

Therapeutic interventions employed by Greater Toronto Area chiropractors on pregnant patients: results of a cross-sectional online survey

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Introduction: *Due to different biomechanical, nutritional, and hormonal considerations, it is possible that chiropractors may employ different therapeutic interventions and recommendations for pregnant patients than non-pregnant ones. The objective of this study was to determine the therapeutic interventions that chiropractors who are members of the Ontario Chiropractic Association in the Greater Toronto Area most commonly provide to pregnant patients.*

Methods: *An introductory e-mail was sent in October 2011 to 755 members of the Ontario Chiropractic Association within the Greater Toronto Area five days prior to a 15 question survey being distributed via e-mail. Reminder e-mails were sent 13 days and 27 days later. Using descriptive statistics, demographic information was reported along with reported use of different treatments and recommendations for pregnant patients*

Results: *A response rate of 23% was obtained. The majority of the respondents (90%) reported using the Diversified technique on pregnant patients, followed by soft tissue therapy (62%) and Activator (42%). The most common adjunctive therapy recommended to pregnant patients was referral to massage therapy (90%). Most of the respondents (92%) indicated that they prescribe stretching exercises to pregnant patients and recommend a multivitamin (84%) or folic acid (81%) to pregnant patients.*

Introduction : *En raison de considérations biomécaniques, nutritionnelles et hormonales différentes, il est possible que les chiropraticiens emploient différentes interventions thérapeutiques et différentes recommandations pour les patientes enceintes et les patientes non-enceintes. L'objectif de cette étude était de déterminer les interventions thérapeutiques que les chiropraticiens membres de l'Association chiropratique de l'Ontario dans la région du Grand Toronto proposent aux patientes enceintes.*

Méthodologie : *Un courriel d'accueil a été envoyé en octobre 2011 aux 755 membres de l'Association chiropratique de l'Ontario dans la région du Grand Toronto, cinq jours avant l'envoi d'un sondage de 15 questions par courriel. Des courriels de rappel ont été envoyés 13 et 27 jours après. À l'aide de statistiques descriptives, des informations démographiques ont été rapportées ainsi que l'administration de différents traitements et recommandations pour les patientes enceintes.*

Résultats : *Un taux de réponse de 23 % a été obtenue. La majorité des répondants (90 %) a indiqué utiliser la technique diversifiée sur les patientes enceintes, suivi par les traitements des tissus mous (62 %) et l'activateur (42 %) Les traitements auxiliaires les plus fréquemment recommandés aux patients sont les massothérapies (90 %). La plupart des répondants (92 %) ont indiqué prescrire des exercices d'étirements pour les patientes enceintes et recommander des comprimés multivitaminés (84 %) ou de l'acide folique (81 %) aux patientes enceintes.*

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The authors declare that there are no disclaimers or declarations to be made in the preparation of this manuscript. The authors did not receive any support in the preparation of this manuscript.

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Conclusion: *In agreement with previous research on chiropractic technique usage on non-pregnant patients, the majority of respondents indicated treating pregnant patients with the Diversified technique, with other chiropractic techniques being utilized at varying rates on pregnant patients. Most respondents indicated prescribing exercise, and making adjunctive and nutritional recommendations frequently for their pregnant patients.*

KEY WORDS: chiropractic, pregnancy, interventions, therapy

Conclusion : *En accord avec des précédentes recherches sur l'utilisation de techniques chiropratiques sur les patientes non-enceintes, la majorité des répondants a indiqué traiter les patients avec la technique diversifiée, ainsi que d'autres techniques chiropratiques utilisées à différents fréquences sur les patientes enceintes. La plupart des répondants ont indiqué fréquemment prescrire des exercices, et faire des recommandations auxiliaires et nutritionnelles pour leurs patientes enceintes.*

MOTS CLÉS : chiropratique, grossesse, interventions, thérapie

Introduction

Reducing patient discomfort and musculoskeletal pain during pregnancy and potentially helping facilitate an uncomplicated labour and delivery have been described as the aims of chiropractic care for pregnant patients.¹ The 2005 National Board of Chiropractic Examiners Job Analysis of Chiropractic surveyed American chiropractors and found that on average they indicated that they “rarely” treat pregnant women.² However, at least 50% of pregnant women experience back pain at some time throughout their pregnancy³, and 50% to 75% experience back pain during labour⁴. Previous studies have indicated that both patients and chiropractors report safe and successful treatment of pregnancy related back pain through chiropractic treatment.⁵⁻⁹

With only a small spectrum of drugs considered safe to use during pregnancy¹⁰, alternative therapies that have a history of safety and effectiveness for the treatment of musculoskeletal pain may be sought out by this population. Chiropractic manual therapy, exercise, massage and techniques of local anesthesia such as Lidocaine¹¹ are all alternative treatments that can be sought out by pregnant women. While there is limited evidence to support spinal manipulation and mobilization for the chiropractic care of pregnant patients, there continues to be pregnant women who seek out chiropractic care for treatment of various

pregnancy related complaints including, but not limited to, back pain, posterior pelvic pain, costovertebral injuries, carpal tunnel syndrome, lower extremity pain, and headaches.¹²

Chiropractors may employ a variety of different treatment technique systems when treating non-pregnant patients. A survey regarding technique systems used by post-1980 graduates of the Canadian Memorial Chiropractic College (CMCC) by Mykietiuk et al¹³, revealed that the technique systems most commonly used in private practice in Ontario were Diversified Technique, followed by Activator®, Thompson, and Active Release Techniques®.

The objective of this study was to determine the most commonly used treatments that chiropractors in the Greater Toronto Area (GTA) provide to their pregnant patients. It is possible that the treatments provided to pregnant patients may be different from those offered to the non-pregnant population when accounting for their unique biomechanical, nutritional, and hormonal considerations. The resulting information may be useful for clinicians and chiropractic students who may benefit from learning which treatments and therapies are most commonly employed on pregnant patients by their colleagues and then follow the principles and process of evidence based practice to investigate their potential value for their

pregnant patients. The information will also be of value to researchers in planning further research on chiropractic treatment of pregnant patients as the most commonly used treatments should likely be among the first and most investigated.

Methods

Subjects

Ethics approval was provided by the CMCC Research Ethics Board (project number 111013). The participants were selected from the 2009 Canadian Chiropractic Association (CCA) digital database as this was the last publicly available CD-ROM based directory. The participants in this study were chiropractors located in the GTA (consisting of the Halton Region, Peel Region, York Region, City of Toronto and Durham Region) and who were members of the Ontario Chiropractic Association (OCA). The GTA was selected as previous surveys have used this population¹⁴ and OCA members were used as this is the largest professional group representing chiropractors in Ontario. There were no limits on type of practice or techniques employed, but the inclusion criteria consisted of actively practicing OCA members in the GTA who see pregnant patients in their practices. Subjects were excluded if they no longer practiced in the GTA or did not see pregnant patients. No compensation was provided for completing the survey. As this was a descriptive survey, there was no allocation to different groups in this study. Participant identities were kept confidential, only visible to study team members and the CMCC Office of Research Administration and response items were reported in aggregate form.

Pilot Study

Prior to distribution of the survey to all eligible chiropractors in the GTA, a brief pilot study was conducted. An initial draft of the survey was completed confidentially by ten clinicians at the CMCC campus clinic in Toronto. This allowed for identification of any problem areas such as unclear, ambiguous, or lengthy questions and allowed for determination of the amount of time for survey completion. Feedback from the pilot study was provided from each individual clinician, and guided necessary changes before distribution of the survey itself. The results from the pilot study group were not reported.

Survey

The survey is available from the corresponding author upon request and consisted of 15 multiple-choice style questions developed by the authors to identify the proportion of responding chiropractors who utilize the treatments of interest on pregnant patients. Face validity was assessed continuously through the development and pilot study periods by the authors and the final survey was deemed to have face validity. Items included questions eliciting demographic information and specific questions regarding chiropractic techniques and other treatments employed when seeing pregnant patients. The survey was administered by e-mail using the e-mail address provided in the 2009 CCA digital database.

Survey Distribution

Prior to the commencement of the survey in October 2011, a preliminary e-mail was sent to the selected chiropractors to notify them of the study. The survey was then distributed five days later. The survey e-mail message consisted of a study information and informed consent sheet. Those who agreed to participate were required to click on an "I Agree" button which linked them securely to the survey via the CMCC Survey Monkey™ account. Thirteen days following the survey launch, a reminder e-mail was sent to the chiropractors who did not complete the survey. An additional reminder was sent 14 days following the first reminder (27 days following the initial distribution). Thus there were a total of four possible contacts distributed (including the pre-notification message) in order to increase the response rate. Participants were given the opportunity to receive the results of this study once it was completed by indicating interest at the end of the survey and providing their e-mail address.

Data Analysis

Aggregated survey responses were provided to the authors from CMCC's Survey Monkey™ account by CMCC's Office of Research Administration in the form of a Microsoft Excel spreadsheet. The data was printed and stored in a secure filing cabinet by one of the authors (KJS). Descriptive statistics were used to analyze this cross-sectional survey using Microsoft Excel.

Results

E-mail messages were sent to 755 e-mail addresses of

Table 1.
*Chiropractic Colleges attended by respondents
(n=140, 3 missing a response).*

Chiropractic College	Number of Respondents	Percentage of Respondents (%)
Canadian Memorial Chiropractic College	119	85
Logan College of Chiropractic	5	3.6
National University of Health Sciences	5	3.6
New York Chiropractic College	2	1.4
Life University	2	1.4
Life Chiropractic College West	1	0.7
Cleveland Chiropractic College	1	0.7
Texas Chiropractic College	1	0.7
Palmer College of Chiropractic	1	0.7
Palmer College of Chiropractic West	1	0.7
Western States Chiropractic College	1	0.7
Anglo-European College of Chiropractic	1	0.7

Table 2.
*Respondent year of graduation
(n=138, 5 missing a response).*

Year of Graduation	Number of Respondents	Percentage of Respondents (%)
Last 5 years (2007-2011)	16	11.6
Last 6-10 years (2002-2006)	33	23.9
Last 11-15 years (1997-2001)	26	18.8
Last 16-20 years (1992-1996)	13	9.4
Last 21-25 years (1987-1991)	9	6.5
Last 26-30 years (1982-1986)	17	12.3
Last 31-35 years (1977-1981)	16	11.6
Last 36-40 years (1972-1976)	6	4.3
Last 41-45 years (1967-1971)	2	1.4

Table 3.
*Location in which the responding chiropractors practice,
organized by region
(n=136, 7 missing a response).*

Location	Number of Respondents	Percentage of Respondents (%)
City of Toronto	74	54.4
York Region	27	19.9
Halton Region	23	16.9
Durham Region	16	11.8
Peel Region	10	7.4

Table 4.
*Further training received by responding chiropractors
(n=28, 115 missing a response).*

Further Training	Number of Respondents	Percentage of All 143 Respondents (%)
International Chiropractic Pediatric Association (ICPA)	11	7.7
Fellow of the Royal College of Chiropractic Sports Sciences	8	5.6
Fellow of the College of Chiropractic Sciences	5	3.5
Fellow of the College of Chiropractic Rehabilitation Sciences	5	3.5
Fellow of the College of Chiropractic Orthopedists	2	1.4

chiropractors in the Greater Toronto Area. Of these, 125 of the e-mail messages were returned as undeliverable due to change of clinic e-mail addresses or addresses which no longer existed. As such, 630 e-mail addresses were sent successfully and 143 respondents gave consent to fill out the online survey. Therefore, the adjusted response rate was calculated as 22.7%. However, there were not necessarily 143 responses to each of the questions on the survey as some of the respondents did not complete all of the questions. The questions with the lowest response rates were those pertaining to further training (28 responses, 115 missing a response) and nutritional supplement recommendations (70 responses and 73 missing a response).

Demographics

Approximately 39% of respondents were female and 61% were male. Tables 1 and 2 indicate the chiropractic college of graduation of the respondents and ranges of graduation years, respectively. Table 3 depicts the different geographic regions where the responding chiropractors practice within the GTA. Of the 143 respondents, only 29 (20.3%) indicated that they completed training provided by any of the Canadian recognized Fellowship programs or the International Chiropractic Pediatrics Association (ICPA) as seen in Table 4.

Frequency of Treating Pregnant Patients

When asked how often they treat pregnant patients, 10.9% of the respondents stated they “Always” treat them, which was defined as several per week, 34.1% stated “Often” (defined as several per month), 54.3% stated “Seldom” (defined as a few per year), and 0.7% stated “Never”.

Techniques Used to Treat Pregnant Patients

When asked which chiropractic technique systems they use when treating pregnant patients, over half of the respondents reported using Diversified technique (89.9%) and soft tissue therapy (61.6%), followed by Activator (42.0%) as shown in Table 5.

Table 5.

Chiropractic technique systems used by respondents when treating pregnant patients (n=138, 5 missing a response).

Technique System	Number of Respondents	Percentage of Respondents
Activator	58	42.0%
Acupuncture	31	22.5%
Applied Kinesiology	8	5.8%
BEST	1	0.7%
CBP	3	2.2%
Cox-Flexion Distraction	1	0.7%
Cranial Therapies	7	5.1%
Diversified	124	89.9%
Cranial Sacral	9	6.5%
Gonstead	9	6.5%
Graston	8	5.8%
Logan Basic	12	8.7%
Meric	3	2.2%
Network	1	0.7%
Nimmo	9	6.5%
NUCCA	1	0.7%
Palmer HIO	5	3.6%
Soft-Tissue Therapy (ART/MRT)	85	61.6%
SOT	17	12.3%
Spinal Stressology	0	0.0%
Thompson	27	19.6%
Trigenics	7	5.1%
Torque Release	3	2.2%
Webster Technique	35	25.4%
Total Body Modification (TBM)	2	1.45%
Koren Specific Technique (KST)	1	0.7%
Kinesiotaping	1	0.7%
Strain-counterstrain	1	0.7%
Rehabilitation	1	0.7%
Exercise/mobilizations/education	2	1.45%

Table 6.

Adjunctive treatments utilized on pregnant patients by respondents (n=125, 18 missing a response).

Answer Options	Response Percentage	Response Count
Orthotics	66.4%	83
Referral to Massage Therapy	90.4%	113
Postural Belts (Pelvic Stabilization Belts, Trochanteric Belt, Pelvic Sling, etc.)	55.2%	69
Other:		
Arvigo Technique (Maya Abdominal Therapy)	1	0.8%
Compression Stockings/Socks	2	1.6%
Kinesio Taping	1	0.8%
Referral to Cranial Sacral Therapist	1	0.8%
TCM practitioner referral	2	1.6%
Naturopath referral	1	0.8%
Nutritionist referral	1	0.8%
Total Body Modification (TBM)	1	0.8%
Education	1	0.8%
Pillows	1	0.8%

Table 7.

Forms of exercise prescribed by responding chiropractors to pregnant patients (n=130, 13 missing a response).

Answer Options	Response Percent	Response Count
Stretching Exercises	91.5%	119
Strengthening Exercises	66.9%	87
Core Stabilization Exercises	59.2%	77
Proprioceptive/Balance Exercises	30.8%	40
Cardio Exercises	25.4%	33

Additional Treatments Used on Pregnant Patients

When asked what additional treatments were used on pregnant patients, most respondents reported referrals for massage therapy (90.4%), with orthotics being the second most common adjunctive treatment at 66.4%, as seen in Table 6.

Exercises Prescribed to Pregnant Patients

When asked which forms of exercise were prescribed to pregnant patients it was found that stretching exercises were prescribed by 91.5% of respondents, and strengthening exercises were prescribed by 66.9% of the respondents as shown in Table 7.

Nutritional supplement recommendations made by chiropractors to their pregnant patients

When asked about nutritional supplements recommended to pregnant patients, a variety of suggestions were made by the respondents, with 84.3% recommending multivitamins and 81.4% recommending folic acid, several other supplements are also indicated in Table 8.

Estimates of Percentage of Patients Returning for Post-Partum care

When asked about the percentage of their pregnant patients who returned for post-partum care, 59.3% of the respondents estimated that at least 80% of their pregnant patients returned for post partum care, as seen in Table 9.

Discussion

To our knowledge this is the first study to investigate which techniques and treatments are used most commonly by chiropractors specifically when treating pregnant patients. Previously, a survey of a small group of chiropractors conducted by Stuber⁷ found that most of the respondents used spinal manipulative therapy, soft tissue therapy, exercise therapies and patient education on pregnant patients with back and/or neck pain, headaches, or benign vertigo. However, the extent to which different techniques and therapies are actually being utilized on that particular population by chiropractors was not reported.

Chiropractic Technique Usage

The majority of chiropractors from the current survey indicated using Diversified technique when treating preg-

Table 8.

Nutritional supplement recommendations made by responding chiropractors to their pregnant patients (n=70, 73 missing a response).

Supplement	Response Percent	Response Count
Folic acid	81.4%	57
Multivitamin	84.3%	59
Iron Supplementation	25.7%	18
Calcium Supplementation	35.7%	25
Vitamin E	14.3%	10
Vitamin A	14.3%	10
Other		
Nutritionist referral	1.4%	1
Parturition preparation	1.4%	1
Combination/fetal development & clearing remedies	1.4%	1
Primary health care provider referral	1.4%	1
Naturopath referral	5.7%	4
Omega 3 fatty acids	5.7%	4
Probiotics	2.9%	2
Registered Dietitian referral	1.4%	1
Vitamin B-50 complex	1.4%	1
Multivitamins	2.9%	2
Vitamin D	1.4%	1
Omega 6 fatty acids	2.9%	2
Prenatal vitamins	4.3%	3
Magnesium	1.4%	1
Vitamin B	1.4%	1
Bioflavonoids	1.4%	1
Nutrition Advice/Education	2.9%	2
Eicosanoids (EEA's)	1.4%	1

Table 9.

Respondent estimates of percentage of patients returning for post-partum care (n = 101, 42 missing a response).

Answer Options of Percentage of Pregnant Patients who return for post-partum care	Number of Respondents who Indicated	Percentage of Respondents who Indicated
10%	7	6.9%
20%	5	5.0%
30%	2	2.0%
40%	2	2.0%
50%	14	13.9%
60%	3	3.0%
70%	8	8.0%
80%	18	17.8%
90%	26	25.7%
100%	16	15.8%

nant patients. This is consistent with the findings of a previous survey of Canadian chiropractors by the National Board of Chiropractic Examiners¹⁵ who indicated that 87.3% of their respondents primarily used Diversified technique to treat their patients, albeit without dividing their patient populations into different subgroups such as pregnant patients. The majority of the respondents in the current survey were educated at the CMCC where Diversified technique is taught exclusively. However, according to the 2005 Job Analysis of Chiropractic in the United States, 96.5% of responding chiropractors use the Diversified technique and 71.5% of patients were treated with this technique, regardless of belonging to any particular subgroups, such as pregnancy.²

The second most popular technique reported by chiropractors in this survey when treating pregnant patients was soft tissue therapies (STT) such as Active Release Technique® (ART®) and Myofascial Release Technique (MRT), followed by use of the Activator®. These findings are in line with those of Mykietiuk et al¹³ who found that 24% of their Canadian respondents utilized soft tissue therapies, while 15% used the Activator on their general patient populations. Thus from the current survey it would appear that a larger proportion of chiropractors reported using Activator and/or STT on pregnant patients, although this could represent an increase in the use of these techniques across patient groups.

Exercise Prescription

Nearly all of the respondents indicated prescribing exercises to their pregnant patients and this appears to follow an evidence-based perspective, and is similar to exercise utilization rates by chiropractors previously reported by the NBCE.² As stated by Fast et al¹⁶, during pregnancy physical activity may prevent or manage chronic conditions such as hypertension, obesity, gestational diabetes, dyspnea and pre-eclampsia. Regular physical activity may help women meet gestational weight gain targets and thus positively influence maternal-fetal outcomes, as well as improving well-being and quality of life.¹⁷

Approximately two-thirds of our respondents reported prescribing strengthening exercises to their pregnant patients. Although it was not specified for which areas of the body respondents were prescribing these strengthening exercises, while roughly three out of five respondents indicated prescribing core stabilization exercises. Borrgren¹

has suggested that targeting the transversus abdominis muscle specifically during pregnancy to potentially prevent some of the postural alterations in the third trimester, therefore potentially reducing the amount of pain experienced. The PARmed-X for Pregnancy from the Canadian Society for Exercise Physiology also supports exercises of the abdomen as being important during pregnancy to promote good posture and prevent low back pain, prevent diastasis recti and strengthen the muscles of labour.¹⁸ The PARmed-X also suggests strengthening exercises for the upper and lower back to promote good posture. The buttocks and lower limbs should be strengthened to facilitate weight bearing and prevent varicose veins. It also advocates Kegel exercises to strengthen the pelvic floor and prevent incontinence. Stretches, proprioceptive/balance exercises, and cardiovascular activity were also reportedly prescribed by respondents to their pregnant patients. The PARmed-X suggests warm up and cool down exercises be done and should include range of motion exercises for all major joints and static stretching for all major muscle groups. Regarding cardiovascular activity while pregnant, some alterations must be made as a result of reduced maximal heart rate reserve during gestation and modified target heart rate zones are provided in the PARmed-X for Pregnancy Guidelines. In a study by Wolfe and Weissgerber¹⁹ it was recommended that pregnant women engage in aerobic exercise regularly for at least 15 minutes, three days per week at the target intensity. Exercise frequency can be increased to four to five days per week and the duration can be increased to 25 to 30 minutes per session at the target intensity to increase maternal physical fitness. To illustrate the need for pregnant women to avoid exercising too frequently or infrequently, the study by Campbell and Matola²⁰ indicated that women who participate in structured exercise five or more times per week have an increased chance of delivering a low birth weight infant compared with women who exercised three or four times per week. Women who exercised two days or less per week were also at increased risk for low birth weight.

In a recent study by Stafne et al²¹ it was found that pregnant women who adhered to a prescribed exercise protocol (consisting of moderate intensity exercise of 45 to 60 minutes in duration, three days per week) tended to have lower weight, had a lower BMI, and reported less evening pain when compared with control women. While the two groups in that study were similar in terms of lumbopelvic

pain prevalence, the women who adhered to the exercise protocol had less disability compared to the women in the control group, taking less time for sick leave due to lumbopelvic pain.

Dietary and Nutritional Supplement Recommendation

Requirements for many, but not all, micronutrients increase during pregnancy.²² Chiropractors frequently provide nutritional and dietary recommendations to patients.² As a component of prenatal care micronutrient supplementation may reduce maternal morbidity and mortality directly by treating a pregnancy-related illness, or indirectly by lowering the risk of complications at delivery. Nevertheless, the effectiveness of supplementation programs, notably of iron and folate, has tended to focus on infant outcomes, perinatal mortality, preterm delivery, and low birth weight.²³ In the current survey multivitamins and folic acid were the most commonly recommended nutritional supplements to pregnant patients by respondents. This high percentage of respondents prescribing folic acid is in line with recommendations by the World Health Organization.²⁴ The WHO states that folate dietary allowances during pregnancy increase substantially, by 147%. This increase is necessary in order to build or maintain maternal stores and to meet the needs of rapidly growing maternal and fetal tissues.²⁴ The administration of folic acid in the periconceptional period reduces the number of births with neural tube defects by 75%²⁵; thus, folic acid administration is recommended as standard prenatal care by the International Nutritional Anemia Consultative Group. The maximum dosage for folate is 1000 µg/d.²³

Vitamin E and Vitamin A were each recommended to pregnant patients by approximately one in seven of this survey's respondents. The Food and Agriculture Organization/WHO recommended that the daily allowance for vitamin A be 20% higher for pregnant women than for non-pregnant, non-lactating women because of the extensive cell proliferation and development of the fetus.²⁶ One explanation for Vitamin E being prescribed less than other vitamins and supplements could be due to discrepancies in the literature. According to Ladipo²² Vitamin E supplementation is not needed in pregnancy because most diets containing plant oils, fruit, and vegetables should provide an adequate supply of Vitamin E, and pregnancy adds no further Vitamin E requirements or needs. Conversely,

the National Research Council²⁶ stated that Vitamin E is needed for fetal growth and they recommended that Vitamin E intake increase by 25% in pregnancy.

Additional nutritional supplement recommendations reportedly made by chiropractors to their pregnant patients in this survey, albeit at much lower rates, included eicosanoids (EEA's), combination fetal development and clearing remedies, Omega-3 and Omega-6 fatty acids, probiotics, vitamin B-50 complex, vitamin D, pre-natal vitamins, magnesium, vitamin B, and bioflavonoids. Referrals of pregnant patients to other health care professionals were also indicated by respondents such referrals as to the patient's other primary health care provider, or to a naturopathic practitioner, nutritionist, or registered dietitian for dietary advice.

According to the Food and Agriculture Organization's recommendations, the dietary allowance of Vitamin D for pregnant women increases 300% to account for the calcium deposition and bone mineralization occurring in the fetus.²⁷ Conversely, other sources, such as the Institute of Medicine²⁸ have indicated that vitamin D supplementation is likely not necessary during pregnancy except perhaps in high-risk population groups, for example, in women whose clothing limits exposure to direct sunlight and in women who live in northern latitudes with few hours of daylight. They also note that vitamin D can be toxic to both the mother and fetus if given in large doses during pregnancy, although the intake at which this occurs is uncertain because inter-individual sensitivity to excessive intake varies.²⁷ They recommend women take smaller, daily doses compared to a few large doses to decrease the risk of toxicity. Vitamin B6 and B12 deficiency rarely occurs (other than in strict vegetarians) so the FAO/WHO has not recommended additional requirements for pregnant women.²⁶

Adjunctive Treatment Recommendations

The most common adjunctive treatment recommended to pregnant patients was massage therapy, followed by recommendations for orthotics and trochanteric belts. According to the 2005 NBCE Job Analysis of Chiropractic, the rates of massage therapy utilization by responding chiropractors were 84.9%, compared with 81.8% for orthotics.² Additional recommended products included compression socks, kinesiotaping and pillows. Respondents also indicated referring their pregnant patients

to Traditional Chinese Medical (TCM) practitioners, naturopaths, nutritionists, or other chiropractic technique therapists at varying, albeit low, frequencies. Pregnant patients often present with a variety of conditions and the need for gynecological consultations, thus it is paramount that chiropractors and other health professionals work collaboratively.

Post-Partum Chiropractic Treatment

According to this survey, nearly 60% of respondents estimated that at least 80% of their pregnant patients return for chiropractic care after delivery. Post-partum patients are still undergoing hormonal and anatomic changes to return to the pre-pregnancy stage. Postpartum health is under-addressed by researchers, clinicians, and women themselves as approximately 90% of women report at least one health problem soon after delivery.²⁹ Conditions such as low back pain, urinary stress incontinence, fecal incontinence, urinary frequency, depression and anxiety, hemorrhoids, frequent headache and migraines cause distress for new mothers. Up to one third of women have reported back pain lasting up to three months after childbirth.³⁰ Chiropractors can assist post-partum women with musculoskeletal dysfunction and educate new mothers regarding new physical and mental challenges in order to cope and manage appropriately.

Limitations

There were several limitations to this study. Surveys were only sent to chiropractors who were members of the OCA within the GTA, thus it is possible that the results are not representative of the wider population of chiropractors across the country, particularly as the majority (85%) of respondents were graduates of CMCC. This is higher than the actual percentage of Canadian chiropractors who are CMCC graduates, which has decreased over recent years due to an influx of graduates from chiropractic educational institutions in the United States and internationally.¹³ Current data provided by the OCA indicated that 76% of their members province-wide were CMCC graduates (personal communication with KJS September 18, 2012). The large percentage of respondents who were CMCC graduates may have been influenced by a larger proportion of CMCC graduates practicing in the GTA owing to CMCC's location in Toronto. It is thus possible that our results could be influenced by a potential association be-

tween the educational institution where the majority of our respondents trained and their practice style. Furthermore, 54% of our respondents graduated between 1997 and 2011, compared with 60% of OCA members, while 46% of our respondents graduated either in or prior to 1996, compared with 37% of OCA members province-wide currently (personal communication with KJS September 18, 2012). The low response rate of 22.7%, and the relatively small sample size could again lead to questions as to whether or not the results may be representative of all Canadian chiropractors. Some technical difficulties were encountered when initially distributing the survey as well as the first reminder, which required two attempts when sending each e-mail message, and unfortunately that may have affected the response rates. We may have been able to increase the response rate by attempting a telephone call to those chiropractors whose e-mail messages were returned as undeliverable; however due to time constraints we were unable to do so. Finally, our results were only presented descriptively; future research could look for bivariate and multivariable associations between particular demographic variables and different treatment-related variables.

One strength of this study was that while the survey was only distributed to members of the OCA within the GTA, there was a good distribution of respondents across the GTA. In an attempt to improve response rates, this survey employed pre-notification, which Russell et al³¹ found to have a non-significant trend towards a higher response rate in previous surveys of chiropractors. Several e-mail messages were distributed to recipients and the response rate for this survey was within ranges previously reported in the literature for previous surveys of chiropractors, albeit well below the mean of 54% reported by Russell et al³¹. Russell et al³¹ found a significant association between the number of mailings of a survey and response rate by chiropractors, where surveys with fewer than three mailings had a significantly lower average response rate than those where three or more mailings were employed. We utilized four mailings (pre-notification, an initial mailing and two reminders) and offered survey results to respondents, a technique that has also been found to increase response rates³² and yet we still had a low response rate and this does potentially threaten the validity of our findings. One potential factor that may have been detrimental to our response rate was that this was an online study, which is a

convenient and cost-effective means of surveying potential participants but can have lower response rates than paper based surveys.³² Furthermore, it has been noted that health professionals are becoming increasingly resistant to completing surveys, with one reason being that some health professionals have simply instituted policies against completing surveys.³³ It has also been found that response rates tend to be higher in surveys that are personalized, have a deadline for completion, have some form of incentive, indicate that others have responded, or are not anonymous, and applying these principles may have helped increase our response yield.^{31,32}

Conclusions

This study represents the first known investigation into specific treatment usage by chiropractors on their pregnant patients. The chiropractors who responded appear to employ many different treatment techniques and modalities on their pregnant patients, many at a frequency similar to those reportedly used on non-pregnant patients. It is recommended that future studies employ a larger sample and include a larger population of chiropractors to obtain a representative sample of the profession and also investigate the stages of pregnancy that different interventions are employed. Further research into the utilization, safety, and effectiveness of chiropractic care during the pregnancy and post-partum periods is still necessary.

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