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- Introduction: succinctly describe the relevant literature supporting the need for the study.
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- Results: present the results of the study, without interpretation.
- Discussion: describe limitations of the study; interpret results; compare results to those of other relevant studies; discuss value and implications of the study.
- Inclusion of appendices is discouraged.

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- Provide documentation of permission for any figures that are not original.

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Reference format—examples

- *Journal article*: Jefferies LJ, Milanese SF, Grimmer-Somers KA. Epidemiology of adolescent spinal pain: A systematic overview. *Spine* 2007;32:2630-2637.
- *Book*: Task Force on Community Preventive Services. Guide to Community Preventive Services. New York: Oxford University Press; 2005.
- *Website/webpages*: Author. Title. Name of website. URL. Date of publication. Updated date (if applicable). Date accessed. Example: Fox F. Promoting and sustaining collaborative networks in pediatrics. Pew Research Center. <http://www.pewinternet.org/2013/06/14/promoting-and-sustaining-collaborative-networks-in-pediatrics/>. Published June 14, 2013. Accessed September 3, 2017.

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The abstract should be 250 words or fewer. It may be either structured or unstructured. If structured, use the same sections as described below for the components of the report (Introduction, Case Presentation, Intervention and Outcomes, Discussion).

Case Report Components

- **Introduction:** State why this case is unusual or important.
- **Methods:** describe the search engine and key words used to review previously published literature on the subject
- **Case presentation:** Provide a brief summary of the pa-

tient's presenting demographics, other relevant characteristics, complaint(s) and related symptomatology.

- **Intervention and outcomes:** Describe the course of treatment, including frequency and duration, and summarize the patient's clinical outcomes, using recognized outcome measures if possible. Include whether informed consent was obtained and if there were any adverse events reported.

- **Discussion:** Succinctly state the important aspects of the case, in terms of its implications for patient care in general, or for specific patient populations or conditions. You may also compare/contrast the case to other cases in the published literature. Be cautious about overstating the importance/implications of your case.

Evidence-based Case Report Instructions

An Evidence-based Case Report (EBCR) is NOT the same as a traditional case report. The EBCR focuses on an answerable clinical question, how it was explored in the search, appraising the results and how it applies to the case, along with the integration of this information with the patient interaction. The final stage in this process is to audit the results.

These are the steps to include:^{1,2}

- Brief summary of the chief complaint: 50-100 words
- Briefly describe the clinical case: 250-400 words
- Explain how you developed the clinical question: 200-300 words
- Explain your search for evidence (key words, databases used, number of articles retrieved): 50-100 words
- Evaluate the articles retrieved: critically appraise the evidence for validity and relevance: 200-300 words
- Describe how you made your clinical decision by applying these findings to the case, including how you considered and integrated the patient's preferences and values: 250-400 words
- Evaluate your performance: 50-100 words

1. Heneghan C, Badenoch D. *Evidence-based Medicine Toolkit*, 2nd ed. Oxford, UK: Blackwell Publishing, 2006.

<http://onlinelibrary.wiley.com/doi/10.1002/9780470750605.index/summary> (download pdf of "all chapters" for free copy of the publication)

2. Jones-Harris AR. The evidence-based case report: a resource pack for chiropractors. *Clin Chiropr* 2003;6 73-84. (download for free from www.chiro.org/cases/FULL/Evidence-based_Case_Report.pdf)

Additional interesting articles to read about EBM and writing and EBCR:

Review an example of an EBCR at:

<https://www.ncbi.nlm.nih.gov/uidm/oclc.org/pmc/articles/PMC1126937/pdf/302.pdf>

Iran J Pediatr. 2010 Sep; 20(3): 261—268. Evidence Based Medicine in Pediatric Practice: Brief Review

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3446038/>

J Can Chiropr Assoc. 2014 March; 58(1): 6—7. **Evidence-based case reports**

<http://pubmedcentralcanada.ca/pmc/articles/PMC3924510/>

3 BMJ. Vol 7, Issue 3, 2002, **Evidence-Based Medicine in Practice: EBM Notebook**

<http://ebm.bmj.com/content/7/3/68>

The unlimited potential of the mentor mentee relationship

By Sharon Vallone, DC, FICCP, Editor

Recently, I had a wonderful conversation with a young, highly motivated colleague who has played a role in linking up doctors of chiropractic with students of chiropractic in a mentor-mentee relationship. She was inspirational! Our talk was a walk down memory lane for me and a reminder of how much gratitude I have for those who have mentored me.

The Merriam-Webster Online Dictionary¹ defines a mentor as “a trusted counselor or guide.” In my personal experience it has been individuals who have helped me achieve educational and career goals, projects (like completing another issue of the JCCP) or general life advice with all out generosity of spirit. While in school, I was lucky enough to have a 10th Trimester student “adopt” me the first week of school and remain a friend for life as well as the wonderful chiropractor who cared for this penniless chiropractic single parent and her two children in exchange for hugs through my entire education. These mentors, along with Dr. Lorraine M. Golden, founder of Kentuckiana Children’s Center, who was the epitome of who I wanted to be as a chiropractor, kept me in school when I would have given up under the weight of just life in general.

But today, I really want to focus on mentorship and writing! My very first “paper” ever published was written by another author who used notes that I had taken in a class to create a paper and named me second author. Upon reflection, I was pleasantly surprised but didn’t understand how I deserved that status. That seemed too easy! Her explanation was that I had done the work of collecting all the data and made a substantial contribution to the writing of the paper. She wrote the paper with the information I gathered to show me that I had information worth sharing but it had to be presented in a venue where that information could be found. She continued to encourage me by saying, “now it’s time to step up and write something on your own. Stop being the student and become my colleague.” She sent me off with paper and pen to write!

So, I ventured out on my own and wrote a case report that was submitted to a prestigious journal who’s editor was kind enough not to laugh at my efforts (which would have, I promise you, probably kept me from writing anything else for a good long while and stick to what I did best - my clinical practice), but instead, he used his red pen and illustrated where I needed to make changes, rewrite, find more recent citations, etc. He walked me through, step by step how to write a decent case report before there were things like the C.A.R.E. Guidelines² to help guide me.

When complete, it did not meet the requirements for the original journal but he directed my submission to a more appropriate journal who accepted my submission.

Without the first mentor, I wouldn’t have attempted an article. Without the second mentor, I would not have continued to write. And without my current co-editors, I would not be able to coordinate the publication of this journal. They both are individuals who’ve mentored more students (including me!) over the years than I imagine they can even remember.

Mentors make amazing differences in people’s lives. I, like my colleagues, would like to encourage mentorship (as well as mentee-ship), to advance pediatric chiropractic by writing and publishing in professional journals. Whether conducting a randomized control study or writing a case report, your efforts are mentoring others in the field, expanding their knowledge, giving them guidance and encouraging them to try, try, and try again until you succeed (whether that’s being a better diagnostician, creating a successful treatment plan (and perhaps knowing when to refer), or using a new manual technic, perfecting your adjustment. You are an instantaneous mentor to anyone who reads your publication.

And we who would like to be mentored (whether in the art, science or business of chiropractic) or, perhaps, in writing, we need to be courageous and seek out a mentor and ask for their support. A mentor is not a “coach” but someone who takes a personal interest in our long-term growth, helps us see how to get to our goals without drawing out every detail, empowers and encourages us to stay with it until we accomplish our goals (which sometimes will require calculated risks! It’s great to have someone to bounce those off of!).

You, as a mentee, need to be prepared to focus on your project and be willing to hear your mentor’s feedback, without fear of their advice or critique whether or not it is “positive.” Listen, process and then take what you want and execute the recommended steps or changes, and leave the rest. You can always counter the advice with your reason why you want to do something or write the way you have written it. Mentor and mentee exchange intellectually, fostering curiosity and initiative. As a mentee, you have to commit yourself to take steps towards your own developmental progress and continued education.

Mentor and mentee commit to each other to be respectful, responsible and accountable to each other until the project is complete. For some of us, these relationships guide us

along our life process and not just a single project, but either way, the value of the relationship should never be underestimated nor unappreciated. I encourage you to look for and ask for support. Authors, look at papers that are similar to what you would like to write and contact the author or authors and ask if they might be willing to mentor you in your own efforts to publish. Mentors, please be open to communicating with potential mentees and sharing

your knowledge and leadership with them. Together, we will create a stronger foundation of chiropractic pediatrics whether in our clinical practice, in the publications of case reports and case series or academic commentaries, our research foundation or being awarded an advanced academic degree.

We work better together!

References:

1. Merriam-Webster Online Dictionary <https://www.merriam-webster.com/dictionary/mentor>.
2. Riley DS et al. CARE guidelines for case report: explanation and elaboration document. *J Clin Epidemiol*. Sept 2017;89:218-235.

Safety in chiropractic care for the pediatric patient: Can we rest on our reputation?

By Joyce Miller DC, Ph.D.

The top priority in chiropractic care for the pediatric patient, in fact, the only priority, is the safety of our care for that child. When I have spoken to a wide scope of clinicians and health care providers on this topic, I realized that they could not hear any details about our care until they were assured of the safety of our care. A hospital midwife familiar with our service and who referred many infants to our university-affiliated clinic* stated,

“Chiropractic care may not help EVERY baby,
but it will not hurt ANY baby.”

She based this statement upon her experience of years of cooperative care between the hospital and chiropractic clinic. It was very reassuring to hear that statement from a colleague. However, as clinicians who manage the most precious entity in the world, newborns, infants and children, we cannot rest on our past performance but must stay constantly updated.

The purpose of this editorial is to provide the briefest of reviews of the safety record of chiropractic manual therapy for children along with suggesting some reminders for maintaining safety within our practices. The goal is to improve confidence in the safety of our care, based on more than our personal experience, although that is an important element as well.

To be fair, I must start with a disclaimer. I cannot guarantee that this investigation is definitive because this is an editorial and not a systematic review, so it is a given that the search cannot be considered exhaustive, but based upon opinion (as well as word count) as to what is included or not.

Once upon a time, in what now seems to be ancient history, there were very few but very compelling reports in the peer-reviewed literature of harm to children treated by chiropractors. Table 1 lists specific published adverse events in chiropractic pediatric practice.¹⁻⁴

Description of event	Reference
1. 1959- 12 YOA girl with congenital occipitalization resulted in hospitalization	Vohra et al., 2007
2. 1978 - 7 YOA male with recurrent unilateral headaches, often following gymnastics, DC adjusted cervical spine in flexion and extension. Child suddenly became ill with severe occipital bifrontal headache, vomiting and left facial weakness. DC resumed cervical manipulation the following day, again accompanied by severe headache, vomiting and diplopia. Child hospitalized and radiographic studies found defect in distal basilar artery and occlusion of left vertebral artery in the middle of body of C2.	Zimmerman et al., 1978
3. 1983 — treatment of a 12-year-old girl with osteogenic imperfecta resulted in paraplegia	Vohra et al., 2007
4. 1992 — 4-month-old male with torticollis, first noticed 1 week after birth and termed congenital. At 16 weeks, taken to chiropractor. Baby was not able to extend his head when prone. Manipulation included flexion, extension, axial loading and unloading. On the day after treatment, baby was difficult to rouse from a nap and was limp, pale and moaning. Parents took him back to the chiropractor who manipulated again. He immediately began to moan and groan, developed a temperature and was taken to hospital with 39.3 fever, tachypnea (40) and tachycardia (160). He later had a generalized seizure. He was diagnosed with a spinal cord astrocytoma from C3-T8. He was on ventilation for 3 months; at 18 months of age, he was able to use his arms, but never his legs, resulting in paraplegia.	Shafir and Kaufman, 1992
5. 1940-1997: 19 cases of missed diagnosis or delayed medical treatment with three adverse events between 1940 and 1969	Vohra et al., 2007
6. 1992-1997: 16 cases of delayed treatment without adverse event	Vohra et al., 2007
7. 2012: 16 day old baby presented to chiropractor with colicky crying. Chiropractor adjusted the infant with an instrument. Five days later, the baby was presented to a pediatrician for “unusual bulges in the back.” X-rays found 2 posterior rib fractures.	Wilson et al., 2012

Table 1. Total of 8 adverse events (1940-2012) after chiropractic care reported in peer-reviewed literature.⁴

Table 2 shows audits that have been done of specific practice notes along with percentage of side effects.⁵⁻⁷

Table 3 shows systematic reviews of manual therapy for children and their conclusions.⁸⁻¹¹

Table 4 shows parent reports of side effects, in multiple chiropractic practices in two different countries.^{12,13}

Side effects are divided into three categories: (1) mild (transient and requiring no healthcare), (2) moderate

(requiring additional health care) or (3) severe (requiring hospital care).¹⁴

Mild side effects have been reported in chiropractic care for children in approximately 1% of cases. Mild side effects include increased crying for up to 24 hours after treatment, slight restlessness and most commonly, increased sleep.¹³ These are not considered outside of the norm in routine health care. Any event requiring additional medical care is considered an adverse event, and these have been exceedingly rare.

Number of side effects/number of patients	Auditor/Location/year
1 side effect/250 million patient visits	Pistolese/USA/1998
1 side effect for 7,303 patient visits	Jensen/EU/2003
0 side effects in 483 pediatric patient files	Coote/AECC Clinic UK/2003
1% of cases, >7000 pediatric patient treatments	Miller and Benfield/AECC Clinic UK/2008
1% of cases, >300 pediatric patient files	Rawson/AECC Clinic files, UK/2009
1% of cases in >300 pediatric patient files	Alcantara/ICPA files, USA/2011

Table 2. Side effects in chiropractic care for children found in clinical audits.^{5,6,7} An audit is research done on information that was gathered for a different reason. The problem with this is that it is secondary research and it is possible that the side effects may not be included in the record. For example, parents may have just quit care and not reported the side effect.

Conclusion of review	Auditor/Location/year
Serious adverse events from spinal manipulation (performed by chiropractors, osteopaths, physiotherapists, or medical manipulators) were 'exceedingly rare'	Todd, et al., 2015
Systematic analysis of the effectiveness and harms of spinal manipulation found "gentle, low-velocity spinal mobilizations seem to be a safe treatment technique."	Driehuis et al., 2019
Side effects of manual therapy are rarely reported	Parnell Prevost, et al., 2019
The incidence of mild adverse events ranged from 0.3% (95% CI: 0.06, 1.82) to 22.22% (95% CI: 6.32, 54.74). The risk of moderate and severe adverse events is unknown in children treated with SMT. It is unclear whether SMT increases the risk of adverse events in children < 10 years	Corso et al, 2020

Table 3. Systematic reviews since 2015 of safety of manual therapy for children.⁸⁻¹¹

Parent report of side effects or adverse events	Size and type of study (author)
There were no adverse events reported after chiropractic care in responses from 26,600 parents	Open government large survey in Victoria, Australia (Keating, 2021)
Eleven mild side effects reported in a population of 2001 infant patients treated by chiropractors	Prospective study of outcomes in 16 chiropractic practices in the UK (Miller et al., 2019)

Table 4. Side effects or adverse events reported by parents after chiropractic care.^{12,13}

The few adverse events reported in the literature occurred from one to eight decades ago (Table 1). Although a few authors have suggested that adverse events are under-reported, it is unlikely that parents are standing by and watching children being hurt and not speaking out. In fact, there are virtually no reports of legal suits against chiropractors from the pediatric age group of patients. It is an extrapolation, but my thought process suggests that chiropractors are staying educated and updated on recognition of red flags, gentle treatment procedures and safe practices in our youngest population of patients, and thus, continue to maintain safety in practice.

Potential harm in pediatric patients are the same as in all patients and usually stated in four categories:¹⁴

1. Failure to diagnose correctly
2. Delay of correct treatment (usually indicating delay of referral of an ill patient)
3. Misapplication of technique: too much force, poor skills, incorrect technique for the patient causing an unexpected effect
4. Accident — possibly involving office equipment not suitable for the size or age of patient or an unintended use

The incidents reported in Table 1 precisely demonstrate these four categories. What went wrong? In case 1, there was failure to correctly diagnose; manual treatment resulted in headache, unsteady gait, poor coordination and neck pain. The 12-year-old girl was hospitalized after chiropractic treatment and subsequently diagnosed with congenital occipitalization.

In case 2, the chiropractor failed to stop treatment and refer the patient after the 7-year-old developed headache, facial weakness and vomiting after treatment. After continuing chiropractic care, the child was admitted to hospital for treatment, but retained persistent right-sided dysmetria with reduced quadrantanopia (blindness in visual field) as long-term effects.

In case 3, the chiropractor applied inappropriate treatment to a child with osteogenic imperfecta, where manipulation is contra-indicated.

In case 4, the chiropractor failed to recognize signs of 4-month-old ill child, delayed referral for correct treatment, but instead applied a second treatment (after an adverse event) which resulted in life-long paraplegia.

Between 1940 and 1997, there were 35 cases of delayed treatment or referral for correct treatment resulting in three adverse events, which were not further defined. In 2012, a chiropractor likely applied an incorrect treatment with

too much force to a 16 day-old neonate. Rib fractures were subsequently diagnosed by a pediatrician after the mother noticed “odd bumps” in the baby’s back.

These cases come under a Legal Standard of Care, indicating that doctors of chiropractic (DCs) have the same ethical duty to recognize our own limitations and when necessary, recommend more appropriate type of care. The courts have determined the standard of care for DCs is the same that apply to physicians: “that degree of care, diligence, judgment and skills which is exercised by a reasonable chiropractor under like or similar circumstances.” As such, DCs must ensure that they have the necessary knowledge, skills and training to treat the patient’s condition, comply with regulatory and institutional policies and are legally authorized to provide the treatment proposed in the jurisdiction in which they practice.

A key rule in safety is to know when to stop treatment and to refer. Anytime a patient gets worse or fails to get better is the right time to stop treatment and to refer. Applying another treatment after an adverse event is always contra-indicated.

It is prudent to think about common issues in daily practice so that we don’t miss difficult cases. Failure to diagnose is a common issue and usually stems from inadequate history or examination that would identify illness resulting in diagnostic errors which delays correct treatment. A high index of suspicion is appropriate in all practice and the younger the age of the patient, the higher the index of suspicion should be raised. In our teaching clinic, we instituted helpful guidelines:

- Determine that it isn’t a serious or life-threatening condition before determining what condition it is; do a careful diagnosis, with thorough differentials, before instituting any therapy.
- Determine risk/benefit ratio before performing any procedure.
- Document heart rate, respiratory rate and temperature each visit to assess health of child
- In cases where research evidence is unavailable, the best way forward is a short (3-4 treatments) therapeutic trial. If improvement isn’t verifiable after the first or second treatment, reconsider the appropriateness of care. Always be willing to refer.
- The course of therapy must “beat” the natural history of the disorder; if the condition of the child worsens or stays the same, refer for a different type of care.

These simple guidelines will remind the chiropractor to take a pro-active stance to incorporate safe practice strategies into daily practice. It goes without saying that the safety and protection of all patients is our highest goal and we are

grateful for these types of discussion to keep this foremost in our minds.

The conclusion is the same as our previous discussion in 2009.¹⁴ At this moment in time, based on the published research literature, it appears that manipulation, when given by a skilled chiropractor with years of training,

carried out with low forces recommended for pediatric care, has few side effects for the healthy infant and child and their recorded incidence is exceedingly low.

Using fungible forms such as those presented by Miller and Weber in this issue is a helpful way to avoid mis-diagnosis.

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Improvements in developmental delay in a female child following chiropractic care: a case report and selective review of the literature

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ABSTRACT

Objective: To describe the improvement in developmental delay in a female child following age-appropriate chiropractic care for the assessment and reduction of vertebral and cranial subluxation. **Clinical features:** A three year four-month-old female was presented to clinic by her mother seeking help with concerns about communication and walking delay. Previous care included general practitioner visits and a speech therapist. Clinical assessment revealed she could partially manage two-year-old expected capacities. Additionally, vertebral and cranial subluxations were found. **Intervention and Outcome:** Age-appropriate chiropractic was delivered at seven visits over one month. Improvements in gross motor control, central sensitization, sleep, communication, balance, emotional regulation, and weight were noted. **Conclusion:** Chiropractic care involving touch and hold, cranial release and adapted diversified technique were associated with improvements in a child exhibiting developmental delay. Further research is warranted in this area including larger and more controlled sample groups utilizing validated testing tools.

Key words: developmental delay, chiropractic, pediatric, vertebral subluxation, spinal manipulation

Introduction

Child development can be subdivided into four domains, including: motor, speech and language, social/emotional and cognitive. Development in each of these areas can progress as either typical or atypical with developmental delay occurring when a child does not achieve their milestones in these domains in comparison to peers of the same age.¹ Kim et al. explain that developmental disabilities caused by central nervous system dysfunction are termed neurodevelopmental disorders with these individuals exhibiting difficulties in areas such as physical, linguistic learning and behavior.² Delay may be noted in a single domain or more than one. If delay is observed in two or more domains under five years of age, the child may be termed as having global developmental delay.³ This affects 1-3% of the population under five years of age, making it one of the most common conditions to present at pediatric clinics.⁴ Piek and Dyck found that a child diagnosed with one developmental disorder is very likely to meet the criteria for another developmental disorder as well.⁵

Delay can be classified as mild (functional age <33% below chronological age), moderate (34-66% of chronological age) or severe (<66% of chronological age).³ Alternatively, the delay is said to be significant if the child's performance is 1.5 standard deviations or more below age-expected norms.⁶ Early detection of developmental delay is of utmost importance because early intervention can prevent or reduce sequelae. The Bayley-111 scale is most widely used for assessment however evidence is mounting that

use of the scale may lead to possible misclassifications.⁷ The delay itself may be transient or sustained. If it is sustained, the child is at a higher likelihood to experience learning difficulties, behavioral issues and functional impairments in later life.⁶ Risk factors associated with developmental delay include: poor maternal health during pregnancy, infections, birth complications, genetic characteristics, trauma, exposure to toxins, maltreatment and possibly low socioeconomic status.⁶

The prevalence of such delays is estimated to be as high as 5-20% and have shown a gradual trend upwards in recent years.⁷ In a survey of children with developmental delay syndromes, over 65% of families reported current or past use of complementary and alternative healthcare options including chiropractic, diet modification and supplementation.⁸ The literature is beginning to show indications that poor muscle tone is related to postural disorders as well as sensory-motor and coordination disorders. While current literature regarding chiropractic care of children suffering developmental delay is limited, the evidence suggests that chiropractic care may be beneficial for this population.⁸⁻¹²

Chiropractors and chiropractic students recognize that the central focus of chiropractic care is to assess for and reduce nerve interference, caused by vertebral subluxation, to enhance nervous system function and support the optimization of health and well-being.¹³⁻²¹ The Australian Spinal Research Foundation conceptually define

subluxation as “a diminished state of being, comprising of a state of reduced coherence, altered biomechanical function, altered neurological function and altered adaptability.”²² A vertebral subluxation has been recognized as a complex of functional and/or structural changes in articulations of the spine and pelvis that compromise neural integrity and may influence organ system function and general health.²³ A vertebral subluxation represents an altered state of afferent input which can lead to maladaptive changes in central neural plasticity resulting in dysfunction.^{24,25} A vertebral subluxation may be characterized in various ways from a traditional misalignment, occlusion of an opening, pressure or impingement, and interference to the transmission of mental impulse, to tight vertebral muscles, reduced intervertebral movement and tenderness to touch.^{23,25} Vertebral subluxation correction is thought to be achieved through chiropractic adjustments (specific spinal segment contact high velocity low amplitude thrusts as opposed to manipulation with non specific contacts of spinal regions)²⁵ that are typically manually performed. Cranial patterns of subluxation have been reported in the literature for decades^{26,27} and textbooks are published on their assessment and correction.²⁸⁻³⁰ Chiropractic adjustments in infants and children are appropriately modified for age and stage of development.³¹

The purpose of this case report is to describe the improvement, using the CARE guidelines³², in developmental delay in a female child following age-appropriate chiropractic care for the assessment and reduction of vertebral and cranial subluxation.

Case report

History

A three year, four month old female was brought to the clinic by her mother with concerns about “communication delay and walking delay.” She further noted concerns with learning difficulties, achieving milestones, digestion/feeding, general co-ordination and balance, crawling/walking, hip/leg/knee/foot co-ordination, flexibility, and muscle tone (low). The child was co-managed with a general medical practitioner (GP) and speech pathologist and has a family history of siblings with autism.

Pregnancy history noted 4/5 anxiety levels (1=low, 5=high), 4/5 stress at work and home, fear of labour 4/5, 5/5 supported at home, 5/5 back pain through pregnancy, had a physically active job, didn't sit more than four hours a day, 5/5 morning sickness, no cigarette, alcohol, vaccines, or drugs used during pregnancy.

The child was the fourth live birth for the mother and was a planned Caesarean section. The mother noted she had high blood pressure, birth was in her place of choosing (hospital), that the fetus was in a breech presentation, and that it had

been engaged low in the pelvis for longer than three weeks pre delivery. The infant cried immediately after delivery, was reported as jaundiced, had a Vitamin K injection, and they remained in hospital for four days.

During the first eight weeks post-partum the mother reported that the infant recovered and slept well post birth, skin to skin was not achieved after birth, and the infant woke herself to have a feed. The infant's muscle tone was reported as average, regularly arched her back and head, and was diagnosed with “clicky hips.” The infant was formula fed, experienced colic/persistent crying, and experienced constipation with a lot of gas. There were no report of secondary exposure to tobacco smoke, no reported dermatological issues, or any medicines taken.

For the first two to twelve months the child preferred to play by herself, did not bang her head or have quick changes in temperament, and did engage in direct eye contact. She was transported in a pram predominantly and did not like tummy time. She did not reach their milestones at similar times to their peers. She continued to be formula fed. She had episodes of ear infections, tonsillitis, 39C plus temperatures, skin rashes, colic/reflux/excessive crying and persistent colds/flu. She began to use words at five and a half months, sat on their own at eight months, began crawling at eight months, and unsteadily walked with a very broad-based gait at three years. She had been diagnosed with global developmental delay with genetic duplications.

Between one and three years she experienced one hospitalization due to dehydration associated with gastritis. Her mother reported no reactions to her standard vaccination program. She reported the child has quick mood changes, tantrums, easy frustration, shying away from loud sounds. Physically she reported balance problems, walking problems, clumsiness, motion sickness and learning difficulties. Related to her immune system function, she reported the child has had chronic colds and the flu, ear infections/tonsillitis, upper respiratory infections, food sensitivities, and bowel challenges (diarrhea/constipation).

Relating to drawing, writing, and throwing, she is reported as right hand dominant, and uses eyes/ears/feet without a dominance displayed. She does not like to sit still for short periods and is hesitant on stairs. She frequently drops things, walks regularly on her toes, likes a heavy blanket, is weaker or tires easily compared to others and has difficulty with buttons or laces.

Clinical findings

Initial clinical assessment revealed a height of 96.5 cm (50th centile) and weight 12.5kg (25th centile). Vertebral subluxations were noted at C0/1, C5(P), T4, T9, and S1(P).

Hypertonic erector spinae were present between T9 & T11 on the right, and T12 & L2 on the left. Cranial restrictions were noted at her left frontal, bilateral sphenoid, bilateral parieto-occipital, occipital and sagittal suture. Her muscle stretch reflexes at C5, 6, 7 and L4, S1 were 2/2.

In terms of gross motor development, she could partially manage two-year-old expected capacities. This included squat and spring, bending and touching toes, but was unable to complete her associative arm swinging. She was unable to jump with two feet, heel or toe walk, or climb onto the table unaided. In terms of balance, she was able to walk carrying a toy, but was unable to stand with eyes closed or walk in a straight line.

A schedule of two visits per week for three weeks as recommended, including the initial visit.

Therapeutic intervention—chiropractic care

22-9-20 Visit 1: Her position of ease was seated on her mother's lap, so spinal and cranial assessment was completed in that position. No impulse was delivered on any vertebral subluxations found. However the cranial distortion patterns listed were gently facilitated manually towards improvement.

28-9-20 Visit 2: She slept well post adjustment and the mother reported that the father thought her walking was smoother. Seated cranial work was completed; touch and hold contact on an atlas AIRA listing and T4 and T12 were adjusted with an anterior thumb lift move. Home care was given including tummy time, using an inflated ball to lie on for variation in prone movement patterns.

1-10-20 Visit 3: Her mother noticed she's a lot calmer, movements and walking are better, sleeping better and waking up better; she stood with her eyes shut which she'd never done before. Seated assessment and adjustment on mother's lap. Right PI Innominate mobilization, T12 T3 anterior thumb lift, ASLA touch and hold, seated bilateral cranial scan.

6-10-20 Visit 4: Her mother reported she was moving and sleeping better, as well as moving and talking more. Seated assessment and adjustment on mother's lap. S2 Touch and hold, T12 6 2 anterior thumb lift, ASR touch and hold, seated bilateral cranial scan.

9-10-20 Visit 5: Her speech was noticeably improved. Seated assessment and adjustment on mother's lap. S3PR Touch and hold, L1LP touch and hold, T3 anterior thumb lift, ASLA touch and hold, seated bilateral cranial scan. Her mother said "I'm amazed at how well she lets you touch her head — no one else can do that, I have more challenges with that, especially doing her hair — although that has got

better" and "she's trying to jump".

13-10-20 Visit 6: She was talking more, using more sign language. Her gait continues to get less broad; sleeping a lot better, bending knees and ankle more effectively; her mother reported she had a two and a half hour sleep at lunchtime after her first visit, then went to bed at 9pm (never goes to bed that early), slept through, woke up happy, not holding her head. Seated assessment and adjustment on mother's lap. S3PR touch and hold, ASLA touch and hold, T9 and 3 anterior thumb lift, bilateral seated cranial scan. Review next visit

Follow up and outcomes

20-10-20 Visit 7- REVIEW VISIT: Her mother said the staff at the Early Childhood Development program noticed significant changes; the speech therapist noticed her speech had improved. She jumped for the first time this week. She was picking up sign language quicker and her mother says she was responding more accurately to questions. Mother reported that she was "moving her head a lot more freely, bending over and picking things up more easily." Her walking pattern is noticeably better — instead of swinging legs through with stiffness of her lower limb, she was activating hip, knee and ankle flexion and extension.

Review clinical assessment revealed a height of 97 cm (50th centile) and weight 13.7kg (25th centile). Vertebral subluxations were noted at C1 (ASLP), C5(LP), T2, L3, and S1(LP). Cranial restrictions were noted at the front-maxillary junction, bilateral sphenoid, occipital and sagittal suture.

Parent reported global health improvements included: sleep quality improved, waking brighter, general mood improvements, general behavior improvements, number of meltdowns decreased, posture improved, improved walking and general movement, pain or discomfort has decreased, strength/stamina has increased, fruit and vegetable intake increased, cold or flu frequency/duration decreased, mental energy levels increased, vitality improved, fewer run down days, physical energy improved, bounced back better from fatigue/stress. Her mother strongly agreed with the statements: "I feel my child is healthier and has stronger resilience," "I feel my child has a higher level of health overall," and "I feel more confident with my health decisions for my family."

Following discussion with her mother regarding care options a further six weekly visits was decided upon. Improvements noted over this time included improved eye yoking, climbing regularly (including into the pantry with the strength to open food containers which she couldn't previously do), and starting to run.

At her second review her mother decided to continue care on a twice a month basis. Her lived experience for her daughter under care is reported below as of July 2021.

“(child) was diagnosed with global delayed development. Before (child) started getting adjusted, she was able to stand for very short periods of times, but it was never long. Her mode of transport was she used to walk upright on her knees or crawl, her speech was very delayed, and she would only say a few words but that wasn’t very many. She was always very unsettled and quite stiff in her movements, she used to fall a lot too. As for getting her hair done or touching her head, she would never let you do this as it was way too sensitive for her. I noticed a massive improvement after her 1st adjustment, that she was a lot happier, her movements were a lot smoother, and she started talking more. It wasn’t long till she started walking, using more words, sleeping better, eating better, and her overall health dramatically improved almost overnight. She has been getting adjustments regularly now and she is walking, running, talking more, and is gaining fast on all the things she was behind in, I would highly recommend this, for (child) it has been life changing on all fronts, we now have a much happier chatty active child now.”

Discussion

Global health improvements were observed in a three-year-old female with delay in gross motor function, co-ordination and speech delays following a course of chiropractic care lasting three weeks. Care was warranted based on failure of the child to meet her milestones with appropriate timing and the clinical cranial and vertebral subluxation findings. Improvements included improved sleep, behavior, posture, general movement, and vitality.

Generally accepted therapies involved in the multidisciplinary approach to developmental delay include speech and language, physiotherapy, occupational therapy and behavioral therapy (psychology).³ Although pharmacologic agents have proven effective in improving some of the symptoms related to developmental delay, there are concerns about the long-term use of antidepressant as well as stimulant medications in children with these disorders.⁸

Regarding chiropractic care, although a review of the literature revealed a limited number of case series and case reports, all yielded positive results regarding developmental delay. The current report used a combination of treatment protocols including: ‘touch and hold’, modified diversified technique, cranial release maneuvers and home exercise. Aspects of these approaches have been used in the past by previous reports⁸⁻¹¹, although inclusion of other techniques such as Sacro-Occipital technique,^{9,10} extremity adjusting,¹⁰ craniosacral therapy¹⁰ and instrument assisted adjusting¹¹

have also shown positive results. In terms of duration of care, the current report is in line with previous reports which range from seven visits over twenty-four days¹⁰ to ten visits over sixteen weeks¹¹ up to forty-four visits over eight months.¹²

Outcomes noted in previous work have ranged from improvement of concentration, focus and impulse control⁸ to integration of primitive reflexes,⁹ improvement in milestone achievement¹⁰ and generalized improvement in delay. The current report shares improvements in speech and walking seen by Troy et al⁹ in a similarly aged male who was also partaking in speech therapy at the time of care. Whereas the previously identified reports focused more on sensory integration, primitive reflexes, and milestone attainment as their main results, the current report also includes improvements in areas such as: sleep quality, mood improvement, posture and having an overall higher level of health. These quality-of-life markers are of interest as they could be seen as signs that improvement in developmental delay is resulting in a child that is thriving.

A noteworthy finding was that mention was made in two reports^{8,9} that upper cervical and cranial release were seen to be pivotal in the reduction of delay symptoms. The current report includes cranial release as well as upper cervical release techniques which too resulted in improvement of delay markers.

Previously, the subluxation has been conceptually defined by The Australian Spinal Research Foundation as “a diminished state of being, comprising of a state of reduced coherence, altered biomechanical function, altered neurological function and altered adaptability.”²² It represents an altered state of afferent input linked to lack of appropriate joint motion¹⁰ potentially leading to maladaptive changes in central neural plasticity resulting in dysfunction.^{24,25} The effect of the chiropractic spinal adjustment is to normalize these altered joint functions. This in turn may optimize afferent information received by the central nervous system through joint mechanoreceptors from the periphery.^{10,25} If this can improve cerebellar input as well as input to the vestibular and then onward to the sensory and motor cortices, the higher centres will be able to integrate sensory and motor output allowing more precisely for improved engagement and adaptability with the environment.^{10,25} The outcome of this could be improved motor development, cognitive function, and social interaction.

Cranial patterns of subluxation have been reported in the literature for decades.^{26,27} It is hypothesized that cranial release techniques both restore optimum cranial motion which encourages normal flow of cerebrospinal fluid whilst simultaneously relieving reciprocal membranous

tension within the cranial structures such as the falx cerebri and tentorium cerebelli and reducing dural torsion.⁹ These changes may result in a normalization of neurological transmission, promoting neuroplasticity and more appropriate somatosensory filtering, processing and sensorimotor integration.²⁵ It has been postulated by Troy et al⁹ that by normalizing the sensorimotor integration and increased processing speed, the brain is able to process and integrate stimulation more efficiently potentially leading to normal brain maturation through improved cortical connectivity and synchronization.

Limitations

Single case reports have inherent limitations. Foremost among these are the lack of a control group and the potential

for spontaneous remissions. Although the diagnosis of global developmental delay had been given, clinical assessment and improvement were not graded with the use of a formal assessment tool. Rather, improvements were gauged by observations made by parent and chiropractor. The reader is cautioned as generalization of these findings to larger groups cannot be concluded.

Conclusion

Chiropractic care involving touch and hold, cranial release and adapted diversified technique were associated with improvements in a child exhibiting developmental delay. Further research is warranted in this area including larger and more controlled sample groups utilizing validated testing tools.

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Headaches in children: Part 2

The changing phenotypes of headaches in children

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ABSTRACT

Headaches in children are common and the prevalence is increasing worldwide. The phenotypes of headaches change throughout growth and development making differential diagnosis a challenge. Children of all ages experience headaches but these can be difficult to recognize and diagnose particularly in the younger ages. Early intervention addressing the chemical, mechanical and psychological factors contributing to an individual's headache is essential. This reduces the risk for central sensitization associated with chronicity and disability including the risk for headache in adulthood.

Key Words: 'Pediatric headache', 'Tension-type headache children', 'cervicogenic headache children', 'migraine headache children', 'new persistent daily headache children', 'ADHD headache childhood', 'headache vitamin D', 'manual therapy headache childhood', 'chiropractic headache'.

Introduction

This is a second article in a series to help the clinician recognize and understand the most common headache types that present in children. The first article described how migraine headache can present through age and development from infancy to adolescence.¹ The second article reports on the wide variety of headache types that afflict children along with therapeutic treatments.

Headaches are a primary source of disability worldwide in both children and adults² and are one of the most common pain syndromes in childhood.³ Children that suffer from headaches commonly have other somatic and emotional disturbances⁴ which together significantly affect quality of life for the child and their family.^{5,6} Children with headaches are less socially and physically active,⁷ and more often absent from school,⁸ which negatively affects academic achievement and eventually socioeconomic status.⁴

Appropriate early intervention is recommended as it has been shown to decrease the frequency, disability and chronicity of headaches.^{9,10,11}

Incidence/Prevalence of Pediatric Headache

Headache prevalence and the prevalence of frequent headaches in children is increasing worldwide.^{12,13} Headaches debut earlier now,¹⁴ and for a long time, it has been known that the prevalence increases with age¹⁵ peaking between 11 and 13 years.¹⁶

Co-Morbidities and trajectories

The World Health Organization recognizes headaches as a common disorder of the nervous system. A primary headache is one that is intrinsic to the nervous system¹⁷ and not caused by a secondary problem. Headache sufferers commonly have other somatic complaints and emotional

disturbances,^{4,18} which may change during growth and development. There is a high degree of co-morbidity with non-musculoskeletal and musculoskeletal disorders.^{18,19} These include asthma, respiratory disorders, hay fever, frequent ear infections, depression and anxiety,²⁰ low back pain,²¹ along with neck and shoulder pain.²²

There is co-relationship with physical inactivity; it acts as both a risk factor and a consequence of headaches.^{13,20,23} There is a higher prevalence of headache in the population of obese children.²⁴

Neuropsychiatric disorders commonly co-occur with headaches in childhood.¹⁸ Emotional problems and behavioral disorders in pre-school are over-represented in the headache population. Children with headaches often display features of hyperactivity, impulsivity, inattentiveness and the complex diagnosis of ADHD with learning disabilities.^{4,25}

Anxiety/depression and headache are bidirectional and present concurrently in children and adolescents.²⁰ Sleep disorders have a complex relationship with headaches, co-occurring commonly in children of all ages.²⁶ There is a relationship as well with Vitamin D and neurotransmitters in primary headache disorders and the regulation of sleep.²⁷

Diagnosis

The phenotypes of headaches differ between adults and children due the differences in myelination and cerebral maturation.²⁸ The most common types of headaches seen in practice reflect the triad of health. The major headache categories involve chemical, psychological and mechanical factors which activate the trigeminal nociceptive system resulting in a neuroinflammatory cascade causing and exacerbating headaches. The threshold for headache

decreases when more than one provoking factor is present simultaneously. A primary headache is caused by dysfunction or overactivity of pain-sensitive structures in the head, and is not a symptom of an underlying disease. Migraine headaches, tension-type headaches and new persistent daily headaches are common examples of primary headaches in children. A secondary headache is a headache that is due to an underlying condition, such as a neck injury, concussion, an infection, or rarely, a serious underlying medical condition.

One primary headache form is a result of a complex neurochemical, neurovascular disorder.²⁹ Another primary headache form has more of a psychological profile^{25,30} and a common secondary headache form is due to biomechanical dysfunction involving the cervical spine.⁹

Migraine headaches and tension-type headaches are by far the most common types of primary headaches in children.³¹ Migraine headaches are more common early on in childhood while tension-type headaches predominate in adolescence. Symptoms change and overlap significantly during growth and development which raises the question whether these are actually expressions of one disorder (the continuum model)^{32,33,34} or if they are separate disorders as described by the ICHD II and III Beta criteria.^{35,36} Genizi's (2016) results support the theory of the continuum model for migraine headache without aura and tension-type headache and differentiates these from those suffering from a mix of the two headaches concomitantly.³⁰ Other studies describe adolescents with headaches more often as highly motivated over-achievers.³⁷ (Migraine with aura appears to be a uniquely separate entity and this is supported by several studies).³⁸

Migraine headache subtypes in children are described in more detail in part I of the headache series.¹ Migraine headache is a complex neuronal disorder resulting in a release of inflammatory neurotransmitters and vasodilation.³⁹ Migraine with aura is distinguished by the presence of transient, focal neurological symptoms that usually precede or accompany the migraine headache.⁴⁰ The aura is a reversible neurological disturbance affecting different senses, often vision, sensation and speech function. Visual disturbances, in the form of scintillating crescents occur most often,⁴¹ followed by a sensation of pins and needles migrating in the body, numbness and aphasia.⁴² In children, these usually occur unilaterally, while adults experience them bilaterally.

The phenotype of migraine headache changes with age and development.¹ It is associated with such significant morbidity that it has received the majority of attention in research on headaches.³ Tension-type headache and cervicogenic headache are also common in children but

generally less disabling. It is not unusual for a child to experience more than one headache type simultaneously, though when combined with a migraine headache, a more severe headache is experienced.

Tension-type headache (TTH) is a primary headache disorder which presents in childhood and becomes the most common primary headache in adolescence. Tension-type headache is considered to be coupled to psychosocial stress.⁴³ It is described as a mild to moderate headache in intensity and is experienced as a pressing headache with pericranial tenderness.⁴⁴ This is a recurrent headache which can be infrequent, frequent or chronic. A frequent headache is experienced 1-14 days per month while a chronic headache is experienced more often than 15 days a month. Bendtsen proposes a pathophysiological model for chronic TTH.⁴⁵ The peripheral nociceptive input drives central sensitization and once this loop is established, elimination of the peripheral nociception is not sufficient to interrupt the central sensitization. This results in increased pericranial muscle activity or release of neurotransmitters in the myofascial tissues. This is thought to be the mechanism responsible for the conversion of frequent TTH to chronic TTH. Jensen emphasizes that tension-type headache is a multifactorial disorder with several concurrent pathophysiological mechanisms, and that extracranial myofascial nociception may constitute only one of them.⁴⁶ Obesity, sleep disturbance, behavioral and psychiatric problems have all been linked with childhood TTH. There is an increase in frequency and disability of headaches as body mass increases.⁴⁷ Overweight and obesity lead to an inflammatory state in the body which acts to perpetuate the trigemino-inflammatory cascade.

Psychopathological symptoms also affect children with TTH particularly anxiety and depression.⁴⁸ Behavioral problems include concentration difficulties, hyperactivity, conduct disorders and poor emotional regulation.⁴⁹ Children with tension-type headache have been found to have significantly higher levels of somatic symptoms and family problems.⁵⁰ Family problems can cause insecure attachments which are related to cognitive affective regulation deficits and alexithemia.⁵¹ Alexithemia is significantly more common among children with TTH.⁵² This is described as having difficulty with verbal emotional expression, or difficulty identifying their feelings. Studies have not found a linear transmission of alexithemia between mother and child, but have found mood and anxiety disorders common in parents of children with headaches.⁵³ Children with TTH are generally more shy and less sociable having more behavioral, emotional and temperamental difficulties.⁴⁹

TTH has been associated with antenatal maternal smoking, problem behavior at 3.5 years, higher body fat, and being bullied at 11 years.⁵ Being bullied has been shown to

result in an inflammatory process in the body which can perpetuate the trigemino-inflammatory cascade which hallmarks headaches.⁵⁴

TTH lacks significant associated vegetative symptoms as seen in migraine headaches in children. TTH is less severe, and is not associated with the disability seen with migraine headache. Parents may not even be aware that the child is suffering from headache and therefore, do not seek care.⁵⁵ Due to issues with communication, it may be difficult to understand that younger children are having headaches.

The International Classification for Headache Disorders (ICDH-III) presents headache diagnostic criteria and pediatric experts agree that the most recent edition lacks sensitivity for headache types for the child under six years.⁵⁶ The diagnostic criteria have not been modified for TTH in children as they have been for migraine headache. The criteria for TTH are listed in Table 1.

10 episodes in a life time
Attack lasting 30 min to 7 days
Pain characteristics include:
Bilateral location
Mild to moderate intensity
Not aggravated by physical activity
No associated nausea, vomiting, photo or phonophobia

Table 1. Diagnostic criteria for Tension-type headache.

Headache episodes in children are commonly shorter in duration than in the adult, but increase with age.

TTH presents equally among boys and girls in preadolescence⁵ but with the onset of puberty the prevalence is higher among girls. Boys in preadolescence experienced more headache pain than girls did.⁵ The higher HA prevalence among girls in adolescence is thought to be due to hormonal changes,⁵⁷ but the influence of hormones on tension-type headache is much less than in migraine headache. Gender differences in cognitive and social reactions to pain are considered to influence reporting of headaches.⁵⁸

New persistent daily headache (NPDH) is a primary headache disorder whose signature is an abrupt onset of headache which persists daily for at least three months. It more commonly lasts for 10-12 months with a spontaneous resolution within 24 months.⁵⁹ Incidence is higher in children and adolescents than in adults⁶⁰ though it is uncommon in children under 10 years of age.⁶¹ Strong's 2021 study indicated this type of headache is more common among white females which raises the question of socioeconomics in health care in the United States.⁶² Do

other less advantaged groups of females have the same access for care? Onset of NPDH appears to be related to school start in the fall and the winter months with an identifiable specific trigger.⁶³ Pathogenesis is unknown but pro-inflammatory cytokines and cervicogenic dysfunction are thought to be involved. Two common triggers identified were stress related to an increase in school work, a minor head injury and an infection.⁶¹ Studies are now identifying patients recovering from COVID-19 who are suffering from NPDH⁶⁴ which may influence the numbers of patients presenting with this type of headache. The pain is constant and lacks specific characteristics though it has some migrainous features making misdiagnosis common. It is difficult to treat and highly disabling, with conflicting results regarding pharmaceutical therapy.^{65,66} To date, no studies have been identified which evaluated the effect of spinal manipulation on this type of headache.

The etiology of secondary pediatric headaches is multiple and when these are combined with other headache forms the clinical picture becomes complex. Contributing factors include but are not limited to infections, trauma, vascular disorders, substance use/withdrawal, psychiatric conditions, sleep disorders, family disharmony, stress and spinal dysfunction.⁶⁷ A minority of headaches (0.5—1%) are secondary to undiagnosed emergent intracranial abnormalities.⁶⁸ It is essential that the clinician seeing pediatric patients with headaches recognizes and refers out in a timely manner a child presenting with a malignant headache. These causes of secondary pediatric headache are seen in Table 2.

Cerebellar dysfunction
Features of increased intracranial pressure
New neurological deficits
Possible brain tumor
Night epilepsy
Waking up due to a severe headache
Personality changes

Table 2. Red Flags for headaches in children.

Ocular headaches are a common cause of headache which need to be assessed by a specialist.⁶⁹ These headaches usually present following prolonged ocular tasks.⁷⁰ Excessive use of digital media has resulted in a rise in adverse physical, psychological, social and psychoneurological health including impaired vision in children, obesity, poor stress regulation and poor sleep.⁷¹ All of these factors influence the prevalence of headaches and need to be addressed for resolution.

Blood pressure measurement is an important part of the examination and can rule out high blood pressure as a cause

of headache. In adolescents a blood pressure greater than 130/80 mm/Hg is considered hypertension. The prevalence of hypertension in adolescents is about six percent and nearly doubles in adolescents who are obese.⁷² Adolescents presenting with high blood pressure should be screened for underlying medical disorders, particularly, diabetes, cardiovascular and kidney diseases.⁷²

ADHD and primary headache disorders commonly co-occur, are significantly disabling impacting quality of life, impairing cognition, emotion and behavior.⁷³ The relationship between migraine and psychiatric disorders are bidirectional; one enhances the occurrence rate of other.⁷⁴ Some findings support the hypothesis which proposes that association between migraine and ADHD operates via hyperactive-impulse behavior pattern and sleep disturbances.⁷⁵ Uyar Cankay's study further indicates a negative effect of a hypersensitized pain axis among individuals with severe headache on cognitive functions.

Medications for ADHD can result in high blood pressure, headaches and sleeping problems⁷⁶ highlighting the need for diligence during history and examination. Medication use for headaches is common in adolescence and is strongly influenced by parental use of analgesics.¹⁹ Taking pain medication 10-15 times a month, for longer than three months can result in a medication overuse headache.⁷⁷ This is a new headache or a worsening of a pre-existing headache.⁷⁸ Pharmaceutical therapy lacks efficacy and evidence in children, and is associated with adverse effects.⁷⁹ Headache diaries are recommended to track information including medication use to help get a better understanding of the headache.⁸⁰

Lyme neuroborreliosis is a tick-borne infectious disorder of the nervous system caused by *Borrelia burgdorferi* spirochetes. It is endemic in many areas and in children commonly causes a headache, Bell's Palsy and or neck stiffness.⁸¹ This is an important headache to rule out as it can progress to an irreversible neurological condition.

Nutritional deficits can commonly cause headaches. Recognition and resolution are critical in management and are considered first line of treatment for pediatric headaches.⁸² Celiac disease in children is often undiagnosed, results in nutritional deficiencies and often presents with headache.^{83,84}

Vitamin D deficiency is a global problem and highly over-represented in the headache population of both children and adults.⁸⁵ It is a common cause of headache and musculoskeletal pain. Vitamin D controls over 200 genes and has an important role in reducing inflammation.⁸² Vitamin D has several different functions in the body. Important functions include activating the immune system,

maintaining brain and bone health⁸⁶ as well as controlling the neuromuscular system.⁸⁷ Magnesium is an essential cofactor for Vitamin D synthesis and normal levels are critical for Vitamin D utilization.⁸⁸ D vitamin deficiency is directly coupled to headaches and musculoskeletal pain syndromes by propelling the body into an inflammatory state.⁸⁹ Vitamin D and magnesium are cofactors which when working together reduce an inflammatory state decreasing pain and headaches.⁸⁸ Vitamin D also influences the release of neurotransmitters and neurochemicals directly involved in migraine headache pathology, anxiety and depression.^{90,91}

Sleep and headache have a complex and extensive interrelationship where both headache and sleep disorder may be manifestations of a same systemic dysfunction.⁹² The interaction between sleep and headache is powerful and an elevated comorbidity between these two disorders is found in children.⁹³ There is a clear relationship between obstructive sleep apnea (OSA) and snoring and morning headache.⁹⁴ The assessment of children with headache should always include a thorough sleep history for the child. Successful treatment of headache in children and adolescents requires an integrated method of evaluation and management of both disorders.⁹³ Treatment of headache cannot be optimized without attention to sleep hygiene and sleep disorders. A sleep questionnaire should be part of every chronic headache evaluation.⁹⁵

Cervicogenic headache (CEH) is a secondary headache characterized by unilateral headache and symptoms and signs of neck involvement.^{35,96,97,98} It is often worsened by neck movement, sustained awkward head position or external pressure over the upper cervical or occipital region on the symptomatic side.^{96,97} The pathogenesis of CEH may originate from various anatomic structures in the cervical spine. Convergence of afferents of the trigeminal and upper three cervical spinal nerves onto the second-order neurons in the trigemino-cervical nucleus in the upper cervical spinal cord is likely to lead to the headache.⁹⁹ The pathogenesis and etiology of CEH remain a challenge as different structures can be causative as opposed to a single entity.¹⁰⁰

Due to significant phenotypic overlap, differentiating CEH from primary headache disorders such as migraine or tension-type headache, or other secondary headache disorders, can be clinically challenging. Cervicogenic headache commonly coexists with other headache types potentiating the headache making them less resistant to treatment.

Mechanical dysfunction of the cervical spine is one of the primary causes of recurrent neck pain and/or headaches causing a cervicogenic headache.^{101,102,103} The findings in adults with cervicogenic headache include faulty head

posture, cervical joint dysfunction (CJD), trigger points (TPs) in associated cervical paraspinal muscles, and reduction in cervical range of motion.^{101,104,105,106,107,108,109} Forward head posture is a deviation from normal leading to forward head carriage which acts to strain the upper cervical spine and can be a cause of neck pain and headache.^{110,111,112} Children with recurring headache were found to have cervical joint dysfunction.¹¹³ Trigger points or focal points of increased tension in a muscle, when present in the cervical spine, can also lead to neck pain and/or headaches.^{114,115,116,117,118,119,120,121} Studies indicate that the upper cervical spine is the primary area of dysfunction in adults with cervicogenic headache.^{101,106,107,122,123,124,125,126,127,128}

These factors are not only a cause of neck pain and/or headache, but they can initiate or exacerbate both migraine headaches and tension-type headaches.^{112,114,115,116,120,121,123,124,125} Cervicogenic headaches commonly become chronic. This is thought to be the result of the production of proinflammatory cytokines which contribute to neuronal sensitization resulting in chronic pain syndromes.^{120,129,130}

Because the cervical spine influences all three headache types, its importance should not be underestimated.^{115,131,132}

Treatment: Manual therapy, Pharmaceuticals and Nutraceuticals

Recurrent headaches result in significant suffering and economic consequences both for the health care system and the families affected. This is despite the fact that the vast majority of patients with headaches do not seek medical care. Manual therapy is the most common non-medical treatment requested by patients¹³³ and guidelines dictate non-medical care as a first line intervention for children.¹³⁴ Lyngé's is the first large scale randomized controlled trial evaluating the effect of spinal manipulation on headaches in children. The results indicated that children with headache had a reduction in headache frequency as well as a better global perceived effect than children who received validated sham manipulation.¹³⁵

A holistic approach to treatment encompassing the associated factors and co-occurring conditions with headache is critical to success. It is equally important that this is addressed at an early stage to reduce the frequency, disability and chronicity of headaches.^{10,136}

Identifying and addressing the mechanical, chemical and psychological triggers that may reduce the disability and chronicity associated with the different headaches should begin in infancy. For the inconsolable infant with a history of a traumatic delivery, mechanical dysfunction should be assessed and addressed. This reduces nociception from mechanoreceptors overloading the trigeminocervical

nucleus. For children, a detailed history of trauma which could have influenced the cervical spine is essential to understand the biomechanics contributing to headaches. Palpation by a chiropractor skilled in pediatrics would confirm these results or be the clue to revealing trauma which is no longer remembered.

Infants should be assessed for signs of allergy/intolerance and the status of the developing microbiome (antibiotic or pharmaceutical exposure, mother's microbiome, immune status).¹³⁷ These factors affect the gut and act to perpetuate nociception in the enteric nervous system and for some cause a migraine headache. In the child, allergy or intolerance may present with stomach ache, delayed growth, with skin conditions, excessive mucous production, hematochezia, constipation and/or loose stools.¹³⁸

Children who have social difficulties may experience stress and possibly be exposed to bullying. This would be optimal to address to reduce the inflammatory state associated with this.

Medication use for headaches is common in adolescence and is related to medication use in the family.¹³⁹ With regular medication use, developing a medication overuse headache is a risk.¹⁹ Education of teenagers is important to avoid this secondary headache by restricting medication to at most 2-3 times a week.⁷⁸

The current pediatric guidelines recommend non-medical alternative treatment for pediatric headache.¹³⁴ Treatment with prophylactic and/or acute migraine with drugs is often unsatisfactory and counterproductive with a potential for toxicity.^{79,140} The role of diet is important before initiating long term pharmaceutical therapy.¹⁴¹ Working to achieve an optimal weight will reduce inflammation associated with overweight and obesity. There are nutraceuticals which have been shown to be effective in treating headache without associated adverse effects. Besides vitamin D and magnesium, these include L-tryptophan, niacin and vitamin B2.¹⁴² Another recommended combination is magnesium with pterin, andrographis paniculate and coenzyme Q10.¹⁴¹

It is interesting that several studies have shown an association between headache occurrence and seasonality.^{61,143,144} This occurrence has been attributed to the stress of starting school in the fall and winter, but it is possible there exists a correlation with vitamin D deficiency.

The neuromusculoskeletal result of spinal dysfunction can initiate or perpetuate a primary headache. Noxious input from the cervical spine can activate the trigeminovascular system resulting in a neuroinflammatory cascade^{140,145,146} potentiating the process occurring in another headache.

Appropriate treatment for age and development is effective in reducing the disability of headaches.¹⁴⁷ This includes instruction in normal posture, exercises to strengthen the spine and education in proper ergonomics. There was a decrease in duration, intensity, and frequency of headache as well as medication use with manual therapy including chiropractic manipulation.^{146,148} The reactive tension in the cervical paraspinal and suboccipital muscles also contribute to the ongoing pain cycle and is important to address in treatment.¹⁴⁹

The threshold for pain decreases with multiple contributing factors, highlighting the importance of recognizing and addressing triggers in the three primary areas (mechanical, chemical and psychological) mentioned. Proper treatment early on can reduce and interrupt the disability and chronicity associated with pain sensitization.¹⁵⁰

Management of headaches should be multimodal, addressing the central and peripheral pain sensitization generators.¹⁵¹ Manual therapy in the form of chiropractic spinal manipulation has been shown to be effective in reducing headaches in children and is an example of managing the peripheral mechanism, or the bottom-up strategy.¹³⁵ The top-down strategy, or addressing the central mechanism is needed with central sensitization, changing how the brain interprets afferent input. Different modalities may be used, but stress, sleep and exercise are the main top-

down interventions used for the management of chronic pain.¹⁵²

Besides skills in manual therapy, holistic management is important for success in treatment. This includes educating families in the area of sleep hygiene, stress management, regular mealtimes, adequate nutrition, sensitivities to certain foods and chemicals, regular physical activity and in appropriate cases, along with addressing the consequences of obesity.

Conclusion

Headaches in children are complex and multifactorial. There are different headache types that children suffer from and it is not uncommon that these headache types both change during growth and development and co-occur, creating a disabling state. The changing phenotypes of headaches can make them difficult to interpret, particularly in young children. Recognizing headaches early as well as addressing the peripheral and central mechanisms which activate the headache are important in avoiding central sensitization and chronic headache. Inflammatory states potentiate the nociceptive trigeminovascular cascade particularly in cases of vitamin D deficiency, obesity and abuse, all of which will be critical in management. Identifying and treating psychological and mechanical stressors will reduce the frequency, intensity and medication use associated with headache. Finally, helping families to understand and avoid the specific triggers for their child will reduce the disability of headaches and improve the quality of life for the family.

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Demographic Profile of Chiropractors and their Pediatric Patients in Cyprus: A Cross—sectional Survey

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ABSTRACT

Background: Pediatric chiropractic care is a popular special interest within the chiropractic profession. Ongoing observational research is important for gathering demographic information on this patient population as well as characteristics of the chiropractors that provide such care. This study investigated the profile of pediatric chiropractic patients in Cyprus and the chiropractors who treated them over a four-month period in 2019 and 2020. **Method:** All 16 members of Cyprus Chiropractor's Association (CyCA) were invited to participate in the two-part observational cross-sectional study. Retrospective data of pediatric patients was anonymized and a separate chiropractor's characteristics survey was completed. **Results:** One hundred and fifty-one pediatric anonymized case records were collected from nine Cypriot chiropractors in the interval November 2019 - February 2020. Patient characteristics showed a slightly higher male to female ratio of cases with adolescent and school age groups having the biggest representation for musculoskeletal (MSK) issues followed by infants with a variety of conditions. Positive outcomes in terms of physical activity levels and reduction of pain were reported by patients within one to five treatments. Data shows a male dominance (11 males:5 females) in the CyCA organization. However, there were equal numbers of male and female chiropractors (5 of each) treating pediatric cases. All chiropractors were graduates of USA, Australian and UK institutions. Members had an average of 23.8 (SD=13.19) years in practice. All chiropractors reported advanced degrees in pediatric practice or had updated continued professional development. **Conclusion:** The country of Cyprus has one of the smallest chiropractic associations in the world with only 16 members. Nevertheless, both the demographic profiles of the chiropractors and their pediatric patients revealed strong similarities to other European chiropractic practices. Demographic studies every five years would be beneficial for making longitudinal observations and recommendations for the Cyprus Chiropractic Association (CyCA) in addition to comparing international results.

Introduction

Pediatric chiropractic care is a popular special interest within the chiropractic profession. While there is strong clinical evidence for efficacy of chiropractic care in general, there is less evidence for the use of chiropractic care for children. Understanding the characteristics of chiropractic practitioners and the kids they treat is relevant and can add to the research base. Ongoing observational research, including national surveys are important for gathering demographic information on this patient population, their conditions and age groups, as well as characteristics of chiropractors that provide such care. Collecting such information can help to shape chiropractic education and advise others on the scope of chiropractic practice. Additionally, highlighting the practice and treatment characteristics of the profession within the wider pediatric health landscape will provide a more comprehensive understanding of where such specialized practice sits within this bigger picture.

To date, existing cross-sectional studies have provided demographic information, referral patterns to and from a chiropractor, medications prescribed by medical doctors, conditions seen, duration of care and satisfaction rates. However, despite some work in this area, there remains

a paucity of global or regional cross-sectional surveys of representative samples of pediatric patient profiles within the chiropractic profession and none in Cyprus. Therefore, this study will address the lack of demographic /characteristics data from both chiropractors and their pediatric patients within the country of Cyprus. The purpose of this study was to build upon the existing European chiropractic pediatric demographic studies in order to potentially inform the national association and wider pediatric arena.

Currently only a single multinational paper focused specifically on chiropractors delivering pediatric care was identified.¹ In a globally focused scoping review for the entire chiropractic profession, Beliveau et al., (2017) reported details from a small number of pediatric studies.² While some of this information is present for North America and Europe, consistency across the seven world regions adopted by the World Federation of Chiropractic (Africa, Asia, East Mediterranean Middle East (EMMME), Europe, Latin America, North America and Pacific region) is not available.

In Europe only a small number of cross-sectional studies investigating pediatric patients attending a chiropractic

clinic to receive chiropractic care have been completed but the majority of these surveys make a call for further research.^{3,4}

The ramifications of musculoskeletal (MSK) conditions are well known and accepted as a global public health issue. Acknowledging the MSK impact on physical health and mental health in all ages is important.⁵ However, this information has not been as well documented for the pediatric population. Research suggests that addressing such issues in a timely manner is essential to avoid chronicity of such issues.⁶ Recent studies indicate that the assessment of pain and functional abilities is useful for all doctors to identify. This information can help support those suffering with multimorbidity in receiving an appropriate and timely diagnosis. It can also help patients get correct treatment of their MSK conditions.⁷

According to the available chiropractic demographic studies in pediatric age groups, the majority seek chiropractic care for MSK issues.⁸ In a pan-European study, 57% of the total complaints were classic MSK issues, including neck and back pain as well as extremity sprains and strains.⁹ Appropriate documentation of each case includes information such as injury or episode onset, duration, previous care and treatment outcome. This also helps highlight the cases that are more prone to become chronic and may need multidisciplinary care. In addition, documentation of the number of treatments, satisfaction outcomes and success rates (both short-term and long-term) are equally important information. This data can help determine the cost-effectiveness of chiropractic care and show how utilizing this treatment could potentially reduce the MSK burden on each country.¹⁰

Hestbaek et al., (2009), Miller (2010) and Moksness and Miller, (2017) identified similar findings of MSK complaints being common to all ages except in infants that typically presented to chiropractic offices with complaints of excessive crying or colic.^{4,11,12} In four out of six European studies on chiropractic care for pediatrics, the most common age groups requiring chiropractic care were infants and young toddlers, 0-23 months.^{3,4,11,12} Adolescent age groups, represented a bigger proportion of the pediatric population treated by chiropractors in two other studies.^{8,9} Thus, at present, there is a mixed picture of the most common age group presenting to a European chiropractor. It appears that infants and adolescents are the most commonly seen age groups.

Methods

The method of choice for this paper was an observational retrospective cross sectional design to examine the demographic and characteristic profile of children presenting to chiropractic offices and the chiropractors

delivering their care. The period of November 2019 to February 2020 was chosen to observe. This was the last four months prior to the Covid-19 Pandemic lockdown in the country of Cyprus. Cypriot chiropractic patients' aged 0-17 years of age whose first consultation had taken place within that timeframe even if their treatment plan was not completed, were chosen to study. These patients were chosen to allow for a wide range of cases for this study.

The recruitment of chiropractors to participate in the study was done via communication with the Cyprus Chiropractor's Association (CyCA). All of the CyCA members were invited to voluntarily participate in this two-part study. The first part was completion of the chiropractor's characteristic survey. The second part was completion of the pediatric demographic questionnaire, for the eligible patients.

All personally identifying data was removed before delivery to the researcher. This information was collected by the individual chiropractor and recorded in an Excel spreadsheet. It was saved on a password protected USB stick to be kept secured for a minimum of 12 months or until publication of the study and then destroyed. Ethical approval was obtained via the AECC university committee and the Cyprus Bioethics committee.

Results

All 16 CyCA members completed and returned the survey (100%; N=16). Nine of the members were treating pediatric cases. 69% (N=11) of the CyCA association doctors were male. The years in practice for all CyCA members varied from 5-40 years, with no recent graduates. The CyCA had 44% (N=7) of its members who graduated from USA schools, 44% (N=7) graduated from UK schools and 12% (N=2) received their DC degree from Australian institutions. In this study, pediatric cases represented less than 10% of the total patient load for the CyCA members.

All nine Chiropractors who reported treating children had some further training in chiropractic pediatric post graduate education, either as a single or series of Continued Professional Development (CPD) courses. One member had a MSc in this area. During the study period, one member who would normally be seeing pediatric patients was not included as there were no relevant cases. Of the nine chiropractors in the study, the four male chiropractors saw a range of pediatric cases who were school age and adolescent ages with primarily sports-related complaints. This was compared to the five female chiropractors who saw mostly infants as well as the other age groups.

Pediatric cases

The results were based on 151 pediatric cases aged 0-17 years. Most commonly reported reasons for these children receiving chiropractic care were MSK conditions such as

neck/headaches, lower back and extremity injuries. The ages of those with these MSK complaints were school age (N=31) and adolescent (N=80). In the infant (N=22) category, colic pain, sleep and feeding issues were the most common conditions.

Chronicity was highlighted both in the school age and adolescent groups where this was defined as pain or discomfort that continues for more than 12 weeks. This chronicity affected the levels of physical activity in 51.6% (N=78) of the patients. In the adolescent group, 17 patients made regular use (at least 1/per week) of painkillers for their particular MSK issue.

In total, 53% (N=85) of the sample population had previously seen another health practitioner for the same condition. These included a pediatrician (N=25), physiotherapist (N=24) or orthopedist (N=20). The referral pattern in the country of Cyprus to a doctor of chiropractic was predominantly by friends and family members who themselves had previous experience with chiropractic care (66%, N=101). In total, 19% of referrals were directly from other healthcare professionals (pediatrician, physiotherapist, podiatrist and orthopedists). Only 15% of the total referrals were directly from sports coaches, dance teachers or personal trainers.

Chiropractors referred 16% of the total sample for co-management with other healthcare providers, particularly in cases of scoliosis (co-managed with orthopedists) and infancy related conditions (co-managed with pediatricians).

On average most conditions seen in the pediatric population were treated by the chiropractors for 1-5 sessions (N=108). In the time frame November 2019-February 2020, 67 of these pediatric cases were said to have been completed successfully. Success was measured in terms of symptom reduction and increase in physical activity levels (where appropriate).

Most chiropractors in this CyCA study provided exercise (N=106) and nutritional advice (N=19) and age-appropriate neurodevelopmental rehabilitation (N=12) in addition to their in-clinic care.

Discussion

Four other studies have previously reported on the profile of chiropractors who treat pediatric patients.^{1,9,13,14} No other studies achieved a 100% return rate, although they did have a much larger potential population. Low response rate is commonly seen in cross sectional studies and this can have an impact on the strength of evidence. Although other studies had significantly larger numbers, the population of Cyprus chiropractors are represented well with a 100% response rate for the pre-covid 19 period November 2019-

February 2020. In this study, the majority of chiropractors were male. This is similar to other national studies. More than half of the 16 CyCA members have been treating pediatric cases. Male chiropractors demonstrated more focus on sport-oriented school age and adolescent cases whereas females treated all ages including infants. All the doctors of chiropractic were graduates of European, USA and Australian schools with some undergraduate pediatric education and additional postgraduate pediatric education in the form of CPD's from accredited European or USA courses. This level of pediatric education could potentially explain why these children with these conditions were treated and had care outcomes that were similar to other European and USA cross sectional studies.

In terms of proportion of practice, 5-10% of Cyprus chiropractor's practices were made up of pediatric cases. Caseload was similar throughout most surveys with 8.2% in Europe, 8.7% in Switzerland and 8-15% in the rest of the world.^{1,2} Pohlman (2010) pointed out that specialty practices with pediatrics as a focus had a caseload of 31.7%.¹³ This again may be reflective of additional age-specific education that would be expected to be common in a professional specialty.

Age and gender of the pediatric patients treated were similar in Cyprus to all other studies, with a slight predominance of the male patient in bi-modal distribution peaking in the infant and adolescent age groups. This was also found in all other demographic studies. Infants are over-represented in mature chiropractic practices largely due to difficult births and difficulty with breastfeeding in the first days, weeks and months of age.¹⁵ Likewise, in the teen-age years, the MSK health may be compromised by athletic activities, sedentary lifestyle and an increase in stress levels.¹⁶

As in other studies, back, neck, headaches and extremity pain were the most typical conditions in the adolescent group (12-17years). The findings in this study for referral to chiropractic care echoes current literature. It also finds that family members or friends commonly recommended chiropractic care for MSK issues. In this study, the adolescent group was occasionally referred by other professionals (coaches, pediatricians) and they often reported pain on and off for more than three months. Adolescent-age patients also reported the use of analgesic or over-the-counter medication. They reported that their MSK complaints had a negative impact on their perceived level of physical activity (sports, leisure and activities of daily living). Chiropractic care resulted in improvement of function and reduction of pain within three and five treatments by which point the patient was discharged. This was determined by chiropractors' re-examination and patient reporting of increase in physical activity and decrease in initial pain using a VAS scale. Parents of the infants treated by these

chiropractors, reported a reduction of crying episodes, better sleep and better feeding habits as outcomes.

In addition to manipulative treatment, patient education information was given in the form of exercise and postural advice. Reflecting on the high percentage of families and friends referring pediatric cases, it can be hypothesized that there is a positive level of satisfaction for chiropractic care. Unfortunately, robust conclusions cannot be drawn as the members of CyCA did not formally record the level of satisfaction reported by parents/patients or guardians about the care and its outcome. This can be further developed in the future.

It is evident that there is some inter-professional referral pattern; however, this appears to be low. Most pediatric cases were brought to a chiropractor on the suggestion of family members that themselves had previous experience with chiropractic care.

Addressing public health issues such as chronic pain, physical health and obesity has been well supported by members of the CyCA. This can be seen from their care outcomes (addressing acute and chronic pain), advice provided (ergonomic/postural advice, exercise and health advice) and co-management referrals (e.g., nutritionist) to better patients' health.

Recommendations for the future

The World Federation of Chiropractic (WFC) estimated that the chiropractic population globally was 103,469 in 2017.¹⁷ A global study is needed to assess the exact number of chiropractors with special interest in pediatrics and to gather information on those patients' characteristics. A global cross-sectional study is needed to draw comprehensive conclusions.

Given the limited studies in this arena, some reference bias

exists as each article referenced and utilized the same sources. Repeated surveys are needed to gain information from new chiropractic professionals as well as more experienced ones and to observe any changes in presentations or practice patterns over time. Remaining up-to-date is essential in evidence-based practice, hence repeating such studies every five years can be recommended.

Limitations

This study was a small cross-sectional study using retrospective data. This study was originally intended to be prospective in nature but due to Covid 19, this was not possible. This may have limited the accuracy of demographics over the time period. Additionally, having the chiropractors self-complete the surveys assumes that correct details were included from each case and not completed from memory. Perhaps a prospective cross-sectional study could have been better as the information would have been fresh in the chiropractor's notes and mind. However, the similarity of findings to much larger studies in the rest of the world suggests that chiropractic practice of pediatrics in Cyprus reflects global practice.

Conclusion

The country of Cyprus has one of the smallest chiropractic associations in the world with 16 total members. Nevertheless, both the demographic profile of the chiropractors and the patient profiles of their pediatric patients revealed strong similarities to the wider European chiropractic practice. Chiropractors in this study reported updated continued professional development or advanced degrees in pediatric practice. Pediatric patients presented to Cypriot chiropractors reported good results within one to five treatments. Demographic studies every five years would be beneficial for making longitudinal observations and comparing the results. Studying patient outcomes and rates of satisfaction are important dimensions for follow-up.

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Mastitis : a guide for the chiropractor working with the breastfeeding dyad

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INTRODUCTION

In 2021, it is generally acknowledged that the promotion of breastfeeding provides multiple benefits for the mother and child, both psychological and nutritive.^{1,2}

The World Health Organization promotes initiating breastfeeding immediately after birth and exclusive breastfeeding for the first six months of life with breastmilk remaining a staple supplement to a whole foods diet until the child's second birthday. Health benefits associated with the nutritional and bioactive components in human milk are many and dependent on breastfeeding duration.^{3,4}

Duration of breastfeeding is influenced by social and physiologic factors including, and for our purposes in this paper, pain. In a study of 1,323 mothers who stopped breastfeeding during the first month postpartum, 29.3% cited pain and 36.8% identified sore, cracked, or bleeding nipples as an important reason.⁵

Many mothers recognize that breast milk provides the ultimate nutrition and protection for the infant; however, a significant proportion of women experience difficulties breastfeeding, some of which lead to weaning the infant.⁶ Lactation mastitis is one of the sources of pain for many lactating women, and, unfortunately, a frequent cause of cessation of breastfeeding.⁷ Efficient and rapid management of these issues are critical in ensuring success for the breastfeeding dyad.⁸ The purpose of this paper is to discuss mastitis and the role of the chiropractor in supporting breast health and facilitating resolution of these issues in the postpartum, lactating female. Practitioners such as chiropractors and osteopathic physicians have played an important role in the reduction of pain and restoration of proper biomechanical function as well as serving as a portal for natural health care in the diagnosis, management and collaborative referral of patients for both conventional medical and integrative therapies.⁹⁻¹¹ As such, it is an important aspect of the chiropractic practice when working with the breastfeeding dyad to not only be educated in the differential diagnosis of breast pain or breastfeeding dysfunction as well as appropriate therapeutic management.

ANATOMY OF THE LACTATING BREAST

Gray's Anatomy describes the lactating breast of glandular

and adipose tissue held together by a loose framework of fibers called Cooper's ligaments. The lobes are composed of lobules, which consist of clusters of alveoli containing lactocytes (mammary secretory epithelial cells) that synthesize breastmilk. The adipose tissue of the breast is typically situated between lobes rather than within lobules. The alveoli are connected to very small ducts that join to form larger ducts draining the lobules. These larger ducts finally merge into one milk duct for each lobe. Then under the areola this single milk duct is depicted as widening into a lactiferous sinus before narrowing at the base of the nipple and terminating at its orifice on the surface of the nipple.¹² The milk ducts in the lactating breast are small (mean 2mm in diameter), superficial and easily compressed.¹²

INFLAMMATORY DISEASE OF THE BREAST

According to the WHO guidelines, plugged ducts, also referred to as blocked or clogged ducts in the literature, and mastitis are different "stages" of breast inflammation during lactation caused initially by blockage of the lactiferous ducts.⁴ This blockage can be caused when ducts are compressed or milk is not efficiently removed from the breast and milk stasis can ensue. Compression can be caused by a variety of factors ranging from systemic inflammation to restriction/compression from tight clothing (like a tight brassiere). Inefficient removal of milk can be influenced by something as simple as mother's lack of knowledge about positioning the infant at breast to more complex biomechanical or oral motor dysfunction of the infant due to subluxation or joint dysfunction or muscular compensations due to the presence of tethered oral tissues.¹³ Stress, fatigue, postpartum thyroid dysfunction, anemia and a weakened immune system have also been associated with the formation of plugged ducts.¹⁴ Table 1 (following page) lists many of the possible factors that could contribute to the development of mastitis in the breastfeeding mother.

Education and guidance on mechanical milk expression (by hand or electric pump), breastfeeding ergonomics and on what a good latch looks (and feels) like as well as evaluating how efficient the infant's latch and transfer are can be provided by a professional educated in lactation support. All of the aforementioned causes of mastitis might require the collaboration of the lactation consultant and another appropriate health care provider to resolve the problem.

A plugged duct may have a gradual or sudden onset. The breastfeeding mother, her lactation consultant or other health care provider, including her chiropractor, may palpate a tender lump the size of a pea. If the plug has formed close to the nipple where the duct exits the nipple a small blister or “bleb” might form. Alternatively, the breast

may be generally sensitive to the touch in one area without palpating a nodule. Occasionally, they may be a stringy discharge from the nipple (it would be a RED FLAG if accompanied by excess mucous, pus or blood). The infant may frequently detach from the nipple or seem frustrated when feeding from the affected breast because the milk flow

Anatomical variants - maternal	<ul style="list-style-type: none"> • Short nipples • Flat nipples • Inverted nipples • Very large nipples • Very elastic nipples • Previous breast surgery
Anatomical/physiologic/neurologic variants resulting in inefficient or injurious (compressive) latch–infant	<ul style="list-style-type: none"> • Torticollis • Asymmetric movement of the mandible • Tethered oral tissues (i.e. tongue tie, lip tie, buccal ties) • Birth injury • Stroke • Jaundice (lethargy)
Direct compression of the breast by mother	<ul style="list-style-type: none"> • Fingertip compression during hand expression too forceful • Bruising from overzealous or inefficient hand expression
Direct compression of the nipple by infant	<ul style="list-style-type: none"> • mechanical compression from a poor or shallow latch where the lips and/or gums are compressing the nipple only and not encompassing the full nipple and areola • biomechanical dysfunction of the infant due to subluxation • oral motor dysfunction • muscular compensations due to the presence of tethered oral tissues
Engorgement	<ul style="list-style-type: none"> • Hyperlactation • Missing a feeding • Inefficient emptying of breast by infant or pump but frequently stimulating the breast • Weaning too quickly
Ergonomics	<ul style="list-style-type: none"> • Position of infant at breast
Factors causing external compression/restriction of the breast	<ul style="list-style-type: none"> • Tight clothing (brassiere, sling for babywearing) • Improperly sized nipple shield • Improperly sized breast pump flange • Holding the flange of the breast pump too tightly against the breast • Failure to understand hand expression
Failure to empty breast	<ul style="list-style-type: none"> • Failure to understand how to use breast pump • Improperly functioning breast pump
Systemic Inflammation/edema--maternal	<ul style="list-style-type: none"> • IV administration during labor • Gut dysbiosis • Food intolerance • Underlying infection • Lymphedema • Autoimmune diseases • Postpartum thyroid dysfunction • Stress (high cortisol levels) • Fatigue • Anemia • Weakened or over-reactive Immune System

Table 1. Possible factors contributing to mastitis in the breastfeeding mother.

may be reduced due to the presence of the blockage or due to a change in the taste of the milk. (<https://www.medela.com/breastfeeding-professionals/education/building-and-maintaining-milk-supply/blocked-ducts>).

A plugged duct may also occur if there is damage to the nipple due to repeated compression from poorly fitted flanges or nipple shields, inflammation in the mother from other issues like food sensitivities, allergies, systemic infections like candida albicans, illness or from oral motor dysfunction of the infant (like tongue tie or other restrictive tethered oral tissues (rTOTS). Loss of integrity of the nipple can result in the point of entry for bacteria or yeast into the ducts resulting infection and blockage.

Initially, mastitis is an inflammation of the breast that is most commonly caused by milk stasis (obstruction of milk flow) rather than infection (bacteria or yeast entering the breast, multiplying and causing a blockage). Although a plugged duct may be painful, when it is accompanied by changes in skin color or temperature (red, hot, “streaking” - a burst of red, hot, sensitive “lines” radiating away from the site of the plug) it has potentially advanced to mastitis. Non-infectious mastitis can usually be resolved without the use of antibiotics. However, the World Health Organization suggests that in a breast from which the milk has not been effectively removed, non-infectious mastitis is likely to progress to infectious mastitis and from there to abscess formation.⁴

Infectious mastitis may require pharmacologic intervention with antibiotics. An abscess could also require surgical intervention, if not dealt with quickly and effectively. Antibiotics present their own challenge when required, as first, they treat the infection but don’t necessary clear the blockage and, secondly, they often result in disruption of the healthy microbiome and its subsequent ramifications ranging from gastrointestinal distress, increases in inflammation to disruption of the critical functions of the immune system.¹⁵

To support the chiropractor when evaluating a patient with pain associated with breastfeeding, The Academy of Breastfeeding Medicine provides an excellent outline of the appropriate history questions and physical examination to establishing a differential diagnosis.¹⁴

COLLABORATIVE CARE

Collaborative care of the breastfeeding dyad should be a part of every chiropractor’s treatment planning. Optimizing lactation support is essential in women with mastitis and chiropractors are a potentially excellent source of information and referrals for collaborative care when patients present with breastfeeding dysfunction.

First and foremost is the recognition of the professionals, International Board Certified Lactation Consultants (IBCLC), who are exclusively trained to support the breastfeeding dyad.¹⁶ According to the IBCLC, their certifying agency, an “International Board Certified Lactation Consultant functions and contributes as a member of the maternal-child health team. They provide care in a variety of settings, while making appropriate referrals to other health professionals and community support resources. Working together with mothers, families, policymakers and society, IBCLC certificants provide expert breastfeeding and lactation care, promote changes that support breastfeeding and help reduce the risks of not breastfeeding.” (<https://ibclce.org/about-ibclce/>).

Patient education is an important part of any therapeutic protocol to prevent or treat plugged ducts and mastitis. Empowering the patient with tools for self-care is one of the roles of the lactation consultant and any other health care provider in a supportive role to the breastfeeding mother.

Manual interventions such as those used by chiropractors and osteopathic physicians for breastfeeding dysfunction have been described in the literature and address many of the biomechanical causes of oral motor dysfunction in the breastfeeding infant.¹⁶⁻¹⁸ Oral motor dysfunction often results

Timing	<ul style="list-style-type: none">• The mother has been recently hospitalized.• The neonate is less than 2 weeks of age.
Integrity of breast/nipple	<ul style="list-style-type: none">• Breast feels hot to the touch• The inflammation (mastitis) appears in both breasts.• There is broken skin on the nipple with signs of infection (redness, inflammation, pus).• Blood or pus are present in the milk when expressed.• Red streaking is present on the breast.
Other signs/symptoms of infection	<ul style="list-style-type: none">• Chills• The mother’s temperature is suddenly elevated.• The mother is experiencing flu-like symptoms (muscle or joint pain, headache, lethargy).• Sudden, severe onset of symptoms.

Table 2. Red flags in chiropractic management of women with mastitis.

in compensatory behaviors that may compress the nipple resulting in the development of a plug of coagulated milk and ultimately, these compensations of the infant can result in the loss of integrity of the breast making it vulnerable to infection. It can also be hypothesized that manual therapies like chiropractic and osteopathy can address edema and biomechanical dysfunction as a result of the ergonomics of the postpartum lactating female potentially also reducing the risk of developing a plugged duct.

There are also other health care professionals who also utilize ancillary treatment like acupuncture, supplements and herbs, homeopathy, essential oils, manual lymphatic drainage, Kinesio taping, ultrasound and low level laser techniques to support recovery. Additional references for complementary and alternative approaches are provided in Table 3. These are not home care approaches to be undertaken without appropriate supervision/advice but can be trialed if the patient is not responding to self-care approaches

Intervention	Link	Notes
Acupuncture	<ul style="list-style-type: none"> • A Short Guide on Acupuncture & Herbs for Mastitis • A Five-step Systematic Therapy for Treating Plugged Ducts and Mastitis in Breastfeeding Women 	Acupuncture is often combined with other treatment, particularly herbs.
Herbs and supplements	<ul style="list-style-type: none"> • A Short Guide on Acupuncture & Herbs for Mastitis • Humphrey, Sheila. <i>The Nursing Mother's Herbal</i> (2003 paperback) • Topical curcumin for mastitis • Thai herbal compress • Herbal compresses • Omega 3's • Cabbage leaves 	Immune system-stimulating herbs such as echinacea, anti-inflammatory herbs like curcumin or cabbage leaves or supplements like the Omega 3's, adaptogenic or tonic herbs such as ginseng, and vitamin C are often recommended.
Essential oils	<ul style="list-style-type: none"> • Plant essential oils' effect on mastitis 	Most research on essential oils focuses on dairy cows and is often extrapolated to nursing mothers. WARNING: Although often recommended, great care needs to be paid to the potential toxicity of the infant ingesting oils from contact with the breast.
Homeopathy	<ul style="list-style-type: none"> • Homeopathic treatment of plugged ducts and mastitis 	
Manual lymphatic drainage	<ul style="list-style-type: none"> • Comparison of manual lymphatic drainage and kinesiotape on postpartum breast engorgement 	
Kinesiotape	<ul style="list-style-type: none"> • Same as above • Does Kinesio Elastic Therapeutic Taping Decrease Breast Engorgement in Postpartum Women 	Although there is a paucity of literature supporting the use of K-Tape in treating mastitis, clinical experience has demonstrated success in reducing edema which can be one cause of mastitis.
Ultrasound	<ul style="list-style-type: none"> • Ultrasound as a treatment of mammary blocked duct • Ultrasound for postpartum breast engorgement 	
Low level laser	<ul style="list-style-type: none"> • Low level laser for breastfeeding problems • Low level laser for nipple pain in breastfeeding women 	

Table 3. Supplementary resources for complementary and alternative interventions for mastitis.

based on clinical experience despite mixed literature reviews.^{25,26} Obstetricians, primary health care physicians, naturopathic physicians, physical therapists, homeopaths, acupuncturists, herbalists, ayurvedic practitioners and massage therapists are just a sampling of other healthcare providers who can provide support to the breastfeeding mother should pain associated with breastfeeding arise and the chiropractor should refer appropriately and in a timely fashion and can work collaboratively to assure the best outcome for their patient.

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IF PAIN and FEVER persist referral to a qualified medical or naturopathic physician is advisable. Allopathic interventions include Ibuprofen to reduce pain and inflammation. Be aware that ibuprofen can mask the flu-like symptoms which indicate systemic infection (fever, body aches, chills). If your patient has these symptoms, they may need to contact their OB/GYN/Midwife or PCP who may prescribe antibiotics. Some alternatives or additions to antibiotics offered by IBCLC's and CAM providers are below:

- **Raw garlic:** 4-5 garlic cloves per day; allicin, the chemical property that gives garlic its strong odor, also has antimicrobial properties that have been shown to be effective against infection. Raw garlic is preferred over garlic capsules. Tip: chop garlic finely and swallow using juice.¹⁹
- **Elderflower, yarrow, and peppermint:** This combination of herbs is excellent for treating mastitis when there is engorgement or an overabundance of milk. The yarrow is very astringent and helps slow the milk production. The herbs have antimicrobial and antipyretic activity. These can be used in addition to garlic. Only use 1-2x as yarrow can slow milk production. Herbal tea: <http://herbsandremedies.com/recipes/detail/elderflower-peppermint-yarrow-tea>. This formula is best taken as a tea made of equal parts of the herbs.
- **Vitamin C megadose:** 3000-5000mg of vitamin C daily. Increase dose to "bowel tolerance" (meaning, until stool loose).²⁰
- **Echinacea tincture:** Echinacea has immune boosting properties. Administer 3-4 times per day. Can be given in capsule or tincture form.²¹
- **Fermented Cod Liver Oil:** 1 teaspoon twice a day during the infection to combat inflammation.²²
- **Breastfeeding probiotics:** multiple studies have shown that probiotics (specifically lactobacillus strains) are effective in both preventing and treating mastitis.²³ This is the example of a specific product designed for breastfeeding mothers
- **Adaptogens:** In cases of recurrent mastitis, there may be underlying immune system compromise, stress being the issue (especially sleep deprivation and handling the rest of the families' needs when postpartum and nursing). Ashwagandha is a great long-term adaptogenic herb that helps the body deal with stressors (both physical and emotional) which tax the immune system. B Vitamins are also important (and knowing if your patient has the MTHFR genetic mutation. If the patient is not able to methylate their B vitamins, appropriate vitamins need to be prescribed: methyl folate, methylcobalamin, Pyridoxyl-5-Phosphate (P5P)).²⁴

Figure 1. Commonly used complementary herbal/nutritional treatment for women with mastitis.

Self-Help for Nursing Moms with Plugged Milk Ducts

- **BREASTFEED! Nurse frequently or nurse on demand.** If the breast is not fully emptied after the feed or if you can still feel the plug with your fingertips, then hand express or pump to expel the plug.
- **Massage:** excellent video and research on gentle self-massage and hand expression (emphasis on gentle): <https://vimeo.com/65196007> & <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.865.2838&rep=rep1&type=pdf>.
- Apply **vibration** to the affected area: again, very gently apply light vibration (the back of an electric toothbrush, a personal vibrator, a child's vibrating toy) moving from the chest towards the nipple.
- **Silicone hand pump** (i.e. haaka: Fill haaka with enough warm water so that when suctioned onto your breast, your nipple is submerged in water. Add 1-2 tablespoons of epsom salts. Suction onto breast for 15-20 minutes. Epsom salts are frequently used to reduce pain and swelling, which can also help a clog loosen. (**Note: discard solution afterwards — babies cannot drink the milk that is expressed*).
- **Position** your baby with their chin pointed to the plug (using football, cradle or koala hold) or nurse side-lying with the plugged breast on top (lie on your right side if the left breast is plugged and nurse the baby from the left breast). Medela provides an excellent outline of these ways to hold your baby to nurse and “dangle feeding” is another helpful possibility! <https://www.medela.com/breastfeeding/mums-journey/breastfeeding-positions>.
- **Cabbage leaf compress:** cabbage leaves can play a role in reducing the pain and inflammation of mastitis. Crack fresh, clean green cabbage leaves and place them inside your bra against the inflamed tissue and plug. Do not cover the nipple. Leave them in for 20 minutes. Remove and wash breast (discard leaves). Repeat 3 times during the day. **Note: Cabbage leaves are also used to help dry up milk supply, so if you're hoping to continue breastfeeding, be sure to follow this time guideline—DO NOT exceed it.*
- **Alternate moist heat and cold compresses before nursing or pumping:**
 - o Take a warm shower or place a comfortably warm moist compress on the breast to help loosen the plug (think melting butter). Apply for only 3-5 minutes to avoid increasing inflammation.
 - o Cold compresses: apply the cold pack to the breast (not the nipple). Cold helps decrease inflammation and pain. Be sure to have a cloth barrier between the ice pack and breast. Don't apply ice for longer than 3-5 minutes or the brain will think you are going to suffer frost bite and will flood the area with warm blood causing swelling again.
- **Castor Oil Pack Therapy:** Instructions: <http://www.drmmomma.org/2010/02/castor-oil-pack-therapy>.
- **Hydration:** Drink lots of fresh water! Avoid dehydration! You can drink coconut water, bone broth or clear soups, or a pinch of sea or Himalayan salt and squeeze of lemon in your water.
- **Rest:** Ask for and accept help with meals, holding the baby (between feedings), and companionship for other children at home. Rest is crucial! Your body needs rest to fight infection and heal.
- **Sunflower Lecithin:** this is a supplement that is thought to be an emulsifier, which essentially means it may decrease the thick stickiness of breastmilk, encouraging expression of plugged ducts. Talk to your healthcare provider about appropriate doses for you.
- **Homeopathy:** OTC remedies are often recommended in social media for plugged ducts (Phytolacca) and mastitis (Belladonna) but a consultation with your health care provider who practices homeopathy for potency and frequency is advised rather than self-prescribing.
- **Essential oils—WARNING:** Although often recommended, great care needs to be paid to the potential toxicity of the infant ingesting oils from contact with the breast.

IF ALL MEASURES FAIL AND PAIN, REDNESS, STREAKING OR INFLAMMATION PERSIST, YOU SUDDENLY HAVE A FEVER OR FEEL LIKE YOU HAVE THE FLU, OR YOU SEE BLOOD OR PUS IN THE MILK YOU EXPRESS CONTACT YOUR HEALTH CARE PROVIDER IMMEDIATELY!

Figure 2. Self-Help for Mothers with Mastitis

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Chiropractic history and examination forms for the infant, pre-school, and school-aged child

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ABSTRACT

The assessment of the pediatric patient is a specialized area of chiropractic practice, requiring additional knowledge and skills. In recognition of this, European Academy of Chiropractors' special interest group for Pediatrics have developed basic history and examination forms for the infant, pre-school, and school-aged child. The aim of these forms are to assist the chiropractor to identify red flags and to triage musculoskeletal and non-musculoskeletal complaints in these age groups. The process of development of the forms is outlined, and the three forms are presented in this article.

Key Words: infant examination, pre-school examination, school age child examination, chiropractic, pediatric history form, pediatric examination form, pediatric red flags.

Introduction

Chiropractic education typically includes a cursory level of education within pediatrics¹ which varies from institution to institution. Practitioners interested in pediatrics can pursue additional education through continuous education courses (continuing professional development), a diplomate, or a Master's degree, through a range of providers. Surveys have shown that the majority of practitioners see children of all ages, but feel they have inadequate skills in assessment and treatment.¹

Triaging musculoskeletal (MSK) and non-MSK complaints is of the highest priority when assessing the pediatric patient.² Some apparently-MSK presentations have serious red flag causes, such as bone or joint infection, malignancy, or non-accidental injury.² Other conditions which appear to be MSK at first glance may be due to potentially disabling pathology, including orthopedic hip conditions, rheumatological diseases, or neuromuscular diseases.² Ability to triage is therefore a vital skill and knowledge base for practitioners to develop when seeing the pediatric patient, as differential diagnosis and treatment vary significantly from the adult patient.³ Children, and particularly infants, are not small adults. There are specific and different concerns which must be addressed with an appropriate history and examination.

Aims

The European Academy of Chiropractic (EAC) is working to provide post-registration education for practitioners. One of the EAC's special interest groups (SIGs) is pediatrics, where members are working to advance education around pediatric practice. The pediatric SIG is a team of four, each with advanced education within chiropractic and/or pediatrics (post-graduate Master's degree or PhD), and each

with expertise in clinical practice, research, or education.

Fungible pediatric history and examination forms for chiropractors and other manual therapists have not yet been made available. Consequently, a key initiative of the SIG over the past year has been to provide basic history and examination forms for the infant, pre-school, and school-aged child, for use by practitioners with limited education in this area. The forms presented with this article have been designed to organize the pediatric history (Tables 1, 4, and 7) and examination (Tables 3, 6, and 9), giving it form and consistency, aiding the practitioner in undertaking a thorough assessment. The primary focus is on triaging common musculoskeletal (MSK) and non-MSK presentations in the three pediatric age groups, and on identifying red flags which are indications for referral (Tables 2, 5, 8). In highlighting non-MSK and red flag presentations,^{4,5} there is an emphasis on safety, particularly identifying and referring the ill child for medical assessment and care. These forms are helpful in reaching the goal of arriving at the correct diagnosis or diagnoses, in order that the proper management can be recommended.

Process

The pediatric history and examination forms have been reviewed by all members of the SIG in an extensive, iterative process spanning 18 months. Within the SIG and for each age group, an initial draft was created, multiple iterations were developed, and meetings were held to discuss and resolve disagreements by consensus. In total, six meetings were held between members of the SIG. Once agreed upon within the group, the forms were then discussed at length with a pediatrician (MD), and recommendations adopted. This iteration was then shared with and reviewed by

chiropractors with expertise in the pediatric patient, and their comments were reviewed by the authors.

Recommendations for chiropractors

The authors recommend adopting these forms in clinical practice. Just as these forms reflect the fact that the child is growing and developing, treatment is also adjusted based on age and development. That said, our recommendations include referring the neonate to another chiropractor with more education and experience as this patient group has special considerations not all covered in the infant form. The age group delineations are not ideal as the 13-month-old is not developmentally the same as the 5-year-old. We will be working to develop more optimal forms. The toddler is difficult to evaluate and because of this, may require advanced skills in evaluation and treatment. The 6-year-old presents challenges, for example, as they may refuse to undress for proper evaluation as developmentally, blossoming self-awareness may result in shyness with strangers.

For those practitioners with additional education and experience with these age groups, there may be additional information you wish to seek in the history and assessment you will carry out in the examination. Using these forms as a foundation will provide a safety net, highlighting non-MSK conditions and red flags for the different age groups within the pediatric patient.^{4,5}

These forms will be available to download from the [European](#)

[Academy of Chiropractors' website](#). Accompanying 'add-on' history and examination forms for common presenting complaints, such as the crying infant, childhood headache, and scoliosis, are currently being developed. A series of recorded lectures to accompany these forms are in progress, discussing key aspects of the history and examination of the pediatric patient. These will also be available through the European Academy of Chiropractic and the General Education Network for Chiropractic (GEN-C).

Conclusion

These forms represent a minimum standard for assessing pediatric patients to ensure safe and effective management. The implementation of these forms should not only raise competence of practitioners, but with widespread use, enable data collection on a large scale for future research. This is a starting point in a series of work, aimed at elevating the safety and quality of musculoskeletal care provided by chiropractors to babies, children, and their families.

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Editors Note: The forms are included on the following pages, and can be found on the JCCP website as stand-alone PDFs which can be easily downloaded for your use.

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Table 1. Infant history form (0-12 months)

Patient information and consent	
Patient name	
Patient date of birth	
Parent/guardian names	
Legal relationship to child	
General practitioner/pediatrician	
Consent to contact other healthcare practitioners	
Consent to care	
Consent to use anonymized data for research purposes	
Date	
Antenatal health	
Maternal health in pregnancy	
Maternal illness in pregnancy	
Previous pregnancies	
Fetal health in pregnancy	
Birth	
Duration of pregnancy	___ weeks ___ days
Duration of labor	1st stage ___ hours 2nd stage ___ hours
Presentation (cephalic, breech)	
Intervention during labor/birth	
Medication perinatally, including analgesia	
Obvious signs of injury after birth (e.g. bruising, skin damage, cephalohematoma)	
Baby's health after birth	
Time between birth and first feed	
Presenting complaint	
Parent/guardian concern/s	
<i>Onset, associated symptoms, timing/course, aggravating and relieving factors, severity</i>	
Crying	
Timing/frequency	
Pitch/intensity	
Consolability	
Associated symptoms/behaviors (e.g. pulling ears, scratching eyes)	
Can the baby be put down?	
Sleeping	
Time and duration	
Positioning (supine or other)	
Location (e.g. cot, car seat)	
Quality of sleep	

Table 1. Infant history form (0-12 months) - continued

Feeding	
How is baby fed? <i>Breast, bottle, other</i>	
What is baby fed? <i>Breastmilk, formula, other</i>	
From 6 months: Introduced solid foods? When, and what foods?	
Weight gain and growth <i>Growth chart</i>	
Any difficulty with or concerns about feeding?	
General health	
Diagnosed conditions	
Suspected conditions	
Medications: Prescribed and over the counter <i>What, why, outcome, any side effects</i>	
Supplements	
GP or hospital visits <i>When, why, outcome</i>	
Other healthcare practitioners seen	
Vaccinations — normal schedule followed?	
Allergies or intolerances	
Family medical history <i>Who, what, management, outcome</i>	
Review of systems	
Respiratory <i>Recurrent coughs, mucous, wheeze</i>	
Skin <i>Rash, eczema, nappy rash</i>	
Gastrointestinal <i>Regurgitation, vomiting, wind, stool</i>	
Output <i>Number of wet and dirty nappies in 24 hours</i>	
Positional or postural preference <i>Asymmetry of head or trunk, upright vs. supine</i>	
Injuries or falls	
Development <i>Does the baby move and interact like other babies the same age?</i>	
Other <i>Any other thoughts or concerns not covered?</i>	

Table 2. Red Flags in the infant (0-12 months) – Indications for referral

Age group	Sign/symptom	✓	/	✗
Any age	Labored breathing			
	Rib retractions			
	Fever			
	Fewer than 4 heavy wet nappies in 24 hours			
	Slow or halted growth (weight, length, head circumference)			
	Halted or regression of development			
	Fractures in non-ambulatory child			
	Lethargic, difficult to rouse			
Development:	Not responding to loud noises			
1-3 months	Not following objects with eyes by 2-3 months			
Development:	Not supporting head well			
3-4 months	Not weightbearing on feet when held upright			
Development:	Stiff or contracted muscles of extremities			
4-7 months	Hypotonia or floppiness of neck or extremities			
	Head not held when pulled from supine to sitting by arms			
Development:	Not crawling by 12 months			
8-12 months	Asymmetry in crawling, e.g. dragging one leg			
	Not standing when supported			
	Not sitting steadily by 10 months			

Table 3. Infant examination form (0-12 months)

Observations and vital signs			
General observations <i>General appearance, movement pattern, skin, handedness</i>			
Head, face, eyes, ears, nose <i>Marks, bruising, swelling, discharge, rash, mucous, asymmetry</i>			
Cardiovascular and respiratory <i>Chest wall deformities, respiratory effort, color</i>			
Abdomen <i>Distention, rigidity, umbilicus</i>			
Social interaction <i>Child and parents, child and practitioner</i>			
Measurements*	Weight:	lb.	kg
	Length:	in	cm
	Heart rate:		BPM
	Respiratory rate:		RPM
	Capillary refill:		secs
	Temperature:	°F	°C

Table 3. Infant examination form (0-12 months) continued

Neurological examination	
<i>When indicated, plus additional neurological examination as indicated (tone, co-ordination, posture, stance, gait, etc.)</i>	
Cranial nerve screening	Normal/abnormal response
CN 2: Pupillary light reflex	
CNs 3, 4, 6: extra-ocular movements	
CN 5: facial sensation, masseter/temporalis motor	
CN 7: blink response, facial expression	
CN 8: hearing screen	
CN 9, 10: speech swallow, gag	
CN 11: active head rotation	
CN 12: active tongue movement	
Primitive Reflexes	Normal/abnormal response
Rooting reflex	
Sucking reflex	
Moro Reflex	
Plantar grasp	
Palmer grasp	
Babinski	
ATNR	
Stepping reflex	
Muscle stretch reflexes	Normal/abnormal response
Biceps	
Brachioradialis	
Triceps	
Patella	
Hamstring	
Achilles	
Orthopedic examination	Normal/abnormal findings
Hip examination if indicated <i>Issues with walking</i>	
Observation and palpation for spinal and extremity deformity, e.g. scoliosis	
Musculoskeletal examination	
Palpation	Findings
Active and passive range of motion <i>Spine, extremities — as indicated</i>	Cervical: Thoracic: Lumbar: Pelvic: Upper extremity: Lower extremity:
Static and motion palpation for regional restriction, tenderness <i>Spine, extremities — as indicated</i>	Cervical: Thoracic: Lumbar: Pelvic: Upper extremity: Lower extremity:

Table 4. Pre-school aged child history form (1-5 years)

Patient information and consent	
Patient name	
Patient date of birth	
Parent/guardian names	
Legal relationship to child	
General practitioner/pediatrician	
Consent to contact other practitioners	
Consent to care	
Consent to use anonymized data for research	
Date	
Primary complaint	
Description (ask parent/guardian & child)	
Onset	
Course since onset	
Possible causes/contributing factors	
Aggravating factors	
Relieving factors	
Behavioral changes	
Associated symptoms	
Previous episodes and management	
Pre-school attendance, engagement	
Activities affected	
Nutrition	
Diagnosed or suspected allergies/intolerances	
Usual diet and any restrictions	
Growth (weight, height, head circumference)	
Sleep	
Sleep patterns	
Any concerns about sleep	
Activity levels	
Physical activity <i>What, how long, how often</i>	
Sedentary time	
Screen time	

Table 4. Pre-school aged child history form (1-5 years) continued

Other medical conditions	
General health	
Diagnosed conditions <i>When diagnosed?</i>	
Suspected conditions	
Medications <i>Prescribed and OTC</i>	
Supplements	
GP or hospital visits/admissions <i>When and why?</i>	
Other healthcare professionals seen	
Surgeries <i>What and why?</i>	
Atopic: <i>Skin, respiratory, gastrointestinal</i>	
Injuries	
Infections	
Vaccinations — normal schedule followed?	
Family medical history <i>Who, what, management, outcome</i>	
Review of systems	
Respiratory <i>Recurrent coughs, mucous, wheeze</i>	
Skin <i>Rash, eczema</i>	
Gastrointestinal <i>Pain, vomiting, wind, stool</i>	
Output <i>Frequency of urination and defecation in 24hrs</i>	
Positional or postural preference <i>Asymmetry of head, trunk, or limbs</i>	
Injuries or falls	
Development <i>Does the child move and interact like other children the same age?</i>	
Other <i>Any other thoughts or concerns not covered?</i>	

Table 5. Red Flags in the pre-school aged child (1-5 years) - Indications for referral

Sign/symptom	✓	/	✗
Labored breathing			
Rib retractions			
Fever			
Reduced urinary output (dehydration)			
Slow or halted growth <i>Weight, height, head circumference</i>			
Halted or regression of development (loss of skills)			
Marked difference between left and right sides of body <i>Strength, tone</i>			
Marked high or low tone, especially with impact on motor skills/development			
Extreme lethargy, difficulty rousing			

Table 5. Red Flags in the pre-school aged child (1-5 years) - Indications for referral continued

Age	Developmental skills		✓ / ✗
>1 year	Fine motor	Unable to do the following:	
		Point with finger to picture in book	
		Hold a cup	
		Hold a toy with both hands at midline	
	Gross motor	Not sitting upright steadily	
		Not crawling	
		Unusual crawling pattern	
		Not pulling up to standing	
>2 years	Fine motor	Unable to do the following:	
		Scribble	
		Stack at least four blocks	
		Put round or square pegs into holes	
	Gross motor	Frequent falling and difficulty with stairs	
		Cannot stand alone at 14 months	
		Cannot walk by 18 months	
		Fails to develop a mature heel-toe walking pattern Walks exclusively on toes	
		Not jumping by 30 months of age	
		“Walking” their hands up their bodies to achieve a standing position	
		Still “toeing in” at two years of age	
>3 years	Fine motor	Unusual creeping patterns	
		Cannot grasp a crayon between thumb and fingers	
		Cannot copy a circle	
	Gross motor	Cannot stack 4 blocks	
		Cannot jump in place	
		Cannot ride a trike	
>4 years	Fine motor	Cannot stand tandem	
		Movements seem shaky or stiff	
		Arms and hands seem very weak	
		Is not able to cut a piece of paper with scissors	
		Cannot copy a cross (+)	
	Gross motor	Is not able to draw a circle and straight lines	
		Stands out from the group in structured motor tasks	
		Difficulty getting up from floor	
		Excessive slouching during sitting activities	
		Limping	
>5 years	Fine motor	Cannot climb stairs alternating feet	
		Cannot hop	
		Movements seem shaky or stiff	
		Arms and hands seem very weak	
		Is not able to cut along a straight line	
	Gross motor	Is not holding her crayons or pencils with her thumb and fingers	
		Is not able to draw a circle, square and cross	
		Cannot hop on one foot	
		Cannot jump	
		Cannot throw a ball	
		Cannot bounce a ball	
		Cannot skip	
		Cannot stand on one foot	
		Cannot walk on a balance beam	
		Fatigue during movement activities	

Table 6. Pre-school aged child examination form (1-5 years)

Observations and vital signs			
General observations			
<i>General appearance, movement pattern, skin, handedness</i>			
Head, face, eyes, ears, nose			
<i>Marks, bruising, swelling, discharge, rash, mucous, asymmetry</i>			
Cardiovascular and respiratory			
<i>Chest wall deformities, respiratory effort, color</i>			
Abdomen			
<i>Distention, rigidity, umbilicus</i>			
Social interaction			
<i>Child and parents, child and practitioner, friends</i>			
Measurements	Weight:	lb	kg
	Length:	in	cm
	Heart rate:		BPM
	Respiratory rate:		RPM
	Temperature:	°F	°C
	Blood pressure:		mmHg
Neurological examination			
<i>When indicated, plus additional neurological examination as indicated (tone, co-ordination, posture, stance, gait, etc.)</i>			
Cranial nerve screening		Normal/abnormal response	
CN 2: Pupillary light reflex			
CNs 3, 4, 6: extra-ocular movements			
CN 5: facial sensation, masseter/temporalis motor			
CN 7: blink response, facial expression			
CN 8: hearing screen			
CN 9, 10: speech, swallowing, gag			
CN 11: active head rotation			
CN 12: active tongue movement			
Primitive reflexes		Normal/abnormal response	
Babkin reflex			
Galant reflex			
Palmar grasp reflex			
Parachute reflex			
Tonic neck reflex			
Moro Reflex			
Other retained reflexes			

Table 6. Pre-school aged child examination form (1-5 years) continued

Muscle stretch reflexes	Normal/abnormal response
Biceps	
Brachioradialis	
Triceps	
Patellar	
Hamstring	
Achilles	
Babinski flexor response	
Orthopedic examination	Normal/abnormal findings
Observation and palpation for spinal and extremity deformity, e.g. scoliosis	
Posture	
Hip examination if indicated <i>Issues with walking</i>	
Musculoskeletal examination	
Palpation	Findings
Active and passive range of motion <i>Spine, extremities — as indicated</i>	Cervical:
	Thoracic:
	Lumbar:
	Pelvic:
	Upper extremity:
	Lower extremity:
Static and motion palpation for regional restriction, tenderness <i>Spine, extremities — as indicated</i>	Cervical:
	Thoracic:
	Lumbar:
	Pelvic:
	Upper extremity:
	Lower extremity:

Table 7. School-aged child history form (5-12 years)

Patient information and consent	
Patient name	
Patient date of birth	
Parent/guardian names	
Legal relationship to child	
General practitioner/pediatrician	
Consent to contact other practitioners	
Consent to care	
Consent to use anonymized data for research	
Date	
Primary complaint	
Description (ask parent/guardian & child)	
Onset	
Course since onset	
Possible causes/contributing factors	
Aggravating factors	
Relieving factors	
Behavioral changes	
Associated symptoms	
Previous episodes and management	
School attendance, engagement, achievement	
Activities affected	
Transport mode to school	
Car, walk, bike	
Any history of emotional trauma	
e.g. bereavement, bullying, abuse	
Nutrition	
Diagnosed or suspected allergies/intolerances	
Usual diet and any restrictions	
Growth (weight, height)	
Sleep	
Sleep patterns	
Any concerns about sleep	
Activity levels	
Physical activity	
What, how long, how often	
Sedentary time	
Screen time	

Table 7. School-aged child history form (5-12 years) continued

Other medical conditions	
General health	
Diagnosed conditions <i>When diagnosed?</i>	
Suspected conditions	
Medications <i>Prescribed and OTC</i>	
Supplements	
GP or hospital visits/admissions <i>When and why?</i>	
Other healthcare professionals seen	
Surgeries <i>What and why?</i>	
Atopic: <i>Skin, respiratory, gastrointestinal</i>	
Injuries	
Infections	
Vaccinations — normal schedule followed?	
Family medical history <i>Who, what, management, outcome</i>	
Review of systems	
Respiratory <i>Recurrent coughs, mucous, wheeze</i>	
Skin <i>Rash, eczema</i>	
Gastrointestinal <i>Pain, vomiting, gas, stool</i>	
Output <i>Frequency of urination and defecation in 24 hrs</i>	
Positional or postural preference <i>Asymmetry of head, trunk, or limbs</i>	
Injuries or falls	
Development <i>Does the child move and interact like other children the same age?</i>	
Other Recreational drug use <i>Any other thoughts or concerns not covered?</i>	

Table 8. Red flags in the school-aged child (5-12 years) – Indications for referral

Sign/symptom	✓	/	✗
Labored breathing			
Rib retractions			
Fever			
Reduced urinary output (dehydration)			
Lethargy, difficulty rousing, change in mentation			
Slow or halted growth			
Growth curve/chart			
Halted or regression of development (loss of skills)			
Marked difference between left and right sides of body			
Strength, tone			
Marked high or low tone, especially with impact on motor skills/development			
Persistent toe-walking			

Table 9. School-aged child examination form (6-12 years)

Observations and vital signs			
General observations			
<i>General appearance, movement pattern, skin, handedness</i>			
Head, face, eyes, ears, nose			
<i>Marks, bruising, swelling, discharge, rash, mucous, asymmetry</i>			
Cardiovascular and respiratory			
<i>Chest wall deformities, respiratory effort, color</i>			
Abdomen			
<i>Distention, rigidity, umbilicus</i>			
Social interaction			
<i>Child and parents, child and practitioner, friends</i>			
Measurements	Weight:	lb	kg
	Length:	in	cm
	Heart rate:		BPM
	Respiratory rate:		RPM
	Temperature:	°F	°C
	Blood pressure:		mmHg

Table 9. School-aged child examination form (6-12 years) continued

Neurological examination	
<i>When indicated, plus additional neurological examination as indicated (tone, co-ordination, posture, stance, gait, etc.)</i>	
Cranial nerve screening	Normal/abnormal response
CN 2: Pupillary light reflex	
CNs 3, 4, 6: extra-ocular movements	
CN 5: facial sensation, masseter/temporalis motor	
CN 7: blink response, facial expression	
CN 8: hearing screen	
CN 9, 10: speech, swallowing	
CN 11: active head rotation	
CN 12: active tongue movement	
Muscle stretch reflexes	Normal/abnormal response
Biceps	
Brachioradialis	
Triceps	
Patella	
Hamstring	
Achilles	
Babinski flexor response	
Developmental screening	✓ / ✗
Stand steadily with feet together, eyes closed	
Stand steadily on one leg	
Stand steadily on one leg with eyes closed	
Heel-toe walk	
Finger-to-nose	
Dysdiadochokinesia	
Retained primitive reflexes	
Orthopedic examination	Normal/abnormal findings
Observation and palpation for spinal and extremity deformity, e.g. scoliosis	
Posture	
Adam's forward bend (scoliosis)	
Musculoskeletal examination	
Palpation	Findings
Active and passive range of motion <i>Spine, extremities — as indicated</i>	Cervical: Thoracic: Lumbar: Pelvic: Upper extremity: Lower extremity:
Static and motion palpation for regional restriction, tenderness <i>Spine, extremities — as indicated</i>	Cervical: Thoracic: Lumbar: Pelvic: Upper extremity: Lower extremity:

JOURNAL ABSTRACTS

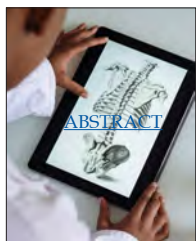
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Chiropractic Care for Adults With Pregnancy-Related Low Back, Pelvic Girdle Pain, or Combination Pain: A Systematic Review

Carol Ann Weis, Katherine Pohlman, Crystal Draper, Sophia daSilva-Oolup, Kent Stuber, Cheryl Hawk
Journal of Manipulative and Physiological Therapeutics 2020, 43 (7): 714-731

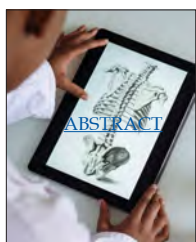
The purpose of this study was to conduct a systematic review (SR) of the literature to assess the effectiveness of chiropractic care options commonly used for pregnancy-related low back pain (LBP), pelvic girdle pain (PGP), or combination pain for both experienced practitioners and students of chiropractic.



Chiropractic Care of Adults With Postpartum-Related Low Back, Pelvic Girdle, or Combination Pain: A Systematic Review

Carol Ann Weis, Katherine Pohlman, Crystal Draper, Sophia da Silva-Oolup, Kent Stuber, Cheryl Hawk
Journal of Manipulative and Physiological Therapeutics 2020, 43 (7): 732-743

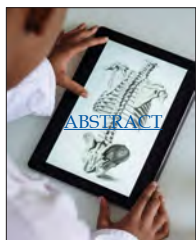
The purpose of this study was to conduct a systematic review (SR) of the literature to assess the effectiveness of specific chiropractic care options commonly used for postpartum low back pain (LBP), pelvic girdle pain (PGP), or combination (LBP and PGP) pain.



Adverse events from spinal manipulations in the pregnant and postpartum periods: a systematic review and update

Carol Ann Weis, Kent Stuber, Kent Murnaghan, Shari Wynd
Journal of the Canadian Chiropractic Association 2021, 65 (1): 32-49

The purpose of this study is to update a previous critical review of adverse events in pregnant and postpartum populations. This update found one case study that demonstrated a serious adverse event in the cervical spine following SMT and a handful of minor and transient adverse events in the low back following SMT.



Physical activity throughout pregnancy: guideline critical appraisal and implementation tool

Gaelan Connell, Carol Ann Weis, Heather Hollman, Kelsey Nissen, Leslie Verville, Carol Cancelliere
J Can Chiropr Assoc. 2021 Apr;65(1):50-58

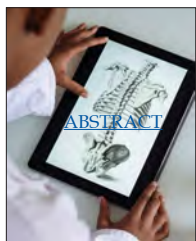
The 2019 Canadian guideline for physical activity throughout pregnancy provides evidencebased recommendations to promote maternal, fetal, and neonatal health. We aimed to 1) critically appraise the 2019 Canadian guideline for physical activity throughout pregnancy; and 2) develop a guideline summary for clinicians to facilitate the uptake of recommendations into practice.



The Effectiveness of Non-Pharmaceutical Interventions Upon Pregnancy-Related Low Back Pain: A Systematic Review and Meta-Analysis

Ioannis Koukoulithras Sr, Alexandra Stamouli, Spyridon Kolokotsios, Minas Plexousakis Sr, Christine Mavrogiannopoulou
PMID: 33728108 PMCID: PMC7934802 [doi: 10.7759/cureus.13011](https://doi.org/10.7759/cureus.13011).

Low back pain (LBP) is a very common pathology among pregnant women and various methods are used to reduce the pain. The aim of this study is to conduct an evidence-based systematic review and meta-analysis regarding the effectiveness of the interventions used to reduce low back pain related to pregnancy.



Comparative Efficacy and Safety of Conservative Care for Pregnancy-Related Low Back Pain: A Systematic Review and Network Meta-analysis

Lingxiao Chen, Manuela L Ferreira, Paula R Beckenkamp, Eduardo L Caputo, Shiqing Feng, Paulo H Ferreira
PMID: 33210717 [doi: 10.1093/ptj/pzaa200](https://doi.org/10.1093/ptj/pzaa200).

More than one-half of pregnant women experience pregnancy-related low back pain (LBP). Pregnancy-related LBP greatly affects activities of daily life, and although many interventions have been proposed, the optimal treatment for pregnancy-related LBP remains unclear. The purpose of this study was to compare conservative care strategies on their efficacy and safety for women with pregnancy-related LBP through systematic review with pairwise meta-analysis and network meta-analysis.

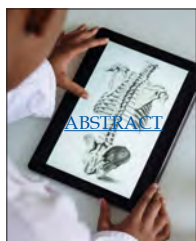
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Effects of elastic tape in pregnant women with low back pain: A randomized controlled trial

Matchimamart Chamnankrom , Nuttaset Manimmanakorn , Apiwan Manimmanakorn, Kiattisak Kongwattanakul, Michael J Hamlin
J Back Musculoskelet Rehabil. 2021;34(1):111-119.

Low back pain is a common problem in pregnant woman. Elastic tape is an alternative method that may reduce low back pain. After the application of stretched elastic tape, lower back pain was significantly reduced by 29.4% ($p=0.003$) immediately post-taping and by a further 75.4% after wearing the tape for a week.



Effectiveness of kinesiотaping in pregnant women with sacroiliac joint pain: A randomised controlled study

Banu Ordahan , Jule Eriç Horasanlı
Int J Clin Pract. 2021 Sep;75(9):e14432. doi: [10.1111/ijcp.14432](https://doi.org/10.1111/ijcp.14432).

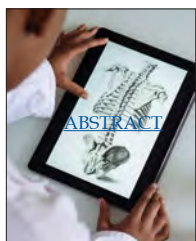
Sacroiliac joint (SIJ) dysfunction is an especially common cause of pain during pregnancy. Treatment options during pregnancy are very limited in order to reduce pain and increase the quality of life. We aimed to determine the efficacy of kinesiотaping (KT) in the treatment of SIJ pain in pregnant women. KT treatment improved the pain levels, functioning and quality of life among pregnant women with SIJ pain.



Breastfeeding Support Team: When to Add a Chiropractor

Miller, Joyce, BS, DC, PhD
Clinical Lactation Vol 11 Issue 1, doi: [10.1891/2158-0782.11.1.7](https://doi.org/10.1891/2158-0782.11.1.7).

Chiropractors are primary care clinicians with a musculoskeletal focus. As community-based practitioners, they are educated and available to treat the common problems of infancy, including sub-optimal breastfeeding. The objective of this investigation was to highlight some of the key skills and techniques used by chiropractors to assist the breastfeeding dyad.



Adverse events associated with pediatric complementary and alternative medicine in the Netherlands: a national surveillance study

Björn Vos, Jan Peter Rake, Arine Vlieger
Eur J Pediatr. 2021 Jul;180(7):2165-2171. doi: [10.1007/s00431-020-03899-8](https://doi.org/10.1007/s00431-020-03899-8). Epub 2021 Mar 1.

Pediatric use of complementary and alternative medicine (CAM) in the Netherlands is highly prevalent. The risks of pediatric CAM use are, however, largely unknown. Therefore, a 3-year survey was carried out at the Dutch Pediatric Surveillance Unit. Pediatricians were asked to register cases of adverse events associated with pediatric CAM usage.



Effectiveness of chiropractic manipulation versus sham manipulation for recurrent headaches in children aged 7–14 years - a randomised clinical trial

Susanne Lynge, Kristina Boe Dissing, Werner Vach, Henrik Wulff Christensen, Lise Hestbaek
Chiropr Man Therap. 2021 Jan 7;29(1):1. doi: [10.1186/s12998-020-00360-3](https://doi.org/10.1186/s12998-020-00360-3).

To investigate the effectiveness of chiropractic spinal manipulation versus sham manipulation in children aged 7-14 with recurrent headaches. Chiropractic spinal manipulation resulted in significantly fewer days with headaches (reduction of 0.81 vs. 0.41, $p = 0.019$, NNT = 7 for 20% improvement) and better global perceived effect (dichotomized into improved/not improved, OR = 2.8 (95% CI: 1.5-5.3), NNT = 5) compared with a sham manipulation procedure.



Complementary and Alternative Therapies for Infantile Colic: A Systematic Review of the Literature

Bengü Çetinkaya
Altern Ther Health Med. 2021 Mar;27(2):42-47.

Infantile colic is defined as paroxysms of uncontrollable and unexplained crying in the first three months of life. Complementary and alternative therapy methods are one of the methods used to treat infantile colic, which has negative effects on parents and infants. Further study of the complementary and alternative therapy methods will help to increase the evidence for their effective use in the treatment of infantile colic.

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Effects of Osteopathic T9-T10 Vertebral Manipulation in Tonsillitis: A Randomized Clinical Trial

Agustín Luceño-Mardones, Irene Luceño-Rodríguez, Elena Sonsoles Rodríguez-López, Jesús Oliva-Pascual-Vaca, Ignacio Rosety, Ángel Oliva-Pascual-Vaca
Healthcare (Basel). 2021 Apr 1;9(4):394. doi: [10.3390/healthcare9040394](https://doi.org/10.3390/healthcare9040394).

This study aimed to determine whether osteopathic manipulation of the T9-T10 vertebrae improves the evolution of tonsillitis. A randomized, stratified, controlled clinical trial with blinded patients, evaluator and data analyst was performed. The patients in the control group (CG) underwent a “sham” manipulation.



Physical Therapist Interventions for Infants With Nonsynostotic Positional Head Deformities: A Systematic Review

Irene Cabrera-Martos, Salvador Jesús Ortigosa-Gómez, Laura López-López, Araceli Ortiz-Rubio, Irene Torres-Sánchez, María Granados-Santiago, Marie Carmen Valenza
Phys Ther. 2021 Aug 1;101(8):pzab106. doi: [10.1093/ptj/pzab106](https://doi.org/10.1093/ptj/pzab106).

This study sought to examine the methodological quality and summarize the evidence from clinical trials that examined the effectiveness of physical therapist interventions in the management of nonsynostotic positional head deformities in infants.



Chiropractic Care for the Pregnant Body

Shayna N Conner, Amanda S Trudell, Craig A Conner
Clin Obstet Gynecol. 2021 Sep 1;64(3):602-610. doi: [10.1097/GRF.0000000000000621](https://doi.org/10.1097/GRF.0000000000000621).

Chiropractic care is a commonly used treatment modality for musculoskeletal pain in pregnancy. Low back pain, pelvic pain, and other neuromuscular complaints are prevalent in pregnancy and contribute to significant maternal discomfort in many women. Nonpharmacologic therapies to relieve pain are increasingly important during pregnancy because of the opioid epidemic. Chiropractic treatment is one of the potential therapies that offers intervention without medications. This article provides an evidence-based review of the epidemiology of chiropractic use in obstetrics, commonly treated conditions, related physiology of pregnancy, and safety of spinal manipulation.



Clinical characteristics, treatment and outcomes of paediatric COVID-19: a systematic review and meta-analysis

Omar Irfan, Fiona Muttalib, Kun Tang, Li Jiang, Zohra S Lassi, Zulfiqar Bhutta
Arch Dis Child. 2021 Feb 16;106(5):440-448. doi: [10.1136/archdischild-2020-321385](https://doi.org/10.1136/archdischild-2020-321385). Online ahead of print.

Compare paediatric COVID-19 disease characteristics, management and outcomes according to World Bank country income level and disease severity. 129 studies were included from 31 countries comprising 10 251 children of which 57.4% were hospitalised. Mean age was 7.0 years (SD 3.6), and 27.1% had a comorbidity. Paediatric COVID-19 has a favourable prognosis. Further severe disease characterisation in children is needed globally.



Assessment of Studies Evaluating Spinal Manipulative Therapy and Infectious Disease and Immune System Outcomes: A Systematic Review

Ngai Chow, Sheilah Hogg-Johnson, Silvano Mior, Carol Cancelliere, Stephen Injeyan, Julita Teodorczyk-Injeyan, J David Cassidy, Anne Taylor-Vaisey, Pierre Côté
JAMA Netw Open. 2021 Apr 1;4(4):e215493. doi: [10.1001/jamanetworkopen.2021.5493](https://doi.org/10.1001/jamanetworkopen.2021.5493).

Claims that spinal manipulative therapy (SMT) can improve immune function have increased substantially during the COVID-19 pandemic and may have contributed to the rapid spread of both accurate and inaccurate information (referred to as an infodemic by the World Health Organization).