PD patients had increased risks of these conditions.

**Methods:** Statewide record linkage was performed between Nebraska PD Registry data recorded since 1997 through 2012, and Nebraska Hospital Discharge data patient and outpatient files between 2004 and 2012. The cohort comprised of 3,852 PD inpatients and 19,260 non-PD inpatients, and 5,217 PD out-patients and 26,085 non-PD outpatients. A systematic random-sampling method was utilized for matching. The referent subjects (non-PD patients) were matched to PD patients by age at initial hospital admissions or outpatient visits, gender, and county of residence with a case: referent ratio of 1:5.

**Results:** Compared to non-PD inpatients, PD inpatients were at higher risks for dementia and other cognitively disabled (RR: 2.29; 95%CI: 2.14-2.45), mood disorders (RR: 1.57; 95%CI: 1.44-1.70), and gastrointestinal disorders (RR: 1.15; 95%CI: 1.06-1.25). In contrast, referent subjects had more frequent diagnoses of disorders of lipid metabolism, coronary atherosclerosis and other ischemic heart disease, and cardiac dysrhythmias. Furthermore, PD outpatients had higher risks for spondylosis and other back problems (RR: 1.23; 95%CI: 1.09-1.38), genitourinary disorders (RR: 1.48; 95%CI: 1.29-1.69), and gastrointestinal disorders (RR: 1.59; 95% CI: 1.38-1.84) than non-PD outpatients. Contrastingly, PD outpatients had decreased risks for essential hypertension, uncomplicated diabetes mellitus, disorders of lipid metabolism, and coronary atherosclerosis and other ischemic heart disease.

**Conclusions:** Our findings highlight PD as a multisystem neurodegenerative disorder with unique comorbidities. This information is crucial for creating strategies to better prevent and manage PD complications and avoidable costs.

**OP-3-13**

**REDUCED ARM SWING DURING GAIT IN PATIENTS WITH PARKINSON DISEASE: OBJECTIVE MOTION ANALYSIS STUDY**

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**Objective:** Reduced arm swing during gait is a well-described feature of PD. However, there has been unclarity in what anatomical segments mainly contribute to decreased arm swing and in what clinical features are related to. The aims of this study are 1) to reveal which segment (shoulder and elbow) is the best indicator of reduced arm swing, 2) to investigate the contribution of the reduced arm swing and clinical features and 3) to evaluate arm swing as clinical predictors of postural instability in patients with PD.

**Methods:** Twenty eight PD patients were included. All patients were evaluated with UPDRS III, MoCA, gait analysis with GaitRite and Qualysis 3D gait analysis system.

**Results:** 16 participants were akinetic rigid type and 12 participants were tremor type. 18 participants were classified as asymmetric group and 10 participants as symmetric group. For asymmetric group, asymmetry index of elbow could explain 81.15% of variance of asymmetry index of wrist (p=0.01). Simple regression for the influence of asymmetry index of shoulder explained 78.65%, and elbow explained 31.37%. Compared to akinetic rigid type, tremor type showed tendency of high asymmetry index of wrist and shoulder joint (p = 0.08).

Arm swing amplitude was inversely correlated with HYS (p<0.01). However, arm swing amplitude was not correlated to the UPDRS III, tremor and nontremor score. CV of stride and step shows a tendency to decreased arm swing amplitude (p = 0.06).

**Conclusion:** The quantitative measurement of shoulder motion in sagittal plane is the best indicator of reduced arm in PD. Clinical phenotype (presence of tremor) may have close relationship with upper limb motion asymmetry. Reduced arm swing could be an indicator of postural instability in PD.

**OP-3-14**

**BODY COMPOSITION, SARCOPENIA AND FRAILTY IN A MULT-ETHNIC ASIAN COHORT WITH PARKINSON’S DISEASE**

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**Objective:** Weight loss is common in Parkinson’s disease (PD), but poorly understood. Sarcopenia (age-related loss of muscle bulk and strength) is associated with functional impairment in the elderly. We studied body composition, sarcopenia, frailty, and their clinical correlates, in PD patients.

**Methods:** Clinical-demographic data were obtained from 100 patients and 78 spousal/sibling controls. Subjects underwent evaluation of dietary intake, frailty (Fried criteria), and body composition using dual-energy X-ray absorptiometry (DEXA).

**Results:** Patients were older (66.1±8.3 vs. 62.4±8.4 years, p=0.004). There were no significant differences between group differences in gender, ethnicity and dietary intake. Mean body mass index (24.2±3.9 vs. 25.5±4.3 kg/m², p=0.044), and body fat mass (18.7±7.8 vs. 23.5±7.8 kg, p<0.001) and percentage (30.7±8.9 vs. 36.7±8.1%, p=0.001) were lower in patients, even after controlling for age and gender using regression models. There were no significant differences in appendicular skeletal muscle mass and bone mineral density. Patients had a higher prevalence of frailty (28.3% vs. 7.1%, p=0.001) and sarcopenia (16.0% vs. 10.3%, p=NS)

Reduced body fat mass correlated significantly with motor disability (MDS-UPDRS part III), but not with disease duration, MDS-UPDRS part III or frailty scores. Sarcopenia correlated significantly with frailty, motor severity (MDS-UPDRS part III), and later age of PD onset. There were no significant correlations between body composition measurements with levodopa-equivalent units.

**Demographics and Clinical Data**

<table>
<thead>
<tr>
<th></th>
<th>PD Patients (n = 100)</th>
<th>Controls (n = 78)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>66.1±8.3</td>
<td>62.4±8.4</td>
<td>0.004*</td>
</tr>
<tr>
<td>Gender (% males)</td>
<td>56.0</td>
<td>41.0</td>
<td>0.067</td>
</tr>
<tr>
<td>Total calorie intake (kcal)</td>
<td>2060±3.1339</td>
<td>2024±3.1583.4</td>
<td>0.591</td>
</tr>
<tr>
<td>Total protein intake (g)</td>
<td>130.4±68.8</td>
<td>134.8±69.3</td>
<td>0.671</td>
</tr>
<tr>
<td>Total fat intake (g)</td>
<td>107.4±55.1</td>
<td>108.7±55.0</td>
<td>0.878</td>
</tr>
<tr>
<td>Total carbohydrate intake (g)</td>
<td>363.6±180.9</td>
<td>385.0±237.1</td>
<td>0.499</td>
</tr>
<tr>
<td>Total fiber intake (g)</td>
<td>38.2±18.1</td>
<td>40.0±21.3</td>
<td>0.532</td>
</tr>
<tr>
<td>% Reported weight loss of 5kg in the last one year</td>
<td>20.2</td>
<td>9.5</td>
<td>0.089</td>
</tr>
<tr>
<td>Body mass index (kg/m2)</td>
<td>24.2±3.9</td>
<td>25.5±4.3</td>
<td>0.044*</td>
</tr>
</tbody>
</table>
Conclusions: PD patients had reduced body fat but preserved skeletal muscle mass, despite an equivalent dietary intake compared with controls. PD medication did not appear to have an effect on body compo- sition. These findings suggest that weight loss may be due to loss of fat that is inherent to the disease process. Body composition differences correlated with clinically important parameters such as motor dis- ability. A significant percentage of PD patients were classified as frail. Further studies are needed to under- stand the patho-mechanisms of these alterations in PD.

OP-3-15
DIAGNOSTIC VALUE OF STRIATAL-PREFRONTAL PROJECTION ESTIMATED BY CEREBRAL BLOOD FLOW AND DOPAMINE TRANSPORTER SPECT IN PARKINSONIAN SYNDROMES

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Objective: We reported that striatal dopamine transporter activity (DAT) and regional cerebral blood flow (rCBF) in ipsilateral prefrontal cortex (PFC) were positively correlated in patients with Parkinson’s disease (PD). The aim of this study is to investigate the relations between PFC rCBF and striatal DAT in other par- kinsonian disorders and to compare them with PD.

Methods: We recruited 50 patients with PD, 16 dementia with Lewy body (DLB), 20 multiple system atro- phy (MSA), 14 progressive supranuclear palsy (PSP), and 24 corticobasal syndrome (CBS), who had both CBF [(123)I-IMP) and DAT [(123)I-FP-CIT) SPECT. Striatal specific binding ratio (SBR) of DAT SPECT were automati- cally calculated using Bolt’s method. Multiple regression analysis for standardized CBF images with striatal SBR as independent variables were performed by SPM12 and clusters composed of more than 100 voxels at a height threshold of FWE p < 0.05 were consid- ered significant. By drawing regression line by striatal DAT SBR and ipsi- lateral PFC rCBF where positively correlated in PD group, estimated rCBF from SBR were calculated for each subject. We defined the deviation of PFC rCBF from rCBF of PD estimated from SBR as SPPPD (striatal-prefrontal projection derived from PD) score.

Results: Mean SPPPD scores and standard deviation of each group were 0±0.17 in PD, 0.0033±0.1878 in DLB, -0.148±0.157 in MSA, -0.102±0.126 in PSP, and -0.172±0.169 in CBS (ANOVA p < 0.001). SPPPD score were significantly lower in MSA, PSP and CBS than PD (post hoc Tukey’s test p < 0.05). The Area under curve of receiver operating characteristic discrimi- nating PD from MSA, PSP and CBS by lower SPPPD score was 0.766, and the sensitivity and specificity were 74.8% and 77.3% with cutoff at -0.107.

Conclusions: SPPPD score reflects the integral function of the circuit from striatum to PFC via globus pal- lidum and thalamus and contributes to differential diagnosis or prognostic prediction.

OP-3-16
PAIN IN PARKINSON DISEASE: A LOCAL SINGLE-CENTER CORRELATIONAL STUDY OF AMBULATORY PARKINSON DISEASE PATIENTS

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Objective: Motor impairments lead to disabilities in patients with PD. Sensory symptoms, frequently pain, have been noted as common com- plaints during the course of the illness. Hence, this study aimed to show correlation between the severity and duration of the disease with pain, utilizing the King’s Pain in Parkinson Disease Scale (KPPS).

Methods: One hundred eight PD patients (59 women, 49 men: mean age 76.6 ± 12.5 years old; mean disease duration 17.8 ± 15.5 years) on dopa- mineric medications underwent neurological examination, staging of disease using Hoehn and Yahr, and evaluation using Unified Parkinson Disease Rating Scale and King’s Pain in Parkinson Disease Scale (KPPS). Descriptive analysis of the demographic variables were done. Pearson correlation coefficient linear regression analysis were utilized to analyze correlation be- tween variables.

Results: 75% of the patients was noted to exhibit pain. According to the classification on KPPS, the follow- ing types of pain were present in those patients complaining of pain: 74% musculoskeletal pain, 12.3% dystonic pain, 3.7% central neuropathic pain, 44.4% radicular pain, 12.3% visceral pain, 11.1% nocturnal pain, 3.7% orofacial pain, and 9.9% discoloration/ edema pain. One type of pain affected 33.3% of subjects with pain, 44.4% was affected with two types, and 23% had 3-5 types of pain. Age, UPDRS I score, UPDRS II score, and UPDRS IV showed a very weak positive corre- lation with KPPS score. Linear regression analysis between HoY stage and KPPS score likewise revealed a very weak correlation. However, stronger positive correlation shown between disease duration and KPPS score (significant at 0.05 level of confidence, 2-tailed, r=0.253), and between UPDRS II and KPPS scores (significant at 0.05 level of confi- dence, 2-tailed, r=0.234).

Conclusion: Results revealed that pain in PD is frequent and complex. Multiple types of pain affect one individual, and possibly correlating with impairments of activities of daily living and disease stage and duration. Larger cohort of patients is recommended to be systematically evaluated. Follow-up evaluation must be done to determine the changes in pain severity, correlated with the changes in disease duration and severity.