

Impact of prenatal visit utilization on pregnancy outcomes within differing risk populations

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Introduction

- Principle functions of prenatal care visits (PNV) include screening and management of "high-risk" (HR) disorders throughout pregnancy:
 - Advanced maternal age (AMA) (age >35 at delivery), obesity, diabetic (DM) disorders (DM1, DM2, gestational DM (GDM)), hypertension (HTN) disorders (chronic HTN, gestational HTN, pre-eclampsia, eclampsia), asthma, etc.
- Recommended PNV number & frequency via ACOG¹:** 12-13 PNV
 - HR pregnancies:** general increase in PNV number & frequency, but lack specific guidelines and so scheduling is left up to the discretion of the provider.
- Current literature lacks consensus:**
 - Effectiveness of PNV quantity on pregnancy outcomes remains unresolved with numerous conflicting studies¹⁻⁵.
 - Unfortunately, while HR pregnancies are associated with an overall increase in labor interventions and poor pregnancy outcomes compared to non-HR^{6,7}, very few PNV studies focus on specifically these HR populations and instead either examine "all risk" or "low risk" populations^{2,3,5}.
- This study therefore seeks to close these literature gaps by examining a larger breadth of HR populations and their association with adverse pregnancy outcomes. Anticipated clinical benefits include contributing to the development of tailored PNV recommendations dependent on maternal health history ultimately potentially decreasing unnecessary interventions, poor pregnancy outcomes, & medical costs.

Research Question

- Higher quantities of PNV will be associated with lower number of labor interventions and adverse pregnancy outcomes for HR mothers with past medical histories significant for any of the following: AMA, asthma, obesity, or DM or HTN disorders.
- Higher quantities of PNV will be associated with higher number of labor interventions and have no correlation with adverse pregnancy outcomes for non-HR mothers.

Materials and Methods

- IRB approval:** UACOM - Phoenix.
- Retrospective cohort analysis:**
 - 2017 calendar year chart review of 503 mothers delivering at Banner University Medical Center Phoenix.
- Inclusion criteria:** maternal documentation at time of delivery of either complete absence of PNV or complete PNV records.
- Maternal group classification:** "non-high-risk" (non-HR) or "HR" if received any of previously listed diagnoses.
- Data collected:**
 - PNV Utilization:** total quantity of PNV, gestation/trimester (T) of initiation of PNV, frequency of PNV per T (ex: T1, T2, T3).
 - Pregnancy outcomes:**
 - Labor interventions:** induction/augmentation of labor, delivery via c-section, etc.
 - Labor/delivery complications:** shoulder dystocia, PPH, etc.
 - Adverse neonatal outcomes:** fever/sepsis, NICU care, prematurity, respiratory distress, etc.
 - Data to assess for confounding variables:** GBS status, etc.

Statistical analysis:

- Continuous variables:**
 - Means & standard deviations
 - Descriptive & bivariate statistics (Kruskal-Wallis test)
- Categorical variables:**
 - Frequencies & percentages
 - Chi-square or Fisher exact tests
- Odds ratio with logistical & linear regression:**
 - Utilized to adjust for relevant covariates selected based on results of stratified analyses:
 - Insurance status (Medicaid vs private), gravida para, gestational age at first PNV, & prematurity.

Results

Of 503 mothers in the cohort, 324 met inclusion criteria. Non-HR mothers consisted of 159 (49.07%) compared to HR mothers at 165 (50.93%) (table 1). Utilizing logistic and linear regression, pregnancy outcomes of both risk groups were then compared to same risk group in the following total PNV categories: low (≤ 8 PNV), mid (9-11 PNV), or high (≥ 12 PNV) (table 1).

HR mothers with higher quantity of PNV in T1 and T2 were less likely to have labor interventions when compared to those with lower quantity of PNV in same trimester (T1: OR 0.34; 95% CI 0.13-0.91, p-value 0.032) and (T2: OR 0.42; 95% CI 0.21-0.84, p-value 0.015) (table 2). HR mothers with higher quantity of PNV in T2 were less likely to have labor complications when compared to those with lower quantity of PNV in T2 (OR 0.70; 95% CI 0.51-0.98, p-value 0.043) (table 2).

Non-HR mothers with high total PNV were more likely to have labor interventions when compared to those with mid and low total PNV (odds ratio [OR] 4.02; 95% confidence interval [CI] 1.26-12.9, p-value 0.019) (table 2). Non-HR mothers with higher quantities of PNV in T3 were less likely to have labor interventions when compared to those with lower quantities of PNV in T3 (OR 0.69; 95% CI 0.48-0.98, p-value 0.039) (table 2).

No further differences in likelihood of labor complications, delivery complications, or adverse neonatal outcomes were found in either mother group when assessing for total PNV usage or total PNV usage per trimester.

Total PNV	1-8 [Low]	9-11 [Mid]	≥ 12 [High]	All
Total (n)	120	121	83	324
Non-HR	58/120 (48.33%)	55/121 (45.45%)	46/83 (55.42%)	159/324 (49.07% All)
HR: All	62/120 (51.67%)	66/121 (54.54%)	37/83 (44.58%)	165/324 (50.93% All)
HR: AMA	19/120 (15.83%)	23/121 (19.00%)	10/83 (12.05%)	52/165 (31.52% HR)
HR: Asthma	7/120 (5.83%)	8/121 (6.61%)	9/83 (10.84%)	24/165 (14.55% HR)
HR: DM	10/120 (8.33%)	12/121 (9.92%)	8/83 (9.64%)	30/165 (18.18% HR)
HR: HTN	3/120 (2.50%)	20/121 (16.53%)	8/83 (9.64%)	31/165 (18.79% HR)
HR: Obesity	38/120 (31.67%)	48/121 (39.67%)	29/83 (34.94%)	115/165 (69.70% HR)

Table 1: Total PNV vs Frequency of Maternal Risk Populations.

	Non-HR n = 158		HR n = 166		HR: Obesity n = 115	
Labor Interv. ¹	OR (95 CI)	p-value	OR (95 CI)	p-value	OR (95 CI)	p-value
PNV Category	4.02 (1.26, 12.9)	0.019*	4.41 (0.47, 40.8)	0.19	1.80 (0.04, 77.1)	0.75
PNV: T1	1.09 (0.60, 1.95)	0.79	0.34 (0.13, 0.91)	0.032*	0.20 (0.03, 1.49)	0.12
PNV: T2	1.09 (0.75, 1.56)	0.66	0.42 (0.21, 0.84)	0.015*	0.37 (0.13, 1.03)	0.056**
PNV: T3	0.69 (0.48, 0.98)	0.039*	0.69 (0.39, 1.25)	0.23	0.74 (0.31, 1.79)	0.51
Labor Comp. ¹	OR (95 CI)	p-value	OR (95 CI)	p-value	OR (95 CI)	p-value
PNV Category	0.91 (0.32, 2.55)	0.85	0.87 (0.33, 2.31)	0.79	1.12 (0.34, 3.65)	0.86
PNV: T1	0.70 (0.41, 1.20)	0.19	0.77 (0.49, 1.21)	0.26	1.20 (0.63, 2.29)	0.57
PNV: T2	1.39 (0.99, 1.95)	0.056**	0.70 (0.51, 0.98)	0.043*	0.87 (0.57, 1.34)	0.55
PNV: T3	0.97 (0.72, 1.32)	0.88	1.06 (0.84, 1.34)	0.59	0.88 (0.65, 1.20)	0.44
Delivery Comp. ¹	OR (95 CI)	p-value	OR (95 CI)	p-value	OR (95 CI)	p-value
PNV Category	1.25 (0.21, 7.20)	0.79	0.83 (0.14, 4.86)	0.84	0.99 (0.09, 10.8)	0.99
PNV: T1	1.05 (0.43, 2.58)	0.91	0.62 (0.25, 1.57)	0.32	0.82 (0.21, 3.15)	0.77
PNV: T2	1.03 (0.58, 1.81)	0.93	1.57 (0.88, 2.79)	0.12	1.31 (0.63, 2.77)	0.47
PNV: T3	0.78 (0.47, 1.31)	0.35	0.91 (0.61, 1.37)	0.66	0.78 (0.43, 1.45)	0.45
Neonatal Adv. Outcomes ¹	OR (95 CI)	p-value	OR (95 CI)	p-value	OR (95 CI)	p-value
PNV Category	1.08 (0.33, 3.45)	0.89	1.06 (0.38, 2.94)	0.90	0.92 (0.24, 3.60)	0.91
PNV: T1	1.48 (0.81, 2.71)	0.20	0.62 (0.37, 1.05)	0.074**	0.51 (0.24, 1.08)	0.078**
PNV: T2	1.09 (0.75, 1.60)	0.64	0.70 (0.48, 1.02)	0.06**	0.65 (0.38, 1.11)	0.12
PNV: T3	0.85 (0.60, 1.21)	0.38	0.89 (0.69, 1.13)	0.35	0.94 (0.66, 1.34)	0.74

Table 2: Non-HR & HR mothers: relationship of quantity of pregnancy outcomes vs frequency of PNV within each trimester [T1 (<14 weeks), T2 (14-27 weeks), or T3 (≥ 28 weeks)]

¹ Logistic Regression adjusting for insurance status, gravida/para, gestation at 1st PNC, preterm birth, term cat.

*p-value <0.05 **p-value >0.05, <0.10

Conclusion

HR mothers with higher compared to lower quantity of PNV in T2 were less likely to have labor complications and labor interventions. HR mothers with higher compared to lower quantities of PNV in T1 were less likely to have labor interventions.

Non-HR mothers with high total PNV were more likely to have labor interventions when compared to those with mid and low total PNV. Non-HR mothers with higher quantities of PNV in T3 were less likely to have labor interventions when compared to those with lower quantity of PNV in T3.

Limitations include small sample size and study would therefore benefit from further investigation. Anticipated clinical benefits could include contributing to the development of tailored PNV recommendations dependent on maternal health history ultimately resulting in increased cost savings, decreased unnecessary interventions, and decreased poor outcomes.

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Summary

- HR mothers with higher compared to lower quantity of PNV in T2 were less likely to have labor complications and labor interventions.**
- HR mothers with higher compared to lower quantities of PNV in T1 were less likely to have labor interventions.**
- Non-HR mothers with high total PNV were more likely to have labor interventions when compared to those with mid and low total PNV.**
- Non-HR mothers with higher quantities of PNV in T3 were less likely to have labor interventions when compared to those with lower quantity of PNV in T3.**