ORIGINAL RESEARCH

Fetal Heart Rate Monitoring of 33 Pregnant Women Undergoing Chiropractic & Midwifery Care: A Retrospective Analysis of Outcomes & Review of Literature

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Abstract

Objective: A retrospective file review to determine fetal adverse events via fetal heart rate (FHR) monitoring in women receiving concurrent care with chiropractic and nurse-midwifery.

Methods: In addition to socio-demographic and pregnancy status data, inclusion criteria for file review were: (a) the patient underwent a complete history and physical examination with their respective provider (b) the patient attended consistent care with both midwife and chiropractor, (c) the patient provided consent for the review of both the chiropractic and midwifery patient records, and (d) FHR monitoring was performed and recorded. Data was analyzed using descriptive statistics.

Results: A total of 33 pregnant women received FHR monitoring at various stages of pregnancy. Six women in their 1st trimester (mean weeks gestation (MWG)=12.4; 0.58) met our inclusion criteria. Their mean FHR was 150 beats per minute (bpm) (SD=6.32). Fourteen women were in their 2nd trimester (MWG=22.03; SD=3.59) with mean FHR at 143.71 bpm (SD=5.98). A total of 33 women were monitored in their 3rd trimester (MWG=35.75; SD=3.37) with mean FHR at 140.30 bpm (SD=8.48). All subjects received consistent chiropractic care throughout their pregnancy. Comorbidities were present in 75% of the subjects. All FHR data were within normal limits reflective of an indirect measure of safety to the unborn fetus concurrent with chiropractic care. All pregnant subjects delivered without complications.

Conclusion: The use of spinal/pelvic chiropractic adjustments during pregnancy did not result in adverse events for the fetus as measured by FHR, a major indicator of fetal health in obstetric care.

Key Words: *Fetal heart rate, subluxation, chiropractic, adjustment, pregnancy, midwifery, risk management*

Introduction

Women have been making decisions to birth out of hospital settings at an increasing rate since 2004. In 2017, 62,228 out-of-hospital births (i.e., 38,343 home births and 19,878 birth center births) occurred in the United States. This was an increasing trend (i.e., by 85%) from 0.87% of all US births in 2004 to 1.61% in 2017. Home births increased by 77% from 0.56% of births in 2004 to 0.99% in 2017, and birth center births more than doubled, from 0.23% of all births in 2004 to 0.52% in 2017.[1] Of interest in this study are women receiving prenatal care and birth within a birthing center. Many women make the choice to birth in a birthing center due to the family-centered, home-like environment that provides a "wellness" model of prenatal care and birth.[2] Further contributing to the appeal of giving birth in birth centers are the findings that low risk women delivering in birth centers are less likely to experience labor augmentation, episiotomy, assisted vaginal delivery, or cesarean birth when compared to women delivering in the hospital setting.[3,4]

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Prenatal care and subsequent births occurring under the care of a midwife at birthing centers tend to be more cost efficient from both the consumer and healthcare system perspective.[5] Women receiving prenatal care and birth within a birthing center tend to have healthy, low risk, singleton full term pregnancies.[2] Given the evidence that childbearing womens' use of complementary and alternative medicine (CAM) are becoming increasingly popular in industrialized countries[6, 7], their use in midwifery practice may also be widespread. In a review of the literature, Hall et al.[8] found this to be the case.

Common indications for use include; labor induction and augmentation, nausea and vomiting, relaxation, back pain, anemia, mal-presentation, perineal discomfort, postnatal depression and lactation problems. Midwives support the use CAM because they believe it was philosophically congruent; it provides safe alternatives to medical interventions; it supports the woman's autonomy and incorporating CAM can enhance their own professional autonomy. Hyatt et al.[9] examined how characteristics of birth settings influence midwives' decision to offer complementary and alternate nonpharmacological pain relief in labor and childbirth.

A convenience sample (n=520) of members of the American College of Nurse-Midwives (ACNM) were assigned to 1 of 3 primary birth settings (hospital, birthing center, home birth) to identify if certain characteristics (policies/protocols, use of technology, providers' knowledge and beliefs, and midwives' relationship with collaborating obstetricians) in the birth setting influence a midwife's decision to offer nonpharmacological pain relief methods in labor and birth.

The investigators found that their knowledge and beliefs influenced their decisions. Although factors of the birth environment influence midwives' decisions to offer nonpharmacological pain management in labor, they did not prevent midwives from using most of the nonpharmacological pain relief methods during labor and birth. Hyatt et al. concluded that the midwives' philosophy of care more than the characteristics of the birth setting influence midwives' decisions to offer nonpharmacological pain relief methods.

While high quality evidence of CAM modalities during pregnancy remains limited[10], the existing research does suggest that chiropractic care during pregnancy is a popular choice among pregnant women despite the evidence being described as emergent.[11, 12] In a recent study examining the quality of life of pregnant women under chiropractic care (i.e., spinal adjustments or spinal manipulation along with adjunctive therapies), Alcantara et al.[13] found that the majority of pregnant women were motivated for wellness care with referrals from their birth provider as originating more from midwives than obstetricians.

This is not surprising given that midwives have positive personal (i.e., a chiropractic patients) and professional clinical experience with chiropractors/chiropractic and are of the opinion that chiropractic was safe for pregnant patients and children.[14, 15] The collaboration in patient care between midwives and chiropractors is, as Witt et al.[16] described, a contemporary shift in health care that focuses increasingly on wellness, care across the lifespan, patient-centeredness, evidence-based medicine, and the integration of CAM therapies.

In addition to patient care, this approach to integrative health provides a unique opportunity for research to assess the safety and efficacy of chiropractic care. As an initial foray towards such efforts, we describe our findings with fetal heart rate (FHR) monitoring in pregnant patients concurrently under chiropractic and midwifery care.

Methods

This study was approved by the Institutional Review Board of Life University (Marietta, GA, USA). We performed a retrospective file review over a two-year period of chiropractic patients receiving concurrent care with a birth center/midwife. With consent from the patient, in addition to socio-demographic information (i.e., age, educational level), several clinical covariates (i.e., weeks of gestation, comorbidities, prenatal flowsheets, labor flowsheets, postpartum sheet and transfer to hospital sheets if a hospital transfer occurred from the birth center files and time and date of appointment, chief complaint, vertebral subluxation correction from the chiropractic patient files).

Protected health information (i.e., names, social security numbers, phone numbers)[17] was not included in the file review. For the purpose of this study, inclusion criteria for review includes: (a) the patient underwent a complete history and physical examination with their respective provider (b) the patient attended consistent and continuous care (i.e., cared for to term) with both midwife and chiropractor, (c) the patient provided consent for the review of both the chiropractic and midwifery patient records, and (d) FHR monitoring was performed and recorded.

In addition to socio-demographic and clinical covariates information, we obtained data from the FHR monitoring. The birthing center midwives utilized an Edan SonoTrax Basic Fetal Doppler to record FHR. This doppler has an established range of 50 bpm-210 bpm with an accuracy of +/- 3 bpm. The data obtained was entered to an Excel file (Microsoft Excel 2019, Redmon, WA, USA) specifically created for this study. Analysis utilized descriptive statistics such as frequencies, means and proportions. All analysis utilized a free online statistical website.[18]

Results

A total of 33 women met the inclusion criteria for this study. The average age of the subjects was 30.65 years (SD=5.22) and average parity of 0.94 (SD=1.09). On average, the women attended 19.76 (SD=11.56) chiropractic visits during their prenatal period and 11.29 (SD=1.93) prenatal visits prior to onset of labor. As their pregnancy progressed, the number of days between midwifery and chiropractic appointments decreased (mean days=0.67; SD=1.39) with visits made more likely on the same day than on separate days (same day n=133; separate days n=54).

While we were able to determine most FHR measurements were taken within the same day (i.e., within a 9-hour period; n=141) as the chiropractic visits, we were unable to determine whether the midwifery visits occurred prior to or after

their chiropractic visits as the midwifery files were dated but not time stamped. We were able to record a total of 216 FHR monitoring instances with the majority (n=214; 99%) occurring after their chiropractic visit. The mean number of days elapsing from their chiropractic visit to the FHR monitoring at the birth center was 1.28 days (range: 0-21 days; SD= 2.82). The remainder (n=2) occurred on average of 8.5 days (range: 8-9; SD=0.71) prior to the FHR monitoring.

Six (18%) subjects had FHR recording data available in the first trimester. The mean weeks of gestation (MWG) during FHR monitoring was12.4 weeks (SD=0.58). The mean FHR measured for these subjects was 150 beats per minute (bpm) (SD=6.32). For one subject, the patient records documented that the midwife was unable to detect a fetal heart tone, common in the first trimester, but did record a measurement at the mother's subsequent prenatal visit. In the second trimester, 8 additional women were monitored in addition to the 6 subjects transitioning from the first trimester for a total of 14 women. The MWG for this group was 22.03 weeks (SD=3.59). The mean FHR monitored was 143.71 bpm (SD=5.98). In the third trimester, 19 more women were added to the sample for a total of 33 subjects.

Their MWG was 35.75 weeks (SD=3.37) with a mean FHR monitored at 140.30 bpm (SD=8.48). Mean weeks of gestation and mean FHR measures are summarized in Table 1. Maternal fetal comorbidities of our study subjects are listed in Table 2. As a follow-up, all subjects gave birth to a healthy baby.

Discussion

The current study was borne out of a partnership between a chiropractor and a birthing center attended by two practicing Certified Nurse Midwives (CNM) in the Southeast United States. Reciprocal patient/client referrals were a part of this professional relationship with open communication between the chiropractor and midwives as it pertains to clinical care.

The safety of the chiropractic care of pregnant women and the unborn fetus is a concern not only among chiropractors[19] but also by other healthcare providers involved in prenatal care. Steele et al.[20] examined the incidence of adverse birth outcomes among women accessing CAM during pregnancy from a survey-based cohort sub-study from the nationally representative Australian Longitudinal Study on Women's Health (ALSWH). Based on 1835 respondents, the authors found variations in birth outcomes dependent on the CAM used. The outcome most associated with CAM use was emotional distress.

This was found to occur more commonly in women who practiced meditation/yoga at home, used flower essences, or consulted with a chiropractor. Women who consulted with a chiropractor or consumed herbal teas were less likely to report a premature birth, while participation in yoga classes was associated with an increased incidence of post-partum/intrapartum hemorrhage.

The authors noted in their conclusion that their findings emphasized the need for further research evaluating the safety and effectiveness of CAM for pregnant women, with a particular focus on birth outcomes.

Among nurse-midwives, although studies report using and recommending CAM to their patients and believe that CAM can complement conventional medical therapies, concerns and support for research on the safety and effectiveness of CAM therapies during pregnancy and childbirth have also been voiced.[8, 21]

An evaluation of the knowledge, attitude, and practice of general obstetricians and gynecologists and maternal-fetal medicine specialists attending the Central Association of Obstetrician and Gynecologists annual meeting on CAM use found that lack of safety and efficacy evidence was a motivator for not prescribing, referring, or advising patients on the use of CAM therapies in their patients.[22] Weiss et al.[23] assessed the attitudes of Canadian obstetricians toward chiropractic and found voices of concern on the safety of chiropractic care for both expectant mother and fetus.

This collaborative care by a chiropractor and midwives provided a means of indirect measure of safety to the unborn fetus with the use of FHR monitoring. Originally introduced in the late 1960s as an alternative to auscultation of the fetal heart, electronic FHR monitoring is now widely used in modern labor and delivery unit in the developed world.[24] FHR monitoring captures the FHR directly through the use of a fetal electrode or indirectly through the use of ultrasound technology and Doppler physics to provide changes in frequency of sound waves reflected from pulsations within fetal vessels.

The purpose of FHR monitoring is to provide clinicians (i.e., obstetricians and midwives) an accurate and ongoing observation of human fetal physiology. Antepartum or antenatal FHR monitoring may have predictive value for detecting fetal compromise in utero (e.g., hypoxemia, acidemia, issues with the umbilical cord, placenta, etc.).[25-27] As we found in our study, the baseline heart rate decreased with advancing gestational age. The normal rate for the baseline is between 110 and160 bpm.[28] All FHR monitoring in our cohort of subjects revealed no abnormalities detected. As described earlier; although the majority of FHR monitoring occurred on the same day as their chiropractic visits (i.e., within nine hours to each other), we could not determine sequence of timing of the FHR monitoring and the patient receiving a spinal adjustment.

In addition to baseline heart rate, the interpretation of FHR monitoring is the variability of the baseline heart rate. Variability is the variance in time between consecutive heart beats, and its presence is observed in healthy fetuses. Originating in the brain stem and higher brain centers and conducted to the heart via the vagus nerve, direct sympathetic and parasympathetic effects on the heart results in variability.

This may also arise from direct humoral stimulation of cardiac receptors by epinephrine from the fetal adrenal glands. The presence of drugs, hypoxia, metabolic acidosis, or brain injury can affect the baseline variability of the heart rate. Moderate variability of the heart rate is an indicator of normal oxygenation and absence of acidosis, and its presence or absence is key to the correct interpretation of EFM.[24] Unfortunately, variability data was not available from our file review.

In the care of pregnant women, chiropractors are cognizant of the effects of relaxin resulting in peripheral and pelvic-spinal joint laxity along with changing structure and biomechanics of the pregnant patient. In the application of the spinal adjustment, modifications are made with respect to the thrust vector (i.e., amplitude and depth of thrust) and equipment such as the use of a table with a "drop piece" or the use of pillows to accommodate the woman's abdomen. Stuber et al.[29] performed a systematic review of the literature for manuscripts documenting adverse events associated with spinal manipulation during pregnancy and the post-partum period.

The authors identified a survey[30] and systematic review of the literature[31] along with four case reports that involved the use of chiropractic SMT during pregnancy[32], two involving the post-partum period[33-34] and one resulting in cervical fracture following SMT performed by a medical practitioner.[35] Subsequent studies on pregnancy and chiropractic care have documented minimal and minor adverse events associated with spinal manipulation. The prospective cohort by Murphy et al.[36] documented three patients (3.8%) as experiencing increased pain following one treatment. Two patients had pain lasting less than 48 hours and one patient experienced pain lasting 1 week. Peterson et al.[37] reported soreness in subjects receiving either spinal manipulation, exercise, or Neuro-Emotional Technique. Gausel et al.[38] and Peterson et al.[39] reported no serious or long-lasting adverse events experienced by their study subjects.

In addition to electrical physiotherapy modalities and ultrasound as contraindication to care, DiMarco[40] provided an extensive list of conditions as contraindications for chiropractic care. These include vaginal bleeding, ruptured amniotic membranes, cramping, urinary calculus, crashing/sudden onset of pelvic pain, ovarian cysts, inguinal hernias, bowel obstruction, premature labor, appendicitis, placenta previa, fibroids, placenta abruptio, peptic ulcer perforation, ectopic pregnancy, and toxemia.

No supporting documentation was provided to support these contraindication assertions. Not surprisingly, our findings are counter to some of these contraindication recommendations. We encourage continued documentation on the safety of chiropractic care in pregnant patients with various comorbidities to discern true absolute or relative contraindications to chiropractic care, particularly with the use of high velocity, low amplitude thrust types of spinal adjustments.[41-45]

To the best of our knowledge, this is the first examination of the safety of chiropractic care for the pregnant woman and her fetus. We note the sequential testing of our subjects as their pregnancy progressed from the first trimester to the second and from the second to the third trimester without documentation of adverse events to the expectant mother and fetus attributed to chiropractic care.

We noted that most FHR measurements in our subjects were taken within the same day (i.e., within a 9-hour period) as the chiropractic visits. We acknowledged that we were not able to determine the temporal sequence of the subjects receiving spinal adjustments and the FHR monitoring. However, the totally of the findings indicated that no adverse events were experienced by the pregnant subjects and their fetuses as indicated by the FHR data. We encourage continued research in this area of chiropractic care. Particularly the use of fetal monitoring or similar instruments immediately prior to and after spinal adjustments in a prospective cohort of pregnant patients.

This study has limitations. No definitive conclusions can be drawn from our study given the study design. However, the exploratory nature of this study provides preliminary evidence on the safety of chiropractic care for both the pregnant patient and their fetus. As with all retrospective file reviews, our study has limitations associated with random error, bias (i.e., selection bias, non-differential bias due to misclassification) and confounders.

The chiropractic care provided to our subjects were delivered by a single practitioner. Therefore, the generalizability of our results must be eyed with caution. However, the strength of our study is the data obtained was from a practitioner in the field with follow-up of to the birth outcomes.

Conclusion

This study provides preliminary evidence on the safety of spinal/pelvic adjustments during pregnancy to the expectant mother and her fetus as monitored with FHR monitoring during regular prenatal appointments.

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Table 1. Summary of findings of weeks of gestation and FHR monitoring

	n	Mean WOG	SD	Mean FHR (bpm)	SD
First Trimester	6	12.4	0.58	150	6.32
Second Trimester	35	22.03	3.59	143.71	5.98
Third Trimester	180	35.75	3.37	140.3	8.48

Table 2. List of comorbidities experienced by subjects

Comorbidity	N (%)
Anterior Placenta	10
Advanced Maternal Age	7
Placenta Previa	2
Vaginal Bleeding	1
Ovarian Cysts	1
Preterm Labor	1
Hypertension	1
Diabetes	1
Autoimmune Disorder	1