EFFECT OF THE COVID-19 PANDEMIC ON REAL-TIME PHYSIOLOGIC OUTCOMES ASSESSED BY WEARABLE Electronics IN PREGNANT AND POSTPARTUM WOMEN WITH INTERSECTING VULNERABILITIES

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INTRODUCTION

- COVID-19 has increased risk of mental health disorders and substance use in vulnerable populations, such as pregnant women and women with young children.
- Dysregulation in stress and emotion-related brain circuitry is indexed by heart rate variability (HRV)

Study Aim

- This study characterizes the effect of the COVID-19 pandemic on real-time physiologic outcomes, assessed as heart rate variability (HRV), in pregnant and postpartum women with intersecting vulnerabilities.

METHODS

Ethanol, Neurodevelopment, Infant and Child Health (ENRICH) - 2

- Study population: A subset of pregnant and postpartum women were identified from the ENRICH cohort study at the University of New Mexico (UNM). Participants were recruited and classified into control (HC) and alcohol exposed group (PAE) groups based on repeated self-report measures and comprehensive ethanol biomarker panels.
- Participants: N=57

HRV measurements and mEMA survey data

- Ambulatory assessment occurred using a wearable electronic wrist sensor, Garmin Vivosmart4, which uses optical technology to detect changes in blood volume and provide heart rate data in real time.
- Raw data were collected from the device and sent to the phone via Bluetooth. Pulse to pulse, inter-beat-interval is derived via Ilumivu software.
- HRV was captured continuously along with the administration of mobile ecological momentary assessment (mEMA) surveys via smart phone.
- HRV measurements summarized in 5-minute epochs pre-/during/post-mEMA survey administration:
  - SDNN - standard deviation of RR intervals (ms); RMSSD - Root mean square of successive RR interval differences (ms); LF power - low frequency power in normalized units (NU); HF power - High frequency power in normalized units (NU); ratio of LF/HF - low frequency to high-frequency ratio
- HRV per-day measure: SDNN Index – average of SDNN measurements [ms]

Statistical Analysis

- HRV measurements mean and standard deviation were reported by different groups.
- HRV measurements differences were identified for pregnant vs postpartum group and HC vs PAE group by using Mann-Whitney test.
- Statistical significance was defined as p <0.05

RESULTS

Table 1.1: Demographic Table by pregnant/postpartum (N=57)

	postpartum (N=20)	Pregnant (N=37)	Total (N=57)	P-Value
	(Mean ± SD)	(Mean ± SD)	(Mean ± SD)	
Mom age	31.3 ± 4.3	29.3 ± 4.9	30.0 ± 4.8	0.14[1]
Years of education completed	15.5 ± 3.3	16.1 ± 3.5	15.9 ± 3.4	0.49[1]
	N (%)	N (%)	N (%)	
Marital Status				
Single/separated/divorced	3 (15.0)	8 (21.6)	11 (19.3)	0.73[2]
Married/Cohabiting	17 (85.0)	29 (78.4)	46 (80.7)	
Total	20	37	57	
Hispanic, Latino or of Spanish decent	10 (50.0)	20 (54.1)	30 (52.6)	0.79[2]
Race				
White	13 (65.0)	26 (70.3)	39 (68.4)	0.53[2]
Black or African American	0 (0.0)	2 (5.4)	2 (3.5)	
American Indian or Alaskan Native	2 (10.0)	1 (2.7)	3 (5.3)	
other	5 (25.0)	8 (21.6)	13 (22.8)	
Total	20	37	57	
Education				
high school or less	4 (20.0)	8 (21.6)	12 (21.1)	0.57[2]
some college or vocational school	7 (35.0)	8 (21.6)	15 (26.3)	
college degree or higher	9 (45.0)	21 (56.8)	30 (52.6)	
Total	20	37	57	
Income				
under 20,000	2 (10.0)	3 (8.1)	5 (8.8)	0.91[2]
20,000-49,000	7 (35.0)	14 (37.8)	21 (36.8)	
50,000-69,000	3 (15.0)	8 (21.6)	11 (19.3)	
70,000 or over	8 (40.0)	12 (32.4)	20 (35.1)	
Total	20	37	57	
Currently employed	13 (65.0)	23 (62.2)	36 (63.2)	1.00[2]
Insurance				
no insurance	0 (0.0)	5 (13.5)	5 (8.8)	0.073[2]
Employer-based insurance	14 (70.0)	20 (54.1)	34 (59.6)	
self-purchased insurance	1 (5.0)	0 (0.0)	1 (1.8)	
Medicaid	4 (20.0)	12 (32.4)	16 (28.1)	
other	1 (5.0)	0 (0.0)	1 (1.8)	
Total	20	37	57	

[1] based on Mann-Whitney test [2] based on Fisher's exact test

Table 1.2: Breakdown of the pregnant/postpartum % within each HC vs PAE group

		HC	PAE	Total
postpartum	N	15	5	20
	%	34.9	35.7	
pregnant	N	28	9	37
	%	65.1	64.3	
Total		43	14	57

Note: HC, healthy control; PAE, alcohol exposed

In the sample of 57 there were 43 in the HC group and 14 in the PAE group.

ACKNOWLEDGEMENTS

RESULTS cont.

Table 2.1 : HRV measurements by Pregnant and Postpartum (N=4220)

	postpartum (N=1551)	Pregnant (N=2669)	Total (N=4220)	P-Value
	(Mean ± SD)	(Mean ± SD)	(Mean ± SD)	
SDNN	64.2 ± 24.5	58.1 ± 22.9	60.4 ± 23.7	<0001[1]**
RMSSD	41.9 ± 15.1	42.3 ± 17.7	42.2 ± 16.8	0.32[1]
HF_NU	45.7 ± 9.2	47.3 ± 9.6	46.7 ± 9.5	<0001[1]**
LF_NU	54.3 ± 9.2	52.7 ± 9.6	53.3 ± 9.5	<0001[1]**
LF_NU/HF_NU	1.3 ± 0.7	1.2 ± 0.6	1.2 ± 0.6	<0001[1]**

Table 2.2: HRV measurements by Pregnant and Postpartum (N=57)

	postpartum (N=20)	Pregnant (N=37)	Total (N=57)	P-Value
	(Mean ± SD)	(Mean ± SD)	(Mean ± SD)	
SDNNIndex	59.5 ± 10.6	53.5 ± 10.4	55.6 ± 10.8	0.048[1]*

Table 2 note: [1]p values based on Mann-Whitney test, * p value<0.05, ** P value<0.001. Standard deviation of RR intervals (SDNN), root mean square of successive RR interval differences (RMSSD), and mean of all 5-minute interval standard deviations over 24-hours (SDNN index). HRV frequency-domain measurements included relative power of low-frequency (LF), high-frequency (HF) bands, and their ratio (LF/HF).

Table 2 summarizes comparisons between Pregnant and Postpartum groups:

For the 57 participants there are 4220 total observations across the two weeks:1551 for postpartum women, 2669 for pregnant women.

Table 3.1 : HRV measurements by HC vs PAE (N=4220)

	Healthy Control (N=3394)	Alcohol Exposed (N=826)	Total (N=4220)	P-Value
	(Mean ± SD)	(Mean ± SD)	(Mean ± SD)	
SDNN	61.2 ± 23.6	57.0 ± 23.7	60.4 ± 23.7	<0001[1]**
RMSSD	42.9 ± 16.9	39.2 ± 16.1	42.2 ± 16.8	<0001[1]**
HF_NU	46.8 ± 9.3	46.6 ± 10.2	46.7 ± 9.5	0.32[1]
LF_NU	53.2 ± 9.3	53.4 ± 10.2	53.3 ± 9.5	0.32[1]
LF_NU/HF_NU	1.2 ± 0.6	1.3 ± 0.7	1.2 ± 0.6	0.32[1]

Table 3.2: HRV measurements by HC vs PAE (N=57)

	Healthy Control (N=43)	Alcohol Exposed (N=14)	Total (N=57)	P-Value
	(Mean ± SD)	(Mean ± SD)	(Mean ± SD)	
SDNNIndex	56.3 ± 11.4	53.6 ± 9.0	55.6 ± 10.8	0.38[1]

Table 3 note: [1]p values based on Mann-Whitney test, * p value<0.05, ** P value<0.001. Standard deviation of RR intervals (SDNN), root mean square of successive RR interval differences (RMSSD), and mean of all 5-minute interval standard deviations over 24-hours (SDNN index). HRV frequency-domain measurements included relative power of low-frequency (LF), high-frequency (HF) bands, and their ratio (LF/HF). HC (Healthy Control), PAE (Alcohol Exposed)

Table 3 summarizes comparisons between HC and PAE groups:

For the 57 participants there are 3394 observations for HC participants and 826 for PAE.

DISCUSSION / CONCLUSIONS

- To date, 57 participants (37 pregnant, 20 postpartum) were recruited. A larger proportion of ethnic minorities are represented (52.6% Hispanics, 5.3% Native Americans), and 8.8% have income <$20,000.
- Postpartum (34.9% HC, 35.7% PAE) and pregnant women (65.1% HC and 64.3% PAE) were equally distributed within each group.
- Significant differences were noted between pregnant and postpartum women for all HRV measurements except RMSSD.
- Significant differences between HC and PAE participants were found for SDNN (61.2 ±23.6 vs 57.0 ±23.7) and RMSSD (42.9 ±1.9 vs 39.2 ± 16.1) suggesting alcohol use is associated with decreased HRV.
- Differences in SDNN measurements were observed between groups, however while there was a significant difference for the SDNN Index for postpartum vs pregnant participants, there was not for HC vs PAE participants, suggesting greater individual heterogeneity between postpartum and pregnant participants.
- Future analyses will continue to review the data and will utilize multilevel statistical analyses that further consider the clustering of the repeated individual measurement data to explore between group differences and variation among individuals within groups.