

## SHORT COMMUNICATION

### EFFECT OF LEVODOPA ON PERSONALITY DISTURBANCES AND DYSEXECUTIVE SYMPTOMS IN PATIENTS WITH IDIOPATHIC PARKINSON'S DISEASE

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#### ABSTRACT

**Objective:** To assess effects of levodopa (L-dopa) on personality disturbances and dysexecutive symptoms in patients with idiopathic Parkinson's disease (PD).

**Study Design:** Prospective test-retest design.

**Place and Duration of Study:** Bahawal Victoria Hospital and Civil Hospital, Bahawalpur, Pakistan during June 2016 to June 2017.

**Material and Methods:** Informants of sixty patients with idiopathic PD rated changes in personality on lowa scale of personality change and dysexecutive symptoms on dysexecutive questionnaire after three months of L-dopa treatment. Informants and clinical psychologist who collected data from informants were both blind to the objective of the study.

**Results:** Personality disturbances and dysexecutive functioning (dysexecutive symptoms, inhibition, social regulation) were significantly reduced post L-dopa treatment.

**Conclusion:** L-dopa is an effective treatment for bringing positive personality and cognition related changes in patients with idiopathic PD.

**Keywords:** Behavior, Levodopa, Parkinson's disease.

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#### INTRODUCTION

Parkinson's Disease (PD) is a neuro-degenerative disorder of the motor system with symptoms such as rigidity, shaking, difficulty in walking etc<sup>1</sup>. There are approximately 6.5 million people around the world who have been affected by PD. This ratio will be doubled in next 20 years. In Pakistan, the situation is equally alarming with estimated 450,000 people affected from PD<sup>2</sup>. PD deteriorates overall quality of life and mental health<sup>3</sup>. Cognitive deficits (e.g., executive dys-functions, memory impairment, inattention) are common in non- demented PD patients<sup>4</sup>. Executive functions include various aspects of goal-directed behavior such as planning, problem solving, top down control of attention and memory<sup>5</sup>. Deficits in executive functioning (dysexecutive syndrome) have been linked with dopaminergic depletion in prefrontal cortex<sup>6</sup>.

Patients with idiopathic PD have introversion, suppressed aggression, attitudinal inflexibility and premorbid personality<sup>7</sup>. Though levodopa (L-dopa) is considered as standard treatment for improving motor functions in PD, yet there is a gap in literature about personality disturbances and EF deficits in PD patients as a function of L-dopa therapy. Therefore, the present study was designed to assess L-dopa effectiveness on personality disorders and EF in PD patients. It was hypothesized that L-dopa would be effective in reducing personality disturbances and dysexecutive functioning in patients with PD.

#### MATERIAL AND METHODS

Informants preferably spouse and siblings of sixty patients diagnosed with idiopathic PD at Bahawal Victoria hospital and Civil hospital, Bahawalpur, Pakistan during June 2016 to June 2017 participated in the study (age range 40-60 years, M=51.78, SD= 5.90; disease duration (range 2-6 years, M=3.76, SD=1.21) who were stable at L-dopa daily dose for at least three months after diagnosis (M=467.78 mg, SD= 67.65). Patients

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Received: 14 Feb 2018; revised received: 21 Jul 2018; accepted: 29 Aug 2018

were not included if they reported any psychiatric illness, neurological disorder except PD, head injury, dementia (as assessed through Mini Mental State Examination score less than 27). Dysexecutive questionnaire. A 20-item questionnaire used to assess dysexecutive symptoms on 5 point Likert scale (never=0 to very often=4), higher score shows dysexecutive symptoms in cognition, emotion, behavior. Completion time is less than 5 minutes<sup>8</sup>. Revised version with 15 items includes factors: dysexecutive symptoms (6 items), inhibition (7 items), and social regulation (2 items). It is a valid and reliable tool<sup>9</sup>. Iowa scale of personality change. It is a 30-item questionnaire. The caregiver or family member of the patient is asked to rate patient's behavior as baseline and as a change from baseline on several domains: executive functions deficits, depression, disturbance in social behavior, motivation and emotion reactivity<sup>10</sup>. Procedure. The study was approved by the board of studies of The Islamia University of Bahawalpur. After giving informed consent, patient's family member who is caretaker of the patient (informant: spouse & sibling) had two sessions: pre and post L-dopa treatment. In pre-treatment session, informants completed Dysexecutive Questionnaire. In post-treatment session, informants completed dysexecutive questionnaire and Iowa scale of personality change.

### Statistical Analysis

Scores on subscales of Dysexecutive Questionnaire (dysexecutive symptoms, inhibition, social regulation) were analyzed through separate repeated measures analysis of variance (ANOVA) for each subscale with factors (pre vs. post-L-dopa treatment: within subjects). Separate repeated measures ANOVA was used for each subscales on Iowa scale of personality change (irritation, lack of inhibition, perseveration, depression, impulsivity, obsessions, moodiness, lack of stamina, lack of persistence, lack of planning, inflexibility, poor judgment, anxiety, insensitivity, indecisiveness, vanity, suspiciousness, apathy, frugality, inappropriate emotion, social inappropriateness, dependency, impatience, type A

behavior, unemotional, social withdrawal, aggression, manipulativeness, easily overwhelmed, lack of insight) with factors (pre vs. post-L-dopa treatment: within subjects).

### RESULTS

Pre-treatment scores of patients as assessed by informants on all subscales of Dysexecutive questionnaire were significantly reduced which showed improvement in all areas of dysexecutive functioning post L-dopa treatment: dysexecutive symptoms Pre vs. post-treatment  $21.61 \pm 1.62$  vs.  $16.10 \pm 1.54$ , inhibition Pre vs. post-treatment  $26.61 \pm 1.02$  vs.  $12.93 \pm 1.63$ , and social regulation Pre vs. post-treatment  $6.98 \pm 0.81$  vs.  $2.86 \pm 0.74$  (see table). Like wise, pre-treatment scores on Iowa scale of personality change were significantly reduced compared with post-L-dopa treatment scores on several behavioral problems such as irritation Pre vs. post-treatment  $6.06 \pm 0.79$  vs.  $2.05 \pm 0.87$ , lack of inhibition Pre vs. post-treatment  $5.88 \pm 0.71$  vs.  $2.88 \pm 0.76$ , perseveration. Pre vs. post-treatment  $6.01 \pm 0.72$  vs.  $2.80 \pm 0.70$ , depression Pre vs. post-treatment  $5.76 \pm 0.81$  vs.  $2.23 \pm 0.76$ , impulsivity Pre vs. post-treatment  $6.00 \pm 0.73$  vs.  $2.41 \pm 0.80$ , obsessions Pre vs. post-treatment  $6.03 \pm 0.73$  vs.  $2.78 \pm 0.82$ , moodiness Pre vs. post-treatment  $5.93 \pm 0.68$  vs.  $2.96 \pm 0.75$ , lack of stamina Pre vs. post-treatment  $5.93 \pm 0.70$  vs.  $2.70 \pm 0.72$ , lack of persistence Pre vs. post-treatment  $5.93 \pm 0.79$  vs.  $2.43 \pm 0.96$ , lack of planning Pre vs. post-treatment  $6.11 \pm 0.73$  vs.  $2.88 \pm 0.92$ , inflexibility Pre vs. post-treatment  $6.00 \pm 0.75$  vs.  $2.43 \pm 0.96$ , poor judgment Pre vs. post-treatment  $5.88 \pm 0.78$  vs.  $2.55 \pm 0.87$ , anxiety Pre vs. post-treatment  $5.80 \pm 0.75$  vs.  $2.38 \pm 0.71$ , insensitivity Pre vs. post-treatment  $5.80 \pm 0.75$  vs.  $2.63 \pm 0.90$ , indecisiveness Pre vs. post-treatment  $6.05 \pm 0.74$  vs.  $2.98 \pm 0.74$ , vanity Pre vs. post-treatment  $5.98 \pm 0.81$  vs.  $3.20 \pm 0.68$ , suspiciousness Pre vs. post-treatment  $6.11 \pm 0.76$  vs.  $3.05 \pm 0.83$ , apathy Pre vs. post-treatment  $6.03 \pm 0.71$  vs.  $3.25 \pm 0.62$ , frugality Pre vs. post-treatment  $6.06 \pm 0.70$  vs.  $3.03 \pm 0.73$ , inappropriate emotion Pre vs. post-treatment  $6.08 \pm 0.67$  vs.  $3.50 \pm 0.53$ , social inappropriateness Pre vs. post-treatment  $5.90 \pm 0.72$  vs.  $2.91 \pm 0.80$ , dependency Pre vs. post-

treatment  $5.50 \pm 0.98$  vs.  $2.75 \pm 0.98$ , impatience Pre vs. post-treatment  $5.86 \pm 0.74$  vs.  $2.66 \pm 0.85$ , type A behavior Pre vs. post-treatment  $6.10 \pm 0.72$  vs.  $2.90 \pm 0.75$ , unemotional Pre vs. post-treatment  $6.06 \pm 0.75$  vs.  $2.56 \pm 0.85$ , social withdrawal Pre vs. post-treatment  $6.03 \pm 0.73$  vs.  $2.91 \pm 0.80$ , aggression Pre vs. post-treatment  $6.01 \pm 0.74$  vs.  $3.16 \pm 0.69$ , manipulativeness Pre vs. post-treatment  $6.08 \pm 0.78$  vs.  $3.36 \pm 0.55$ , easily overwhelmed Pre vs. post-treatment  $6.03 \pm 0.75$  vs.  $3.16 \pm 0.66$ , lack of insight Pre vs. post-treatment  $6.04 \pm 0.73$  vs.  $2.95 \pm 0.79$  (table).

**Table: Informant’s ratings on factors of dysexecutive questionnaire and iowa scale of personality change pre- and post levodopa treatment of patients with parkinson’s disease (n=60).**

	Pretreatment	Post-treatment	
	Mean ± SD	Mean ± SD	
Dysexecutive symptoms	21.61 ± 1.62	16.10 ± 1.54	F(1,59)=317.81, <i>p</i> <0.001, $\eta^2$ =0.84
Inhibition	26.61 ± 1.02	12.93 ± 1.63	F(1,59)=3969.30, <i>p</i> <0.001, $\eta^2$ =0.98
Social regulation	6.98 ± 0.81	2.86 ± 0.74	F(1,59)=665.22, <i>p</i> <0.001, $\eta^2$ =0.91
Irritation	6.06 ± 0.79	2.05 ± 0.87	F(1,59)=1002.27, <i>p</i> <0.001, $\eta^2$ =0.94
Lack of inhibition	5.88 ± 0.71	2.88 ± 0.76	F(1,59)=549.31, <i>p</i> <0.001, $\eta^2$ =0.90
Perseveration	6.01 ± 0.72	2.80 ± 0.70	F(1,59)=729.88, <i>p</i> <0.001, $\eta^2$ =0.92
Depression	5.76 ± 0.81	2.23 ± 0.76	F(1,59)=475.55, <i>p</i> <0.001, $\eta^2$ =0.89
Impulsivity	6.00 ± 0.73	2.41 ± 0.80	F(1,59)=726.30, <i>p</i> <0.001, $\eta^2$ =0.92
Obsessions	6.03 ± 0.73	2.78 ± 0.82	F(1,59)=460.20, <i>p</i> <0.001, $\eta^2$ =0.88
Moodiness	5.93 ± 0.68	2.96 ± 0.75	F(1,59)=519.84, <i>p</i> <0.001, $\eta^2$ =0.89
Lack of stamina	5.93 ± 0.70	2.70 ± 0.72	F(1,59)=676.16, <i>p</i> <0.001, $\eta^2$ =0.92
Lack of persistence	5.93 ± 0.79	2.43 ± 0.96	F(1,59)=594.04, <i>p</i> <0.001, $\eta^2$ =0.91
Lack of planning	6.11 ± 0.73	2.88 ± 0.92	F(1,59)=382.58, <i>p</i> <0.001, $\eta^2$ =0.86
Inflexibility	6.00 ± 0.75	2.43 ± 0.96	F(1,59)=507.50, <i>p</i> <0.001, $\eta^2$ =0.89
Poor judgment	5.88 ± 0.78	2.55 ± 0.87	F(1,59)=450.38, <i>p</i> <0.001, $\eta^2$ =0.88
Anxiety	5.80 ± 0.75	2.38 ± 0.71	F(1,59)=602.57, <i>p</i> <0.001, $\eta^2$ =0.91
Insensitivity	5.80 ± 0.75	2.63 ± 0.90	F(1,59)=441.88, <i>p</i> <0.001, $\eta^2$ =0.88
Indecisiveness	6.05 ± 0.74	2.98 ± 0.74	F(1,59)=576.64, <i>p</i> <0.001, $\eta^2$ =0.90
Vanity	5.98 ± 0.81	3.20 ± 0.68	F(1,59)=369.68, <i>p</i> <0.001, $\eta^2$ =0.86
Suspiciousness	6.11 ± 0.76	3.05 ± 0.83	F(1,59)=371.00, <i>p</i> <0.001, $\eta^2$ =0.86
Apathy	6.03 ± 0.71	3.25 ± 0.62	F(1,59)=593.81, <i>p</i> <0.001, $\eta^2$ =0.91
Frugality	6.06 ± 0.70	3.03 ± 0.73	F(1,59)=494.01, <i>p</i> <0.001, $\eta^2$ =0.89
Inappropriate emotion/affect	6.08 ± 0.67	3.50 ± 0.53	F(1,59)=507.14, <i>p</i> <0.001, $\eta^2$ =0.89
Social inappropriateness	5.90 ± 0.72	2.91 ± 0.80	F(1,59)=500.24, <i>p</i> <0.001, $\eta^2$ =0.89
Dependency	5.50 ± 0.98	2.75 ± 0.98	F(1,59)=210.38, <i>p</i> <0.001, $\eta^2$ =0.78
Impatience	5.86 ± 0.74	2.66 ± 0.85	F(1,59)=423.47, <i>p</i> <0.001, $\eta^2$ =0.87
Type A behavior	6.10 ± 0.72	2.90 ± 0.75	F(1,59)=506.27, <i>p</i> <0.001, $\eta^2$ =0.89
Blunted affect/Unemotional	6.06 ± 0.75	2.56 ± 0.85	F(1,59)=788.45, <i>p</i> <0.001, $\eta^2$ =0.93
Social withdrawal	6.03 ± 0.73	3.05 ± 0.83	F(1,59)=338.84, <i>p</i> <0.001, $\eta^2$ =0.85
Aggression	6.01 ± 0.74	3.16 ± 0.69	F(1,59)=579.12, <i>p</i> <0.001, $\eta^2$ =0.90
Manipulativeness	6.08 ± 0.78	3.36 ± 0.55	F(1,59)=449.03, <i>p</i> <0.001, $\eta^2$ =0.88
Easily overwhelmed	6.03 ± 0.75	3.16 ± 0.66	F(1,59)=398.87, <i>p</i> <0.001, $\eta^2$ =0.87
Lack of insight	6.04 ± 0.73	2.95 ± 0.79	F(1,59)=504.31, <i>p</i> <0.001, $\eta^2$ =0.89

vs.  $2.90 \pm 0.75$ , unemotional Pre vs. post-treatment  $6.06 \pm 0.75$  vs.  $2.56 \pm 0.85$ , social withdrawal Pre vs. post-treatment  $6.03 \pm 0.73$  vs.  $2.91 \pm 0.80$ , aggression Pre vs. post-treatment  $6.01 \pm 0.74$  vs.  $3.16 \pm 0.69$ , manipulativeness Pre vs. post-treat-

$0.73$  vs.  $2.95 \pm 0.79$  (table).

## DISCUSSION

Results of the present study showed that Levodopa significantly improved executive symp-

toms, inhibition and social regulation after 3 months treatment in patients with idiopathic PD. Likewise, there was significant reduction in dysexecutive symptoms, depression, emotional reactivity and disturbance in social behavior post 3 months L-dopa treatment. L-dopa is a gold standard treatment as an initial therapy to treat PD symptoms. The present study highlighted the significance of L-dopa in improving overall quality of life with reference to cognitive, behavioral, emotional and social deficits in patients with idiopathic PD. Since executive functioning deficits and behavioral anomalies have been related with depleted dopamine in brain and extra functional demands on nigro-striatal system due to pathological intervention as a result of PD<sup>6,11</sup>. It was hypothesized that L-dopa would be beneficial in treating dysexecutive symptoms, inhibition, social regulation and personality disturbances. Results of the present study supported these hypotheses. Findings of the present study are consistent with previous reports of improved neuropsychiatric status, motor function and alertness in PD patients with L-dopa treatment<sup>12</sup>. It has been demonstrated that administration of L-dopa up to six months rather improved frontal lobe functions and reduced depression<sup>13</sup>. Presence of cognitive deficits and non-motor symptoms (remembering, concentrating, anxiety, sadness, has been well documented in studies with Pakistani patients suffering from PD<sup>14,15</sup>. L-dopa is cost effective and recommended pharmacological treatment due to its efficacy on non-motor PD symptoms in Pakistan<sup>16</sup>. Results of this study are consistent with these studies. Here, informants reported higher order cognitive deficits (dysexecutive symptoms) and behavioral problems. Consistent with these results, previous studies demonstrated that PD patients have different personality profile (neurotic, introvert, non-communicative) contrary with their healthy counterparts<sup>17</sup>. There is ample support from literature that personality changes such as rigidity, passive, sluggish behavior etc. are due to damage to dopaminergic system and dysfunctions of the cortical, limbic and striatal circuits<sup>7,18</sup>.

Neuropsychological data also suggest that personality profile, cognitive and emotion functioning are interlinked psychological processes in PD<sup>19</sup>. Efficacy of L-dopa for behavior and executive functioning in this study is in line with literature demonstrating positive effect of L-dopa medication on neuro-psychological and cognitive functioning<sup>12,13</sup>. These results have implications for better rehabilitation of patients with idiopathic PD.

## CONCLUSION

L-dopa is effective to reduce cognitive and behavioral complications in PD, however these findings must be taken as initial evidence which should be further examined.

## CONFLICTS OF INTEREST

This study has no conflicts of interest to be declared by any author.

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