LONGITUDINAL METABOLOMIC STUDY IN WOMEN WITH OR WITHOUT POST-PARTUM DEPRESSION.

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Introduction

Peripartum depression (PPD) is the most common mental health condition affecting women during and after pregnancy, with reports of 10-15% of women suffering from PPD. The stability of the mother's mental health affects both the mother and infant. Yet, 86% of PPD cases are undetected or untreated[1]. Due to the severity of PPD, it is critical that we identify women who may be struggling with depression during this vulnerable period. We investigated the plasma metabolome differences between PPD cases and healthy controls (HC). We hypothesized that women with PPD will have a distinct metabolome that could allow for early detection or classification of PPD.

Methods

- 59 expecting women were included in this study (30 healthy controls (HC) and 29 women who were either diagnosed with PPD or scored ≥13 in the past seven days on the Edinburgh postnatal depression scale (EPDS) at 1 or more study visits).
- Plasma and EPDS scores were taken at four study visits (once per trimester and one 6-weeks post-partum)
- Metabolic analysis was done using liquid chromatography coupled to a mass spectrometer.

Table 1: Patient demographics

		Healthy (n = 30)	Depressed (n = 29)
Age Mean ± SD		27.37 ± 6.178	26.55 ± 6.83
BMI (recorded at 1st study visit) Mean ± SD		31.91 ± 8.97	32.25 ± 8.97
Marital Status Percentages		43% single 53% in relation	48% single 45% in relation
EPDS score over past 7 days Mean ± SD (n)	Pregnancy & Postpartum High EPDS score	3.68 ± 3.07 (114)	10.71 ± 5.42 (106) 15.98 ± 3.33 (43)
	1st Trimester High EPDS score	4.07 ± 3.31 (30)	11.66 ± 4.78 (29) 15.92 ± 3.52 (13)
	2nd Trimester High EPDS score	3.27 ± 2.42 (29)	11.59 ± 4.54 (27) 16.09 ± 2.21 (11)
	3rd Trimester High EPDS score	3.86 ± 3.42 (29)	10.20 ± 5.29 (25) 15.00 ± 2.28 (11)
	Postpartum High EPDS score	3.50 ± 3.14 (26)	9.16 ± 6.83 (25) 17.25 ± 5.23 (8)
Percent of subject's study visits with ≥13 EPDS score over the past 7 days Mean ± SD		0%	41.41% ± 25.86
Employed Percentages		40% unemployed 60% employed	41% unemployed 59% employed

Results

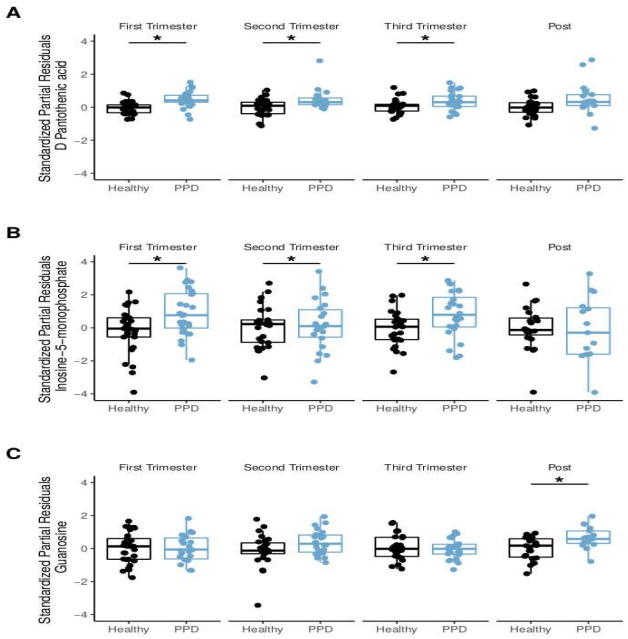

Figure 1: Box plots of standardized partial residuals for the three metabolites with differential expression between PPD patients and healthy controls. Results for trimesters 1-3 are based on linear mixed-effects models with random intercepts for each woman and the postpartum timepoint from a separate linear regression; both sets of models were adjusted for batch and maternal age. *Second generation *p-value* (SGPV) = 0

Pathway	Visit	p-value	FDR
Pantothenate & CoA biosynthesis: EPDS ≥13 PPD vs control (n)	A	0.007 (12)	0.29
all PPD vs control (n)		0.012 (26)	0.51
Nicotinate & Nicotinamide metabolism: EPDS ≥13 PPD vs HC (n)	C	0.052 (11)	0.43
all PPD vs control (n)		0.19 (26)	0.87
Purine metabolism: EPDS ≥13 PPD vs control (n)	C	0.001 (11)	*0.042
all PPD vs control (n)		0.047 (26)	0.87
	B	0.005 (10)	0.21
		0.34 (25)	0.91
	D	0.063 (8)	0.16
		0.046 (24)	0.81

Table 2: MetaboAnalyst pathway analysis. For each visit (A, B, C, and D corresponding to trimesters 1, 2, 3, and the postpartum, respectively.) concentrations were entered into the MetaboAnalyst pathway analysis software and data were scaled using the auto scale function.

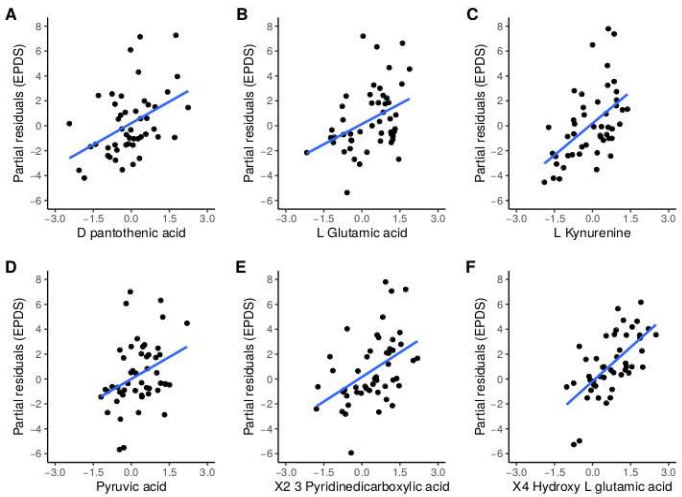

Figure 2: Plot of partial residuals from a linear mixed-effects model, adjusted for age and batch, to better visualize the relationship between metabolites measured in the third trimester and EPDS. All 6 of the plotted metabolites were found to be significantly associated with EPDS in the third trimester via a mixed-effects ordinal regression and had SGPVs < 0.5 in the differential expression analysis (IE had more evidence in favor of differential expression than against).

Acknowledgements

We wish to thank the patients and families who donated their time and clinical histories to support this work.

Conclusions

- Women with PPD have sugar dysregulation, changes in the kynurenine pathway, and increased vitamin B5
- Vitamin B5 and the kynurenine pathway have been shown to affect inflammatory responses

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