with prior male research that found an increase in salivary cortisol levels. [19-21]

CONCLUSION

Increased cortisol levels in Parkinson's disease have an essential role in cognitive impairment and the progression of the illness, as well as affecting the efficacy of VP treatment. PD also disrupts the cortisol cycle. While people with Parkinson's disease maintain a consistent cortisol circadian rhythm, the quantity of cortisol released rises in early Parkinson's disease.

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