



# The impact of Mastery on physiologic variables and birth outcomes

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Previous supported by Award: F31 NR009611

National Institute of Nursing Research, NIH



**THE UNIVERSITY *of* TEXAS**

SCHOOL OF NURSING AT HOUSTON

*A part of The University of Texas Health Science Center at Houston*





## *Secondary analysis of data*

- Dissertation study: *Obesity on Heart Rate Variability, Hemoglobin A<sub>1c</sub>, and Oxygenation*
- This presentation reports a secondary analysis of data relating to the effect of the mean 20 week HbF on the autonomic nervous system, oxygenation, systolic blood pressure (SBP), and hemoglobin A<sub>1c</sub> during pregnancy in women with varied body mass index (BMI) (obese BMI > 30 kg/m<sup>2</sup>, and not-obese with BMI < 30 kg/m<sup>2</sup>) with excess or recommended gestational weight gain.





# *Pregnancy alters autonomic nervous system*



## Parasympathetic

Brakes arousal

< heart rate

< vasoconstriction

> oxygenation

## Sympathetic

>Stress response

>BP, Heart Rate

>vaso-constriction

< oxygenation

>HbF to meet physiologic changes of pregnancy





# *Reasoning and Purpose*

Investigating the impact of HbF on the vagal response, oxygenation SBP and HbA<sub>1c</sub> levels may help to identify possible physiologic pathways through which altered adaptation influence pregnancy outcomes.





# *Hemoglobin F in the Literature*

## *Fetal origin*

- CVS testing
  - (Al-Mufti et al., 2001)
- Aneuploid fetuses
  - (Parano et al., 2001)
- Fetal-maternal hemorrhage
  - (Kush et al., 2005)
- Intrauterine growth restriction (Ghosh et al., 2003)

## *Maternal origin*

- > nausea and vomiting
  - (Peters et al., 1998)
- Gestational hypertension (Troeger et al.; 1999)
- Diabetes mellitus
  - (Al-Mufti et al., 2004)
- Iron deficiency anemia (Allen, 2001)
- Altered autonomic response
  - (Yukusoglu et al., 2007)





# *Study Overview and the Literature*

- Is there an increase in maternal HbF in women free of preexisting states or conditions such as anemia, hypertension or diabetes?
- Ibrahim, Qari, Sait, & Abuela, 2009
- What is the association of HbF levels with pregnancy outcomes and physiology ?







# *Measurement of HRV*

- *Heart rate* was measured by the number of R waves per minute recorded on the electrocardiogram recorder by placing three non-invasive leads on the chest and abdomen.
- *HP* by times series analyses of the HP & RSA using a vagal tone monitor (Delta Biometrics, Bethesda, MD), and MXedit software  
(Porges, 2007).





# *Oxygenation: SpO<sub>2</sub>*

- **Saturation of peripheral oxygen**
- (SpO<sub>2</sub>) is an estimation of the oxygen saturation level measured with a Nellcor (NBP- 290, Pleasanton, Ca) pulse oximeter device. It can be calculated with the pulse oximetry formula :

$$S_{p}O_2 = \frac{HbO_2}{HbO_2 + Hb}$$

- Probe was applied to either the second or the third finger of the dominant hand









# *Hemoglobin A<sub>1C</sub>*

- Is formed when glucose instead of O<sub>2</sub> attaches itself to the hemoglobin
- Index of the average blood glucose level over the previous 60 – 90 days
- Expected adult range = 2.2 – 4.8%
- total glycated Hgb converted to HbA<sub>1c</sub> @ UT SON lab using High performance liquid chromatography
- (Ou & Rognerud, 2001- Saint Lukes laboratory)





# *Methods*

- The main study included a repeat measures observational design
  - 3 Times during gestation @ 20, 28 & 36 Weeks
- Setting: UT Obstetrics Clinic, Houston, Texas
- Ethical approval was given by the Institutional Review Board prior to participant accrual





# Sample

- Sample: 41 pregnant women
  - 21 Obese & 20 Non – Obese
  - Factor to Calculate Power: SpO2
    - Oxygen Level Determined by Pulse Oximeter
  - N = 17 For Effect Size of 1
    - to detect a difference with alpha at .05 and a power of 80%
  - 20% Risk of Attrition for a Longitudinal Design N Set at 20
    - Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.



# Maternal Demographics

	Level 1 HbF		Level 2 HbF	
	Obese (O) (n = 10)	Non-Obese (NO) (n = 11)	Obese (O) (n = 11)	Non-Obese (NO) (n = 9)
Maternal age	24.49 ± 4.67	28.63 ± 6.30*	25.68 ± 5.12	23.34 ± 4.21
Gravida	3.01 ± 3.20	3.64 ± 1.69*	2.36 ± 2.36	2.11 ± 1.05
Height (Inches)	64.32 ± 3.81	63.36 ± 1.78	64.40 ± 3.13	66.33 ± 3.00*
BMI (Kg/M <sup>2</sup> ) 20wks Gestation	39.76 ± 5.02*	25.37 ± 2.77	38.00 ± 5.62	25.07 ± 2.94
BMI (Kg/M <sup>2</sup> ) 36wks Gestation	41.86 ± 5.80	28.29 ± 3.08	40.96 ± 5.46	28.72 ± 3.22
Lives with FOB	3 (30)	5 (45.5)	5 (46)	4 (44)
Married	4 (40)	5 (45.5)	3 (27)	1 (12)



# Maternal Demographics Continued

	Level 1 HbF		Level 2 HbF	
	Obese (O) (n = 10)	Non-Obese (NO) (n = 11)	Obese (O) (n = 11)	Non-Obese (NO) (n = 9)
Caucasian	0	1 (9)	3 (27)	2 (22)
African American	6 (60)	5 (46)	6 (55)	3 (33)
Hispanic	4 (40)	4 (36)	1 (9)	4 (45)
Other	0	1(9)	1 (9)	0
HS graduate or GED	9 (90)	10 (91)	8 (72)	8 (89)
1 – 2 years of college	5 (50)	5 (46)	3 (27)	5 (55)
Full time homemaker	3 (30)	7 (64)	9 (82)	4 (44)





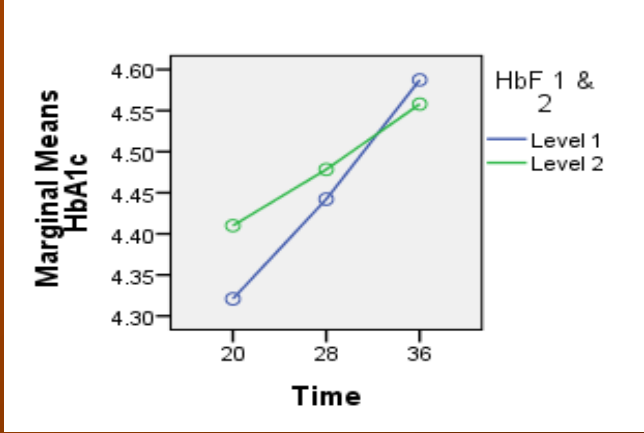
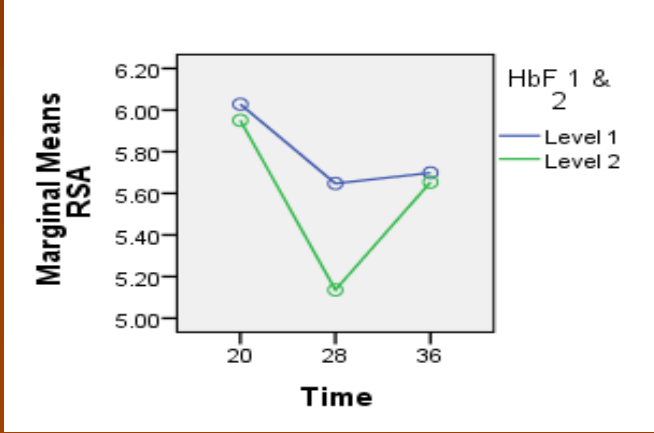
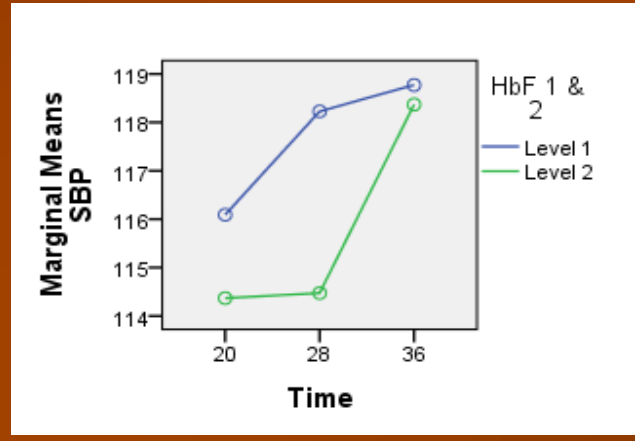
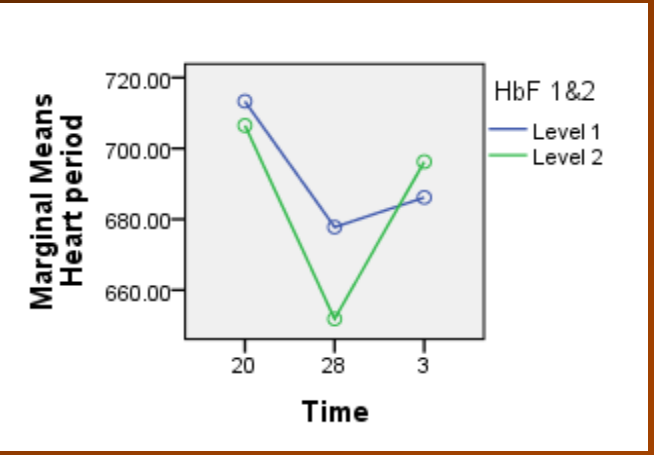


# *Specific Objectives 1*

- to explore the effect of the mean 20 week HbF on six physiologic variables: heart period (HP), respiratory sinus arrhythmia (RSA), oxy-hemoglobin ( $\text{HbO}_2$ ), peripheral oxygenation ( $\text{SpO}_2$ ), hemoglobin  $\text{A}_{1c}$  ( $\text{Hb}_{\text{A}_{1c}}$ ), and systolic blood pressure (SBP) while controlling for obesity and gestational weight gain.

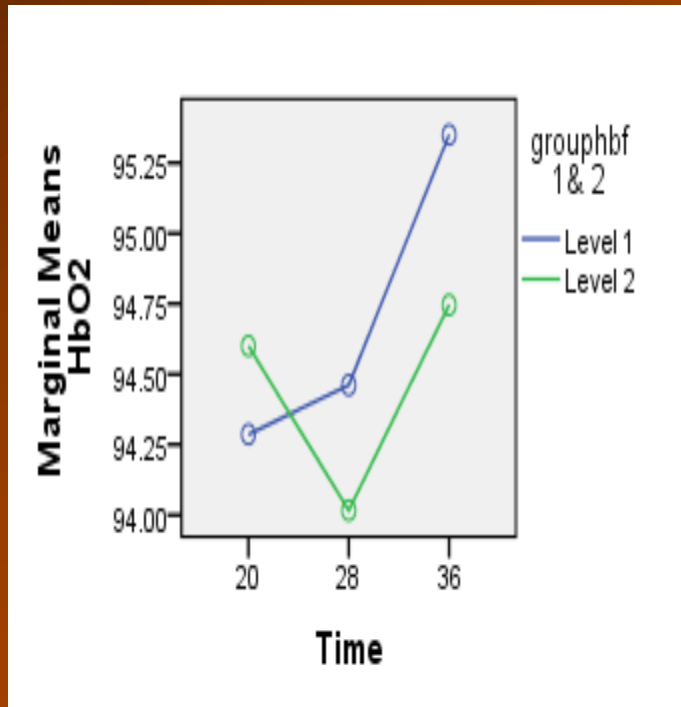


# Change over time





# Mean differences between groups, and changes over time for HbF Levels with HbO2

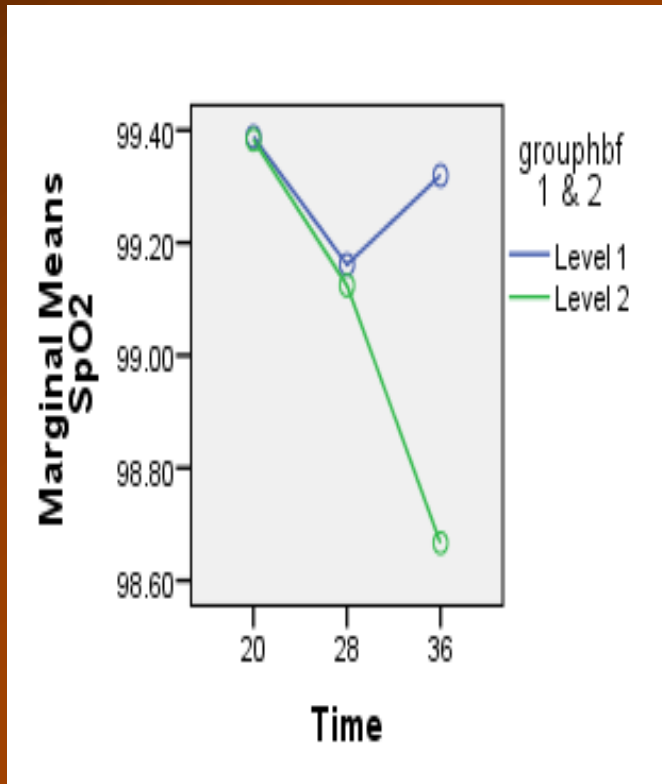


- HbO2 was significantly higher for Level 1 women @ 36 weeks:  $P = .035$
- HbO2 significantly decreased between 20 and 28 weeks for the Level 2 women  
 $F = 7.317$  &  $P = 0.01$





# *Mean differences between groups, and changes over time for HbF groups with SpO<sub>2</sub>*



- HbO<sub>2</sub> was significantly higher for Level 1 women @ 36 week
- $F : 4.922$  &  $P = .032$
- Change over time was not significant





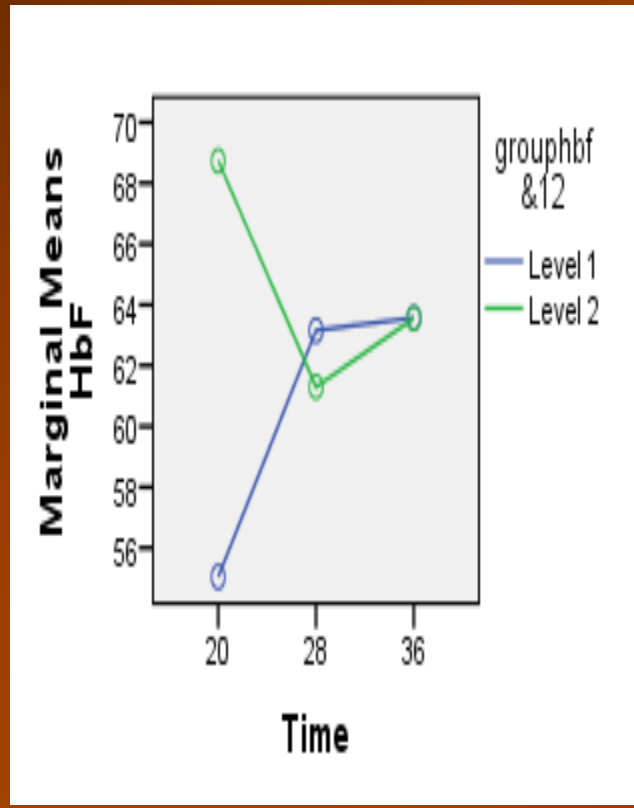
## *Specific Objectives 2*

- to evaluate the differences in HbF at 20, 28 and 36 weeks and changes over time for women with mean HbF at 20 weeks above and below the mean of 62.9%.





# Mean differences between groups on HbF, and changes over time



- HbF was significantly lower for Level 1 women @ 20 week
- $F : 15.816$  &  $P = .000$
- between 20 and 28 wks HbF significantly  $<$  for Level 2, but  $>$  for the Level 1
- $F = 14.383$  &  $P = .001$







## *Specific objectives 3*

- to determine if an association exists between the level of the mean HbF at 20 weeks and the frequency of pregnancy complications and birth events in low risk pregnant woman with varied body mass index (obese and not-obese).




  
*Odds ratios with perinatal events and BMI  
with HbF Levels 1 and 2*

	Obese				Non-obese			
	Level 1	Level 2	OR	P	Level 1	Level 2	OR	P
Diabetes	4	0	9.45	.035	1	2	.428	.558
CS or Assist	10	5	6.74	.040	1	5	.148	.054
Wound dehiscence	4	0	9.49	.035	0	0	NA	NA
Post birth bleeding	8	4	3.57	.614	4	0	9.45	.025





# Conclusion

- . Investigating the impact of HbF on the autonomic nervous system, oxygenation and blood glucose levels may help to identify possible physiologic pathways through which altered adaptation influence pregnancy outcomes.





*Thank you very much for your attention*



• Questions?







## *Inclusion criteria*

- English or Spanish speaking women,
- age 19 years or older
- @ 20 – 22 weeks gestation
- have a pre- pregnancy weight documented or recalled  
be willing to commit to three observations at 20, 28  
and  $36 \pm 2$  weeks of gestation
- have transportation and the ability to arrive at the  
prenatal clinic.





# *Limitations*

- HbF was analyzed by hemoximeter model OSM3 (Radiometer Corp, Cleveland, OH) = rough estimate
- relatively short time frame in which data were collected, 15 to 30 minutes
- Short resting period prior to assessment- familiar with equipment & setting
- Time of day body rhythms affected 0600 - 1200







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