JCCP

JOURNAL OF CLINICAL CHIROPRACTIC PEDIATRICS

VOLUME 16 • NO. 1 • SEPTEMBER 2017

PUBLICATION OF THE COUNCIL ON CHIROPRACTIC PEDIATRICS
INTERNATIONAL CHIROPRACTORS ASSOCIATION

JCCP
JOURNAL OF CLINICAL CHIROPRACTIC PEDIATRICS

The Journal of Clinical Chiropractic Pediatrics (JCCP) is the official peer-reviewed journal of the Council on Chiropractic Pediatrics, 6400 Arlington Boulevard, Suite 800, Falls Church, Virginia 22042, USA

Editorial Correspondence: Correspondence should be sent to:
Editor, JCCP
ICA Council on Chiropractic Pediatrics
6400 Arlington Boulevard, Suite 800
Falls Church, Virginia 22042, U.S.A.
Email: pediatricscouncil@chiropractic.org
or svallonedc@aol.com

TABLE OF CONTENTS

JCCP JOURNAL OF CLINICAL CHIROPRACTIC PEDIATRICS

VOLUME 16, NUMBER 1 SEPTEMBER 2017

Publishing Offices:
ICA Council on Chiropractic Pediatrics
6400 Arlington Boulevard, Suite 800, Falls Church, Virginia 22042 U.S.A.

GUIDELINES FOR AUTHORS

JCCP JOURNAL OF CLINICAL CHIROPRACTIC PEDIATRICS

The *Journal of Clinical Chiropractic Pediatrics* welcomes original and scholarly manuscripts for peer-review and consideration for publication. Topics must pertain to the field of pediatrics which includes pregnancy and adolescence. Manuscripts should not have been published before or submitted to another publication.

The following will be considered:

Case Reports and Case Series – presentations of individual or groups of cases deemed to be of interest to the professional and scholarly community.

Pilot Studies or Hypothesis – papers which, while very broad, present with a clear hypotheses and suggest a foundation for future, in-depth studies.

Literature Reviews – studies of existing papers and books presented with the intention of supporting and encouraging new and continuing study.

Technical Descriptions – reports of new analytical/diagnostic tools for assessment and delivery of care. Controlled, Large Scale Studies – usually, but not necessarily, performed at a college or research facility. May be double-blinded.

Commentaries – presentations of opinion on trends within the profession or current events, pertaining to pediatric and adolescent chiropractic care.

Guidelines for submission

All manuscripts are accepted purely for consideration. They must be original works and should not be under consideration by any other journal or publisher at the time of submission. They must be accompanied by a TRANSFER OF COPYRIGHT form, signed by all authors and by the employer if the paper is the result of a "work for hire." It is understood that while the manuscript is under consideration it will not be sent to any other publication. In the case of multiple authors, a transmittal letter should designate one author as correspondent.

Manuscripts may be sent to editor at svallonedc@aol.com. Manuscript should be in document style MS Word (or compatible) and unformatted. PDFs will not be accepted.

The paper must include an abstract or summary. This abstract/summary should state the purpose of the paper (objective), procedures, methods, main findings (results) and principal conclusions. Also, any key words or phrases that will assist indexers should be provided.

References must be cited for all materials derived from the works of other people and previously published works. Reference numbers in superscript must be assigned in the order of citation in the paper.

Tables – Each table or figure should be on a separate page and not imbedded in the manuscript. If the table is from another publication, permission to publish must be granted and the publication acknowledged.

Photographs – Photographs may be in color or in grayscale and scanned at 300 dpi with sharp contrast. Patient photographs must have consent form signed by the individual or parent or guardian in the case of a minor.

Informed Consent – If the research/study involves experimental investigations performed on humans the manuscript must include a statement that informed consent was obtained from the individuals involved in the investigation.

Patient Anonymity – Patient names or any information that could identify a specific patient should be avoided. All case reports, with or without identifying photographs accompanying a manuscript must have a consent form signed by the individual or parent or guardian in the case of a minor. These are to include any requests for blocking faces, etc.

Acknowledgements – Any illustrations from other publications must be acknowledged. It is the author's responsibility to obtain written permission from the publisher and/or author for their use.

All manuscripts deemed appropriate for publication by the editor will be sent blind to at least two reviewers. If the manuscript is accepted, the author will be notified. If substantive changes are required, the paper will be returned to the author and the author must re-submit a clean copy of the revised manuscript. Author will be given a tentative date for publication if accepted. Manuscripts not accepted for publication will be returned to the author without comment.

Instructions to Authors – Summary

See *Uniform Requirements for Manuscripts Submitted to Biomedical Journals* for detailed information http://www.icmje.org/.

General formatting guidelines

- All submission components must be submitted electronically.
- Only manuscripts in English are accepted.
- Submit manuscripts as **Microsoft Word** documents.
- Use 1" margins on all sides
- Use Arial 12 point black font
- Capitalize only the first letter in the title, and any proper nouns.
- Do not justify text.
- Do not use column function
- Number all pages at bottom right.
- Double-space manuscript. Single-space references, tables or figure legends.
- Do not abbreviate words or terms the first time they are introduced; at that time, provide the abbreviation in parentheses and use it from that point forward.
- Number citations consecutively using superscripted Arabic numerals and place all references in a **Reference** section immediately at the end of your section.
- Run spell check and grammar check after completing the manuscript. Use American English spelling and units of measurement.

Submission Components

- ***JCCP* authorship form**—submit separately from manuscript. All authorship forms may be combined in a single PDF. Each author must complete this form, scan and return it electronically to the editor before the manuscript can be processed
- ***JCCP* Patient (or Parent/Guardian) Permission to Publish Form**—one form for each case (1 for case report; multiple individual forms for case series) — all forms may be combined as a single PDF.
- **Permission to acknowledge forms:** All individuals named in the Acknowledgements section of the manuscript must sign a permission form. The corresponding author may use his or her own form, or use the one *JCCP* provides–submit separately from manuscript. All permission forms may be combined as a single PDF.
- **Cover letter**—submit as separate document, either Word or PDF.

The following items MUST be submitted as a Word document.

Cover letter—Explain why your manuscript is appropriate for *JCCP*.

Document— Each of the following should be on a separate page. Use page break function to separate page, not repeated line breaks to get to a new page.

- Title page
- Abstract
- Manuscript
- Acknowledgements
- References
- Tables
- Figures

Title page

- Title of article—ONLY CAPITALIZE FIRST LETTER OF FIRST WORD
- Running head (limited to 40 characters)
- Word count (excluding references, tables and figures)
- Number of tables
- Number of figures
- Authors
  - Name, with all degrees (do not include Bachelor's level degrees)
  - Current title/position and affiliation, including city, state and country
- Corresponding author
  - Name
  - Mailing address, phone, fax
  - E-mail address; provide alternative e-mail address if possible

Abstract—not to exceed 250 words. It may be structured or unstructured. Structured abstracts usually include the following sections: Purpose, Methods (include study design in this section), Results, Conclusion. For case reports and case series, see document, "Instructions for Case Reports and Case Series."

Manuscript Components

Manuscript length will vary with the type of article; in general, manuscripts are expected to be 1,500-3,000 words in length, excluding references, tables and figures. These may vary with the type of article. For case reports and case series, see, "Instructions for Case Reports and Case Series." In general, for manuscripts reporting research studies, the order of components is:

- Introduction: succinctly describe the relevant literature supporting the need for the study.
- Methods: describe the methods used to accomplish the study, in detail sufficient to allow the informed reader to evaluate their appropriateness.
- 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.

Instructions to Authors – Summary

Tables

- Number tables consecutively in text, using Arabic numerals (1, 2, 3 etc.)
- Place each table on a separate page at the end of the section, immediately following the References section.
- Use "table" function in Word to construct tables; do NOT use tab or space keys to form columns and rows. Use table "normal" style to construct table. Do not insert vertical lines between columns; do not use grids. Place horizontal line under table title and at end of table, separating the table from any footnotes. You may place horizontal lines under headings in the table for clarity.
- Use footnotes to explain details at bottom of the table (below a horizontal line). Identify using either superscripted lower-case letters or standard footnote symbols (sequence: *,†, ‡, §, ||, ¶, **, ††). Sequence the footnotes in the order text is read–from left to right and then down.
- Use left-justification to align numbers in columns.

Figures

- Place figure title and legend on page with the figure.
- Figures must be submitted electronically. Acceptable file formats: DOC, JPG, PDF. Figures may be embedded at the end of the manuscript text file or loaded as separate files for submission purposes. Should not be imbedded within the manuscript text
- Hand-drawn illustrations are not acceptable.
- Provide documentation of permission for any figures that are not original.

Acknowledgements

Include a statement disclosing any funding support for the project or project personnel, or any other potential conflicts of interest. Acknowledge only individuals or organizations who provided input or resources to the project that were above and beyond their usual responsibilities. All individuals acknowledged must provide written permission to use their name; these permissions must accompany the manuscript at the time of submission (scan documents and submit electronically).

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.

Permission to acknowledge forms

All individuals named in the Acknowledgements section of the manuscript must sign a permission form. The corresponding author may use his or her own form, or use the one *JCCP* provides.

Title Page Format

Running Head:
Word count (excluding references, tables and figures):
Number of tables:
Number of figures:

Authors (in correct order)
Name, degrees
Current title/position and institution (if applicable)
City, State, Country

Corresponding Author
Name
Address
Phone Number:
Fax:
Email:

Journal of Clinical Chiropractic Pediatrics Authorship Form

Each author must read and sign the statements on 1) authorship responsibility and contribution, 2) financial disclosure and conflict of interest, 3) copyright transfer. **The corresponding author must sign the Acknowledgement Statement** and email the completed form to Svallonedc@aol.com to initiate manuscript processing.

Manuscript title: _____

1. Authorship Responsibility and Contribution

• I certify that this submission represents original work, and that neither this submission nor a substantially similar one has been published or is under consideration for publication elsewhere in any medium (paper or electronic). I also affirm that this submission is not subject to copyright or any other rights except those of the current authors.

• I certify that if so requested by the editor, I will provide the data or cooperate in obtaining the data on which this submission is based, for review by the journal's designated representative(s).

• I agree that the corresponding author may represent me to review proofs and make other decisions regarding the submission. I have approved the submission.

• I certify that I meet the criteria for authorship, having made substantive contribution to the manuscript as indicated below (check all that apply).

___ Development of project concept or hypothesis
___ Study design and development of methodology
___ Project implementation
___ Data collection and management
___ Data analysis and interpretation of results
___ Literature search and review
___ Manuscript writing
___ Other (specify contribution)_____

2. Financial Disclosure and Conflict of Interest

I certify that all sources of extramural support of this submission, and the role of any funding agencies in the conduct of the study have been clearly described in the Acknowledgements section of the submission.

Check one of the following two statements:

❑ I certify that I have no financial interests, relationships or affiliations related to the project or materials addressed in the submission.

OR

❑ I certify that any potential conflicts of interest, including financial interests, relationships or affiliations related to this submission are disclosed in the Acknowledgements section of the manuscript.

3. Copyright Transfer

In consideration of the action of the *Journal of Clinical Chiropractic Pediatrics* in reviewing and editing this submission (including manuscripts, tables, figures and any supplemental documents), I hereby transfer, assign, or otherwise convey all copyright ownership including all rights and incidental thereto, exclusively to the *Journal of Clinical Chiropractic Pediatrics*.

I also understand that if the manuscript is not accepted for publication by the *Journal of Clinical Chiropractic Pediatrics* I will be notified and the transfer of copyright will be null and void.

_____	_____	_____
Signature	e-mail address	date signed

Acknowledgement statement to be signed by corresponding author

All individuals named in Acknowledgements section should provide written permission. I certify that:

• All individuals who have made substantive contributions to the submission but who do not qualify as authors have been named, along with their specific contribution in the Acknowledgements.

• All individuals so named have provided me with their written permission to be named.

• If no Acknowledgement section is included in the submission, there are no other contributors to the manuscript.

_____	_____	_____
Corresponding Author Signature	e-mail address	date signed

Journal of Clinical Chiropractic Pediatrics

Patient Consent Form for Case Report

Print name:_____

If patient is a minor, print parent/guardian name: _____

I have read the information about me/minor and/or seen the photograph to be published.
I give my consent for this material to appear in a scientific journal.

I understand the following:
(1) My name/minor's name will not be attached to the material. The authors of the article will make every attempt to keep my identity/minor's identity anonymous. I understand, however, that they cannot guarantee complete anonymity. It is possible that someone, such as someone who works in this clinic or one of my relatives, might be able to identify me/minor.

(2) The material will only be published in a scientific journal.

(3) The material will not be used for advertising.

Signed:_____ Today's date: _____
(if patient is a minor, parent or guardian signs.)

Journal of Clinical Chiropractic Pediatrics

Permission to Acknowledge

I give my permission to be acknowledged in the manuscript,

_____

which is to be submitted to the *Journal of Clinical Chiropractic Pediatrics*.

_____ _____
Signature Date Signed

_____
Print Name

Instructions for Case Reports and Case Series

Abstract
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 patient'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 validitiy 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.uws.idm.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/pmcc/articles/PMC3924510/

3 BMJ. Vol 7, Issue 3, 2002, **Evidence-Based Medicine in Practice: EBM Notebook**
http://ebm.bmj.com/content/7/3/68

Editorial

Is it about winning or losing? It's all in the eye of the beholder

By Sharon Vallone, DC, DICCP, FICCP

As we all know, we are taught from an early age that there are winners and losers in every situation. Those of us in clinical practice might have that feeling when it comes to dealing with managed care, and those in research, each time we write a grant or race for the gold (publishing) with our data. But how does this apply to our young patients? When are they winners and when are they losers?

Children are winners when they receive the support they need to be their healthiest selves. They are losers when we neglect to educate ourselves and give them the best care possible. They are losers when professional egos cannot agree and muddy the waters as parents seek information that will guide them in making the best choices for their children. They are losers when critical scientific findings are obscured or denied to further the interest of corporate advancement. They are losers when their parents are told that chiropractic care is not appropriate, or dangerous, or quackery. They are losers when we don't eloquently articulate the clinical benefits of chiropractic care for children.

As an example, in the breastfeeding world as related by Miller and Miller in their cross sectional survey of the incidence of ankyloglossia in an infant population presented with suboptimal feeding published in this issue, the release of tethered oral tissues has been on the rise over the last decade. There are differing viewpoints in all the fields associated with this diagnosis including lactation consultants, medical physicians, dentists, oral surgeons, chiropractors, osteopaths, "other bodyworkers", speech and language pathologists, and on and on. The existence of a tongue tie or any extra tissue in the oral cavity that tethers the tongue or lip or cheek are real — they would have been called "a limitation of matter" by our chiropractic forebears. BUT… before intervening with surgery, functional testing and reduction of any other interfering factors that could limit oral motor function should be addressed and function reassessed. If function has normalized and the infant can sustain normal function, surgery is not indicated. This is no different than adjusting a preteen with scoliosis and restoring normal function and alignment, thus altering the perceived necessity to perform surgery and insert Harrington Rods to support their spinal alignment.

The protocol I propose which I think would be most efficacious, would be to see a chiropractor with postgraduate training in pediatrics and specifically in oral motor dysfunction, before a release of the tissue is scheduled. An alternative for many chiropractors who see children would be to work closely with lactation consultants or speech therapists who can provide that functional assessment of the tongue in conjunction with their chiropractic evaluation. The chiropractor, in collaboration with a (breast)feeding specialist, would perform a functional assessment of the tongue (lip, cheek) and rule out biomechanical reasons why the function may be aberrant or diminished. The causes could range from upper cervical subluxation or cranial subluxation which could influence the range of motion of the temporomandibular joints to fixation of the hyoid which could influence tongue range of motion (therefore function). Even misaligned clavicle when the presentation was a shoulder dystocia, for example, could be the cause of an infant's discomfort at breast causing tension in the anterior muscles of the neck as they flex to prevent traction on the clavicle while at breast and interfering with their ability to nurse effectively. Any of these issues could arise from in utero constraint or the birth process itself, but often they will also accompany the compensations that result from a posterior tongue tie, a lip tie or even buccal ties. As practitioners we must be discerning and thorough in our examination and diagnosis.

After a thorough functional examination, if a true tethering is identified that is influencing oral motor function, then surgery is an appropriate referral to make. If the diagnosis is equivocal, a conservative management approach would be appropriate before referring for surgery. But the importance of providing the manual therapy before the surgery cannot be emphasized enough. It is still important to reduce any biomechanical restrictions and optimize gape, cervical elongation and extension so the surgeon can have a better field of vision to detect the restrictive tissue and cut it or remove it by laser. The follow up with manual therapy is to reduce compensatory biomechanical problems and support "abilitation" (Tow) of the infant to nurse properly along with the support of their lactation consultant or midwife as the surgeons or dentists do not address this and there is a high failure rate post frenotomy when there is no support for the mother. Chiropractors have a very important role on the "team" working towards the success of the breastfeeding dyad. If we claim our role, there will be more "winners" and fewer "losers."

Our authors are winners! They are working in the field or in the community of fine educators and researchers. They are writing about what they see in clinical practice, a snapshot in time of a child — evaluating them, diagnosing the root of the problem and devising a treatment protocol. Or they are documenting the data they've collected on larger scales to attempt to offer comparative results when chiropractic care is the appropriate choice for the diagnosed problem. They give us our voice. They give us the tools we need to support what we do. And for this, I am grateful.

The use of chiropractic care among 6-week-old babies in Bergen, Norway: a cross-sectional survey

By Veronica Pryme, DC[1] and Joyce Miller, DC, PhD[2]

1. Private practice, Norway
   Email: pryme@kiropraktor-klinikk.no
2. Professor, AECC University, Bournemouth, UK

Corresponding author: Joyce E. Miller, DC, PhD
Email: jmiller@aecc.ac.uk

Conflict of interest: The authors declare no conflict of interest. No funding was obtained for this study.

ABSTRACT

Objectives: This study investigates the prevalence of six week-old babies in Bergen, Norway who present to a chiropractor, describes their demographics and documents their presenting complaints and referral patterns. **Methods:** This was an observational cross-sectional survey. Questionnaires were distributed by the health care visitor/midwife to the parents/guardians of infants attending the six-week control (health check up) in nine health care centres in Bergen, Norway. After collection, each form was coded with a number and data entered into the Statistical Package for the Social Sciences (SPSS). **Results:** In all, 123 surveys were collected. Among these, 12 (10%) had seen a chiropractor. Assisted deliveries were more frequent among the infants who had presented to a chiropractor versus the general population. The most common presenting complaints were colic and fussy baby (each reported by 6 participants). The most common mode of referral was by friends/family (N=5). **Conclusion:** The prevalence of six week-old babies in Bergen who have seen a chiropractor was 10%. This is the first study to have investigated the prevalence of all six week-old babies in the general population presented to a chiropractor at a snapshot in time. However, due to the small sample size, these results must be viewed with caution, and further, larger studies are warranted.

Keywords: prevalence, pediatrics, chiropractic

Introduction

The majority of published research within chiropractic care refers to the adult patient population. To date, there is little published research that describes and defines chiropractic pediatric patients and their most common conditions. However, as many as 90.4% of chiropractors around the world report treating pediatric patients,[1] and this leaves an open gap for a scientific platform upon which to base the management of such patients.

What is clear about chiropractic pediatric practice is that infants are the most highly represented age group. Allen-Unhammer et al[2] investigated the use of chiropractic care by pediatric patients in Norway (N=137). Similar to other studies,[3,4] they found that the majority (39%) of the pediatric patients (under 18 years of age) were 0-3 months old. In the most comprehensive study by Hestbaek et al,[3] 40% of all patients (0-18 years old) were less than 1 year of age (N=318), and among these, 74% were less than 4 months old, with a slight over-representation of male babies (54%) (N=725). The most common presenting complaint in infants was excessive crying/infantile colic.[1,2,4]

Referral practices to chiropractors have been found to vary depending on age of the patient. The overall use of CAM is often strongly influenced by the experience of the family physician and friends. There are indications that parents who themselves have had chiropractic care are more likely to take their children to the chiropractor.[5] The proportion of children whose parents were also chiropractic patients has been found lowest among babies: 62% versus 80-84% for other age groups. This corresponds well with the higher referral rates from other health care providers for the youngest age group.[3,4] Twenty-six percent of children were referred by people other than family and friends. Among these, health visitors referred most of the babies (20%) and GPs referred the majority of the teenagers.[3] Similarly, Allen-Unhammer et al[2] found that 33% of pediatric patients were referred by people other than family and friends, including GPs and health visitors. In the study by Doyle,[1] only 7% of pediatric patients were referred by other health care providers, including chiropractors and medical practitioners.

Mapping of chiropractic pediatric patients and their characteristics can help identify areas where there is a particular need for research, increased public awareness and interdisciplinary understanding. This research was designed to find out how many of infants in Norway were presented to

chiropractors for care, along with their demographic profile, presenting complaints and referral patterns.

Study Design and Methods

The study was an observational cross-sectional survey. A paper-based questionnaire containing primarily closed questions was used for the data collection. No validated, standardized questionnaire was found during the literature search, which could give answers to the research questions in this study. Consequently, a questionnaire was constructed. The questions chosen were based on the aims and objectives of this research project, previous studies covering similar topics, in addition to inclusion of some questions from the general Paediatric Intake Survey used at the Anglo European College of Chiropractic.[6] The latter was chosen because it was suitable for the age group that formed the basis of this study.

The questionnaire was handed to the population of mothers and/or guardians of babies attending the 6-week control at health care centers in Bergen, Norway. The 6-week control is part of the recommended health plan for infants advocated by Norwegian authorities. It is not mandatory and it is free of charge. Traditionally, it is widely used and attended. Approximately 5,000 babies are born every year in the hospital in Bergen.[7] However, this is a regional hospital so this estimate covers counties surrounding Bergen as well. The inclusion criterion in this study was all attendees at the 6-week control, who could read Norwegian or English.

Prior to commencing distribution of the questionnaires, a pilot study was conducted involving the mothers/guardians of eight, six-week-old babies attending the clinic. Seven of the participants were Norwegian speaking and one mother was English speaking. The feedback required a rephrase to be made in question number four in the Norwegian questionnaire. None of the results from the pilot study were included in the main study.

Initially, a telephone call was made to the person in charge of each health care center, and a description of the study was presented. The Health Department in Bergen had already informed the person in charge for each health care station about this study. Only one region refused to participate due to work overload as a result of people on sick leave, thus nine out of 10 health care centers participated. Those who agreed to participate received an e-mail presenting the study with the questionnaires attached, and an appointment for initiation of the survey was made.

The author visited the participating health care centers and delivered the questionnaires by hand. A total of 350 questionnaires, of which 300 were in Norwegian and 50 were in English, were delivered among the nine participating health care centers. The denominator was estimated from the number of births in the relevant health care centres in 2015.[7] The midwife or nurse in charge of each health care center instructed his or her colleagues performing the 6-week control of their preferred procedure to conduct the survey. It had been emphasized that the author´s preference was that the participants were to be asked to complete the questionnaire before commencing, or during the 6-week control. However, each health care center carried out its own procedure when implementing the survey, according to what was practically feasible.

Completed questionnaires were placed in a closed box in the office or at reception. Initially, the author collected the questionnaires on a weekly basis to obtain an indication of the response rate, and to make sure there were no misunderstandings or questions unanswered. Once collected, each questionnaire was given a number in order to easier control the data analysis procedure. All questionnaires were eligible for inclusion, and there were no reports of individuals refusing to participate. The Statistical Package for the Social Sciences (SPSS) program was used to analyze the data. The data was mainly categorical and the variables were analyzed using descriptive statistics. The data collection period lasted from February 29, 2016 to May 06, 2016.

An independent ethics approval committee approved the study. Additionally, the Health Department in the county of Bergen had given permission to involve their employees in the data collection process. There was no direct contact between respondents and researchers, and questionnaires were answered anonymously.

Results

In all, there were 123 parents who completed the survey for their infant. Three hundred and fifty surveys were distributed, giving a response rate of 35%. There were no reports of participation refusals. Of the participants, 46% (N=57) were male and 54% (N=66) were female. The mean birth weight of the babies was 3,516 grams. The mean duration of pregnancy was 39.5 weeks, (10 participants had left this question blank). Previously completed pregnancies showed a mean of 0.86 (three participants did not answer this question). The majority (94%) (N=115) presented head first, whereas 3% (N=4) displayed breech position, 2% (N=3) had face presentation whereas 1% (N=1) presented with hand or foot first.

Normal vaginal delivery was the most common type of birth (N=83), followed by induced birth (N=23) and then ventouse (vacuum extraction) delivery (N=11). Ten participants reported very rapid birth, and five had forceps delivery. Emergency caesarean was noted in five participants,

whereas four reported planned caesarean. Participants could "tick appropriate boxes" in this section, thus the total number (N=141) exceeds that of the number of participating subjects (N=123). One subject left this section open.

Among the total of 123 subjects, 12 (10%) had seen a chiropractor, of whom five were boys and seven were girls. Mean birth weight of subjects who had seen a chiropractor was 3,488 grams. The mean duration of pregnancy was 38.7 weeks. One infant was first-born, and the mean from previous pregnancies was 1.0. One participant left the two latter parameters unanswered, thus those numbers are based upon 11 subjects. Demographic data of the infants who had seen a chiropractor is summarized in Table 1. All subjects´ position at birth was with head first, except one planned caesarean. The latter left this question blank. Normal vaginal delivery was the most common birth presentation (N=7), followed by induced birth (N=3). One participant reported ventouse delivery and one reported a planned caesarian.

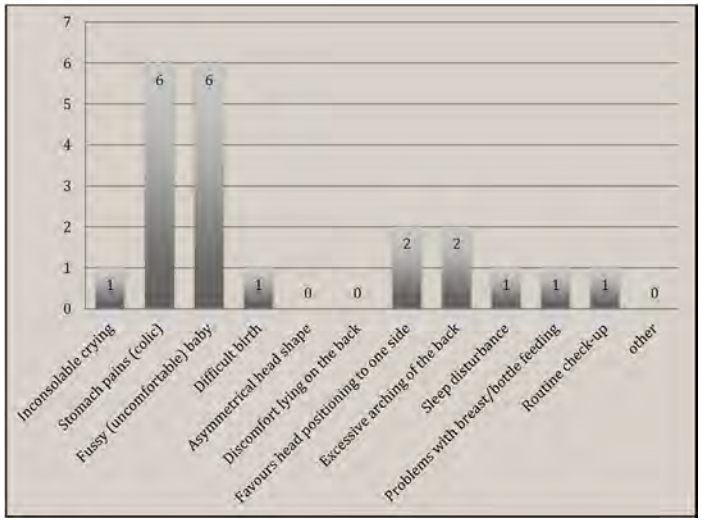
Table 1. Demographic data of the infants presented at six-week control in Health care centres in Bergen, Norway who had seen a chiropractor

Demographic data	Number of responses (N)	Left blank (N)	Mean	Standard deviation (SD)
Birth weight	12	-	3488 grams	814 grams
Duration of pregnancy	11	1	38.7 weeks	2.1 weeks
Previously completed pregnancies	11	1	1.0	0.8
Assisted birth	5		n/a	n/a
Non-assisted birth	7		n/a	n/a

In the presenting complaints section, subjects could tick as many boxes as wanted. The most common presenting complaints were colic and fussy (uncomfortable) baby, reported by six. Among these, three chose both the colic and fussy baby categories. The second most common presenting complaints were favored head positioning to one side and excessive arching of the back, both reported by two respondents. Inconsolable crying, sleep disturbance and feeding problems were all reported once. Similarly, difficult birth and routine check-up were both ticked once each. No subjects were reported to have asymmetry of the head, discomfort lying on the back or other complaints. The presenting complaints are summarised in Figure 1.

The most common mode of referral was by friends and/or family (N=5), followed by health care visitor and themselves (N=3). Two participants reported referrals from another chiropractor, similar to other recommendations (N=2). One subject was referred by a pediatrician, and one by a midwife. Participants could tick appropriate boxes.

Figure 1. Presenting complaints of infants presented at six-week control in health care centers in Bergen, Norway (N=12) who had seen a chiropractor



Discussion

This survey aimed to determine how many six-week-old babies had presented to a chiropractor in Bergen, Norway, to describe their demographics, to identify their presenting complaints and to outline who referred them to the chiropractor. Because of the small sample, any trends observed may not be representative of the general population. No other study has addressed the prevalence of all six-week-old babies in the general population who have seen a chiropractor at a snapshot in time.

Assisted deliveries were more common among the chiropractic subjects in this study versus the general population. This has been the case in several other studies of chiropractic infant patients.[8] Infants with induced birth or intervention birth have a higher proportion of minor birth trauma,[9-14] with the potential consequence of musculoskeletal problems.[15] Furthermore, Zwart and collegues[16] found that the highest association of infant colic was related to birth trauma. The influence of intra-uterine pressures and/or excessive compressive and tractional forces at birth has potential to have long-term effects on the infant, although this has not yet been established. According to Stellwagen et al[17] pelvic obliquity, rib cage moulding, hip dysplasia, torticollis, postural scoliosis and asymmetry, and plagiocephaly are regularly encountered in the new-born. The long-term effect of leaving these conditions untreated is unknown, although it is known that young children have headaches and pain in far larger numbers than previously thought.[15] Considering the high possibility of infants developing musculoskeletal problems, or developmental delay syndromes, as a result from assisted births or interventional births, is there sufficient attention being paid towards taking preventive

measures, or at minimum, examination for musculoskeletal dysfunctions at birth?

In the present study sample, most of presenting complaints were related to colic and fussy baby, and the respondents had ticked several boxes relating to excessive crying/colic/discomfort. This finding corroborates many other studies.[1-4] Interestingly, specialist neurologists, orthopedic surgeons and physiotherapists have implicated the musculoskeletal system as a cause of excessive infant crying.[18-21] Are we heading towards an inter-professional understanding of the importance of the musculoskeletal system in the fussy infants? Inconsolable infants may have huge socioeconomic impacts. Extreme infant crying has, in fact, been associated with organic and psychosocial risks, including high rates of prenatal stress and anxiety, maternal psychopathology, child abuse and partnership conflicts.[18]

Infants in the current study were most commonly referred to a chiropractor by friends and/or family. This is consistent with findings from the study by Doyle.[1] One-fourth were referred by a health care visitor, which corresponds to the findings from Hestbaek et al.[3] Another fourth made the decision themselves that they should take their infant to a chiropractor. The fact that no subjects were referred by a GP or physiotherapist, reflects the authors own clinical experience. Firstly, a plausible explanation may be that treatment by physiotherapist or manual therapist is free of charge for children under the age of 12 years in Norway. Secondly, GPs by tradition refer to physiotherapy. Nevertheless, it is encouraging that one infant was referred by a pediatrician, which is an important indication of the acceptance of chiropractic competency. In a recent study from Canada,[22] referrals from the medical profession were highest to chiropractors with a known musculoskeletal practice. It is thus likely that the number of referrals to chiropractors varies among different regions and different health care stations depending on whether there is an established chiropractic clinic with pediatric competence in the area or not. However, this was beyond the scope of this study.

This study is unique in that it was designed to cover all six-week-old babies in a medium-sized city in Norway at a snapshot in time. This study has severe limitations. The low number of participants means the findings cannot be generalised. Every year, approximately 5,000 babies are born in the Bergen hospital. However, this number includes infants living in surrounding counties as well. Considering that the data collection period lasted for 10 weeks, the estimated number of six-week controls in the participating health care centers was 350, even though this period included the Easter holiday. With only 123 returned questionnaires, the results of this study are based on a response rate of 35%. Minimizing non-response bias was considered as one of the main challenges during this study. Since the data collection relied on the enthusiasm from the midwives working in the different health care centers, there was no guarantee that the questionnaires were distributed to all potential participants. Additionally, since the author was not present during the process where the sample population was invited to participate, it is likely that the participants felt less encouraged to engage in the survey. These two reasons are the most likely explanations for why there were only 123 respondents. Furthermore, recall bias was likely to influence the answers since many of the respondents are in a situation with little sleep and some degree of post partum exhaustion, and the focus is on the actual six-week control. There is also a possibility that the infant was fussy during the consultation, and that the parents thus would not want to spend excessive time at the center, and thereby declining to answer the questionnaire, or not thinking the answers through. This study aimed at eliminating selection and sampling bias by including all six week-old babies. Since there is no follow-up in this study, there were no dropouts. Bias from misclassification in the questionnaire was hopefully avoided by completion of a pilot study.

Perhaps the number of infants seen by a chiropractor would be higher if the survey had included older babies. However, since symptoms often occur between two to four weeks of age,[23,24] six-week-olds were considered a convenient age group for this survey. This is supported by the findings of Marillier and colleagues,[25] who reported that the average age at the first visit to a chiropractor is five weeks. It is most likely that speciality practices get much younger infants.[26]

Since there is little published research in the field of manual therapies for pediatric patients combined with an increasing use of pediatric chiropractic care, the profession has an obligation to provide up-to-date evidence for the justification of the management provided. Inherent to this statement is that a profound rationale for, and understanding of, etiologies and diagnoses is established. Mapping and identification of pediatric patients is fundamental to developing diagnostic criteria and treatment protocols. Documenting referral patterns in chiropractic care of the pediatric patient will also add important information regarding other health professions use of chiropractic care and support interdisciplinary engagement. Similarly, it may give indications of which other health professions could benefit from more information about chiropractic pediatric care in general.

All of these parameters of health care for this patient group require significantly more research. There is little published research that describes and defines pediatric patients and their most common musculoskeletal conditions, and treatment strategies basically rely upon clinical experience. In relation to the potential long-term consequences concern-

ing the musculoskeletal system and the behavioral developmental challenges implicated, a musculoskeletal screening program for infants is suggested.

Conclusion

This study found that 10% of six-week-old infants in Bergen, Norway have seen a chiropractor. The most common presenting patients were colic and fussy babies. Assisted deliveries were more frequent among the infants who had seen a chiropractor versus the general population. The infants were referred by friends and family, health care visitors, and parents making the decision themselves. This study was too small to determine more than trends and more research is required to establish when and for what reasons parents in the general population present their infant to a chiropractor.

References

1. Doyle M. A multinational survey of the demographic of chiropractic care. *Clinical Chiropractic* 2011; 14(4):150-151.

2. Allen-Unhammer A, Wilson FJH and Hestbaek L. Children and adolescents presenting to chiropractors in Norway: National Health Insurance data and detailed survey. *Chiropr Man Therap* 2016; 24:29-38.

3. Hestbaek L, Jørgensen A and Hartvigsen J. A description of children and adolescents in Danish chiropractic practice: results from a nationwide survey. *J Manipul Physiol Ther* 2009; 32(8):607-615.

4. Miller J. Demographic survey of patients presenting to a chiropractic teaching clinic. *Chiropr and Osteopat*, 2010; 18:33.

5. Carlton P, Johnson I and Cunliffe C. Factors influencing parent´s decisions to choose chiropractic care for their children in the UK. *Clinical Chiropractic* 2009; 12(1):11-22.

6. Schmid PN, Hetlevik MA, Miller, J. Infant presentations and outcomes at a chiropractic clinic in the UK: parent report of treatment outcomes using the United Kingdom Infant Questionnaire (UKIQ). *Journal of Clinical Chiropractic Pediatrics* 2016; 15(2):1237-1242.

7. SSB (Statistisk Sentral Byrå), [internet].2015. [cited 2015 30 Oct]. Available from: https://www.ssb.no/helse/statistikker/helsetjko/aar/2015-06-25?fane=tabell&sort=nummer&tabell=232612

8. Homdrum AK and Miller J. Maternal report of feeding practices: a cross- sectional survey of 1753 mothers presenting infants to a chiropractic teaching clinic. Journal of *Clinical Chiropractic Pediatrics* 2015; 15(1):1198-1202.

9. Byers RK. Spinal-cord injuries during birth. *Dev Med Child Neurol* 1975; 17(81):103-110.

10. Hughes CA, Harley EH, Milmoe G, Bala R and Martorella A. Birth trauma in the head and neck. *Arch Otolaryngol Head Neck Surg* 1999; 125:193-199.

11. Biedermann H. *Manual Therapy in Children*. Churchill Livingstone; 2004.

12. Poggi SH, Allen RH, Patel C, Deering SH, Pezzullo JC, Shin Y and Spong CY. Effect of epidural anaesthesia on clinician-applied force during vaginal delivery. *Am J Obstet Gynecol* 2004; 191(3):903-906.

13. Tekes A, Pinto, PS and Huisman TA. Birth-Related Injury to the Head and Cervical Spine in Neonates. *Magn Reson Imaging Clin N Am* 2011; 19:777-790.

14. Miller J and Newell D. Prognostic significance of subgroup classification of infant patients with crying disorders: a prospective cohort study. *Journal of Canadian Chiropractic Association* 2012; 56(1):40-48.

15. Miller J, Fontana M, Jernlas K, Olofsson H and Verwijst I. Risks and rewards of early musculoskeletal assessment. *Br J Midwifery* 2013; 21(10):736-743.

16. Zwart P, Vellema-Goud MGA and Brand PLP. Characteristics of infants admitted to hospital for persistent colic and comparison with healthy infants. *Acta Paediatr* 2007; 96:401-405.

17. Stellwagen L, Hubbard E, Chambers, C and Lyons Jones K. Torticollis, facial asymmetry and plagiocephaly in normal newborns. *Arch Dis Child* 2008; 93(10):827-831.

18. Papousek M and von Hofacker N. Persistent crying in early infancy: a non-trivial condition of risk for the developing mother-infant relationship. *Child Care Health and Development* 1998; 5:395-424.

19. Biedermann H. Manual Medicine of Functional disorders in children. *Medical Veritas*, 3, 803-814;2006.

20. Holsti L and Grunau RE. Initial validation of the behavioural indicators of infant pain (BIIP). *Pain* 2007; 132:264-272.

21. Gudmundsson G. Infantile colic: is a pain syndrome. *Med Hypothesis* 2010; 75:528-529.

22. Blanchette MA, Rivard M, Dionne CE and Cassidy JD. Chiropractors´ characteristics associated with physician referrals: results from a survey of Canadian doctors of chiropractic. *J Manipul Physiol Ther* 2015; 38 (6):395-406.

23. Paradise JL. Maternal and other factors in the etiology of infantile colic. Report of a prospective study of 146 infants. *Journal of American Medical Association* 1966; 3: 191-199.

24. Miller J. Cry babies: A framework for chiropractic care. *Clinical Chiropractic* 2007; 10(3):139-146.

25. Marillier KE, Lima AM, Donovan LY, Taylor C and Miller J. Mama, please stop crying: lowered postnatal depression scores in mothers after a course of chiropractic care for their infants. Available from: http://jcponline.com/Vol14Issue03.pdf [cited 2016 13 May 13].

26. Pohlman KA, Hondras MA, Long CR and Haan AG. Practice patterns of doctors of chiropractic with a pediatric diplomate: a cross-sectional survey. *BMC Complement Altern Med* 2010; 10;26.

Demographic profile of 266 mother-infant dyads presenting to a multidisciplinary breastfeeding clinic: a descriptive study

By Amy S. Miller, MSc[1], Joyce E. Miller, DC, PhD[2], Alison M. Taylor, PhD[3], Susan Way, PhD[4]

1. PhD student, Bournemouth University, UK
2. Associate Professor, AECC University, Bournemouth, UK
3. Infant Feeding Lead, Bournemouth University, UK
4. Associate Professor, AECC University, Bournemouth, UK

Corresponding author: Joyce E. Miller, DC, PhD
Email: jmiller@aecc.ac.uk

Funding: Partially funded by the Seedcorn Fund, awarded by Bournemouth University, UK
The authors declare no conflict of interest.

ABSTRACT

Worldwide, sustained breastfeeding rates are lower than optimal. Mothers and infants with suboptimal breastfeeding present to a wide variety of practitioners to assist their goal of total breastfeeding. To support these mother-infant dyads, a multi-disciplinary chiropractic and midwifery feeding clinic was opened alongside a chiropractic teaching clinic in England. To improve understanding of the presentation and clinical needs of these nursing dyads, a descriptive study was developed. This paper provides an overview of the cases that presented to this clinic over nine months, with a focus on feeding difficulties, birth and musculoskeletal problems in the infant. Mothers frequently reported more than one type of feeding problem, which most commonly included difficulty attaching, painful feeding, and a one sided feeding preference. Birth intervention was more common in this population than the national averages, particularly forceps deliveries. Musculoskeletal problems were prevalent in the babies presented to the feeding clinic, most commonly of the thoracic spine, cervical spine and sternocleidomastoid. Although causation cannot be established from this type of study, intervention at birth, feeding difficulties and musculoskeletal problems frequently coexisted in these infants. Therefore, including musculoskeletal care for infants as part of support for suboptimal breastfeeding may be appropriate.

Keywords: breastfeeding, suboptimal breastfeeding, chiropractic, midwifery, interprofessional

Introduction

The importance of breastfeeding for the health of both mother and infant is widely acknowledged and supported.[1] Health benefits for the infant include reduced infectious morbidity and mortality, reduced dental malocclusions and higher intelligence, when comparing longer periods of breastfeeding to those who are not breastfed or breastfed for shorter periods.[1] For breastfeeding mothers, health benefits include prevention of breast cancer, improved birth spacing due to lactation amenorrhea, and possible reduction in the risk of ovarian cancer and diabetes.[1] Other benefits of breastfeeding are understood in terms of prevention of costs of childhood morbidity, costs of lower cognition, and environmental costs.[2] Although initiation rates are high, sustaining breastfeeding past the first days and weeks is lower than ideal in much of the world, with the United Kingdom having one of the lowest rates of sustained breastfeeding globally.[2] In the United Kingdom, 69% of infants were exclusively breastfed at birth, 23% exclusively breastfed at six weeks, and 1% at six months.[3] Since breastfeeding benefits are dose-dependent, an interdisciplinary breastfeeding clinic was developed, with collaboration between midwives and chiropractic providers in an educational setting. This clinic has dual purposes: 1) to help mother-infant dyads start and sustain breastfeeding; 2) to educate midwifery and chiropractic students to effectively support optimal breastfeeding for the mother and baby.

In order to better understand the population requiring this support, chiropractic students were required to complete standardized forms for each mother-infant encounter, as part of their routine record-keeping in the breastfeeding clinic. In this context, this study describes the population that attended the clinic with a view to better understand the needs of this subgroup, consisting of mothers and infants who required additional support beyond the routine professional care for suboptimal breastfeeding.

Methods

The population studied were all mother-infant dyads who entered the breastfeeding clinic after calling to make an appointment. There were no recruitment techniques. Mothers may have been told about the clinic by their health care professional, a friend or family member, or by picking up a leaf-

let in their local hospital or General Practitioner (GP) office. Each mother signed a consent form when enrolling her baby into the clinic, agreeing for their data to be used for research purposes. The AECC Research Ethics Subcommittee granted permission to collect this data. Data were collected between September 2015 and July 2016.

Each dyad was seen in the clinic by the multidisciplinary team. History taking and observation of a feed were completed by both midwifery and chiropractic students, each bringing their own expertise to gain understanding of the individual clinical picture. Vital signs and a musculoskeletal examination were completed by the chiropractic interns. All aspects of the clinical encounter were overseen by qualified midwives and doctors of chiropractic. Mothers were provided with information and support and babies were treated by students and doctors of chiropractic, when clinically indicated. Midwifery and chiropractic records were kept on each clinical encounter. Standardised forms were completed by the chiropractic students during each consultation and then collated as the basis for this study.

Results

A total of 266 mother-infant dyads were included in this case series over a period of nine months. All data were not available for all cases. The mean age of infants at presentation was 5.7 weeks, with a range of three days to 31 weeks; the mode age at presentation was three weeks. The mean gestational age at birth was 39.7 weeks and the mode was 40 weeks. Seventeen babies were born prematurely (31-37 weeks). There were 137 male babies (52%) and 125 female (48%). Of the 233 cases where the duration of feeding problem was reported, 64% (n = 156) were reported to have a feeding problem immediately after birth which had persisted, and 36% (n = 87) had a feeding problem which developed subsequently, up to 22 weeks later.

Birth

Ninety-one percent of babies (n = 213) were reported as a cephalic presentation, with 27% (n = 45) of these being occipito-posterior (back to back). Five percent (n = 13) were breech and the remaining 4% (n = 9) were reported as "other" (usually transverse lie).

Table 1. Birth type and interventions (n = 259)

Birth type	*n*	*Percentage*
Spontaneous birth without assistance	45	17%
Assisted birth, total	214	83%
Total C-section rate*	67	26%
Elective/planned C-section *	21	8%
Emergency C-section *	46	18%
Forceps *	54	21%
Ventouse*	20	8%
Induction *	73	28%

*More than one intervention may have been reported for each dyad

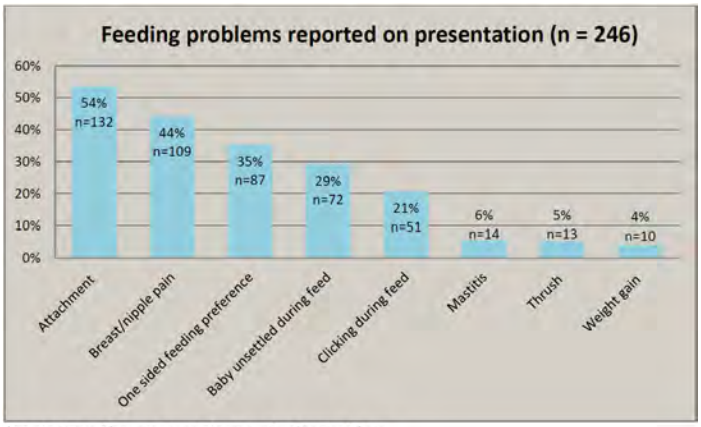
Table 1 shows types of birth experienced by mothers presenting to the feeding clinic. More than one type of birth intervention was reported by some mothers. In this study, assisted birth was defined as any birth which had any form of intervention which changed the natural physiological process of labour and delivery, including induction, instrumental delivery and Caesarean section.

Feeding Problems

At presentation, 64% (n = 167) of babies were exclusively fed breastmilk, although not all of these babies were feeding at the breast and families were using alternative methods to feed including bottle, syringe, cup and nasogastric tube. Mixed feeding, using varying ratios of artificial milk and breast milk, was commonly used (34%; n = 90). A small number of babies (2%; n = 4) were exclusively fed artificial milk.

Mothers often reported more than one type of feeding problem (Figure 1). Specific feeding difficulties were reported by 246 mothers and included difficult attachment to the breast (54%; n = 132), breast or nipple pain (44%; n = 109), one-sided feeding preference of the baby (35%; n = 87), baby unsettled during feeds (29%; n = 72), noises from baby when feeding (21%; n = 51), mastitis (6%; n = 14), thrush (5%; n = 13), and poor/insufficient weight gain (4%; n = 10).

Figure 1. Feeding problems reported by mothers at presentation to the Feeding Clinic

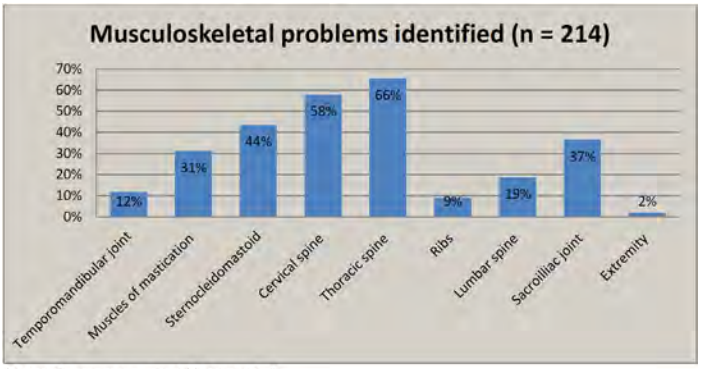


*Mothers could report more than one feeding problem.

Musculoskeletal problems

Mothers pointed out postural problems in the baby: 1) that the baby could not sleep supine (43%; n = 104), 2) baby would only look to one direction (45%; n = 111), and 3) the baby's head seemed deformed (29%; n = 68). In this sample of 266 infants, 214 infants had musculoskeletal (MSK) problems, with a total of 602 specific musculoskeletal problems identified by the chiropractic providers (Figure 2). Of the 248 mothers who were asked whether their baby had been

Figure 2. Area of musculoskeletal (MSK) problem in infants as identified by chiropractors in Feeding Clinic



*More than one area could be reported.

examined and/or treated for a tongue tie, 104 (42%) of babies did not have tongue tie, 45 (18%) had been diagnosed with a tongue tie but it had not been cut, 87 (35%) had a tongue tie that had been cut and a further 12 (5%) had a tongue tie that had been cut twice or more. Thus, a total of 58% of infants in this clinic had a diagnosis of a tongue tie, either prior to presentation or identified by the chiropractic providers in the feeding clinic.

Care at the feeding clinic (Figure 3) was based on the clinical presentation, and usually included both midwifery and chiropractic care (84%; n = 223); some received care from the midwife only (14%; n = 37) or chiropractic provider only (2%; n = 6). Follow up care was reported for 135 infants (Figure 4), with 84% of those followed up at AECC clinic for musculoskeletal problems.

Figure 3. Practitioner required by dyads in the Feeding Clinic

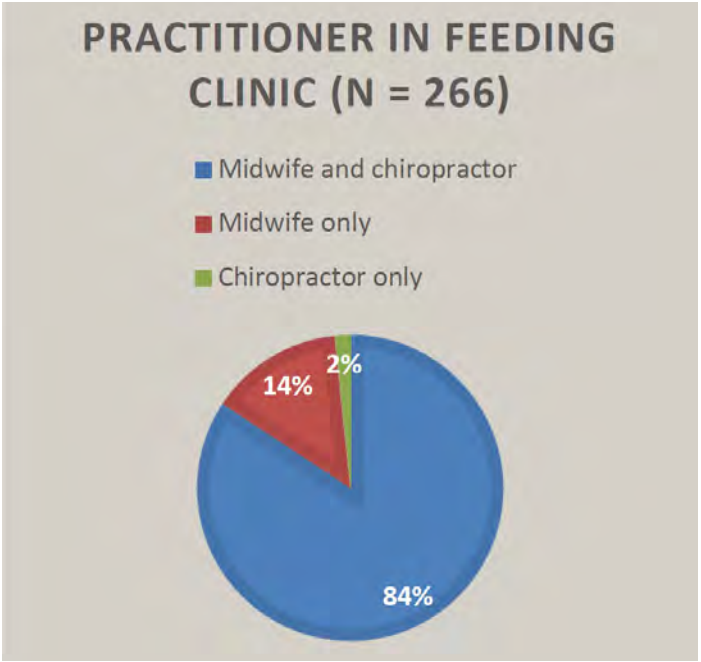
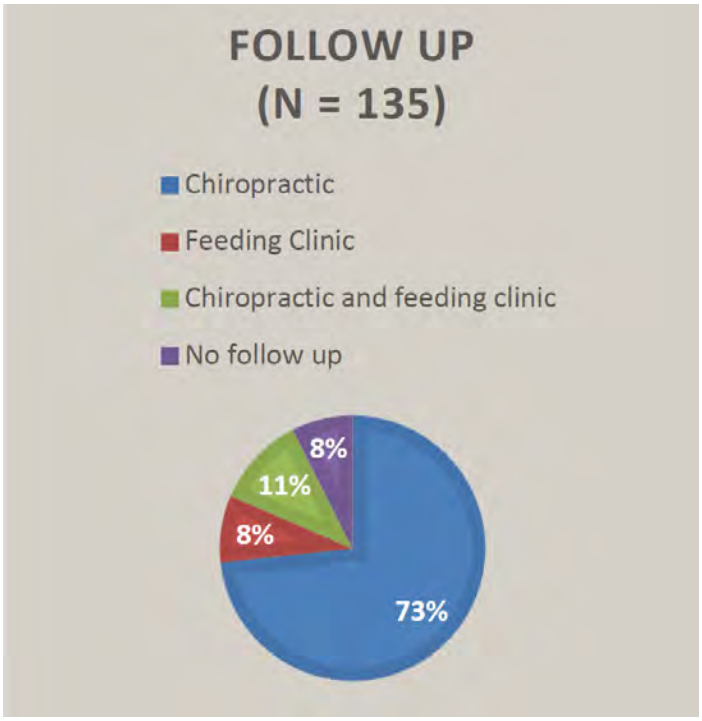


Figure 4. Follow up care after presentation to feeding clinic



Discussion

The purpose of this study was to document the clinical presentation of mother/infant dyads attending an interdisciplinary feeding clinic staffed by midwives and chiropractic providers. Clinical notes taken during consultations were the basis of this investigation. As such, this is a case series and there was no attempt to determine the success or not of the care provided. Those findings have been reported elsewhere.[4]

A history of an assisted birth appears to be associated with feeding problems and this has been widely documented.[5–8] Comparison of the birth interventions of babies presenting at the clinic with national statistics[9] (Table 2) suggested that forceps deliveries were almost three times more common in those infants presented to the breastfeeding clinic than the

Table 2. Comparison of national and Feeding Clinic statistics for type of birth

	National 2014/15	Feeding Clinic 2015/16
Total C-section rate	27%	26%
Elective/planned C-section	11%	8%
Emergency C-section	15%	18%
Forceps	7%	21%
Ventouse	6%	8%
Induction	27%	28%

national average.

Not all feeding problems were apparent at birth, with some dyads establishing feeding and then developing feeding problems later on. Discussion with the feeding clinic team provided ideas on several possible causes for these late developing feeding problems. The physicality of feeding a newborn with poor positioning and attachment (P&A) may be easier than feeding an older/bigger baby with continued poor P&A, when it may become unsustainable. A further suggestion was a delay in skin to skin contact and/or the initiation of breastfeeding following birth, which would normally stimulate the release of prolactin which in turn would prime the receptor cells on the lactocytes, optimising milk production in the long term.[10] This results in the mother being able to provide sufficient milk in the early weeks, but as the baby grows the mother becomes unable to keep up with baby's requirements. Finally, a minor MSK problem (e.g. from intrauterine constraint or birth) which is not alleviated by time alone may cause escalating problems. An example may be a contracture of sternocleidomastoid muscle (SCM) which may initially not affect feeding or produce a mild one-sided preference early on, but later lead to a positional head deformation and exacerbate the MSK problem leading to greater restriction, more discomfort for the baby subsequently affecting feeding.

Both parental report and MSK examination demonstrated that postural and musculoskeletal problems were common in this population. These can arise from intrauterine position or constraint and varying degrees of birth trauma.[11] Whether these are directly or indirectly related to the feeding problems isn't clear; however, assisted births are strongly associated both with feeding problems[5-8] and with other postural problems in infants.[11-13]

Half of the infants in this population required ongoing care, most commonly in the chiropractic clinic due to musculoskeletal problems identified in the infant at the breastfeeding clinic. Chiropractors are musculoskeletalists and treat that type of problem.[14,15] Many infants had MSK problems which directly affected their ability to breastfeed, such as reduced cervical extension, hypertonicity of the SCM or jaw dysfunction. However, a range of other MSK problems also presented. These included inability of the baby to lie supine, which can be a purely MSK problem and requires appropriate treatment as inability to sleep supine is an established key risk for Sudden Infant Death Syndrome (SIDS).[16,17] Other postural problems reported by the parent included ability or preference of the baby to only look one direction, which is associated with development of positional head deformation (PHD)[11,12] and requires treatment. Restrictions of the tissues of the neck are of particular interest in a "one-direction" baby. As the baby lies preferentially on one side of the head, a deformation develops. Although this has been termed as "merely cosmetic" by some,[18,19] there is continuing evidence that there may be a link to developmental delay in some children.[20-23]

A key question from this data is whether these clear MSK problems (cervical spine restrictions, discomfort on supine position and head deformation) and suboptimal breastfeeding are associated, and if so, to what extent. As these are both common problems often occurring together, it may be appropriate to say there is a connection, if not causation. Vallone (2016) suggested that there is an association based on functional asymmetry of the neck.[24]

The relevance of tongue ties in feeding cases must also be questioned based on these current findings. Almost 40% of infants who presented to the feeding clinic had undergone a frenulotomy for a tongue tie at least once and sometimes twice, with minimal or no improvement in breastfeeding and no follow up support for breastfeeding. Whether frenulotomy was appropriate management for all of these cases must be questioned. On the other hand, when a frenulotomy did not improve breastfeeding, it reduced the likelihood of tongue tie as the underlying cause of their feeding problem. It is reasonable to consider the need for different methods of assessing tongue tie with an emphasis on function rather than appearance, along with a trial of conservative management prior to frenulotomy. This approach may be of particular relevance here, as many of the infants in this study were waiting more than two weeks to have frenulotomy provided by the National Health Service (NHS).

It appears that when a mother has difficulty breastfeeding because her baby has MSK problems or tongue tie, she will use desperate measures to adapt her feeding position in order for feeding to be more effective. This can, in turn, cause the mother to hold her baby in compromised positions that undermine effective breastfeeding.[10] Arguably, using an interdisciplinary approach by assessing, supporting and treating the mother and baby together increases the chance of the mother-infant dyad to work in harmony with each other optimising breastfeeding. However, further research is required to test this hypothesis.

Limitations

This is a special population who have often sought multiple modalities of health care and a high number of health care practitioners, and thus, may not be representative of all suboptimal breastfeeding dyads. However, given the vast decline in breastfeeding rates in the first six weeks in the UK,[2] and the fact that 68% of mothers in the UK National Infant Feeding Survey who stopped breastfeeding wished they could have continued,[3] it may be reasonable to assume that this is not an entirely unique population. These prob-

lems may be far more common than is currently recognized and as yet are not appropriately addressed. This paper does not report on satisfaction with the care received or its benefits, if any, for the breastfeeding dyad. It does however highlight that there is a population seeking this type of care and as there is often a waiting list, it is important that further research explores the efficacy of such a service.

Conclusion

In early life and particularly with breastfeeding, rapid resolution is especially beneficial for the whole family. As MSK problems were commonly identified in this population, a multidisciplinary approach to suboptimal breastfeeding may be appropriate care for some dyads. This approach provides a wider range of expertise and broader scope of practice, allowing for several different types of suboptimal breastfeeding problems to be addressed immediately without need for onward referral and the delays this inevitably causes. This multidisciplinary approach is particularly relevant given the high incidence of musculoskeletal problems in infants with suboptimal breastfeeding.

Birth intervention was more common in this population than the national averages, particularly forceps deliveries. Musculoskeletal problems were common in the babies presented to the feeding clinic. Although causation cannot be established from this study, coexistence between intervention at birth, feeding difficulties and musculoskeletal problems was demonstrated. Further investigation into specific musculoskeletal problems and direct association with specific birth interventions and the type of feeding problem would be beneficial.

References

1. Victora CG, Bahl R, Barros AJD, França GVA, Horton S, Krasevec J, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *Lancet*. 2016; 387(10017):475—90.

2. Rollins NC, Bhandari N, Hajeebhoy N, Horton S, Lutter CK, Martines JC, et al. Why invest, and what it will take to improve breastfeeding practices? *Lancet*. 2016; 387(10017):491—504.

3. McAndrew F, Thompson J, Fellows L, Large A, Speed M, Renfrew MJ. Infant Feeding Survey 2010 [Internet]. Dundee; 2012 [cited 2017 March 6]. Available from: http://data.gov.uk/dataset/infant-feeding-survey-2010.

4. Miller J, Beharie MC, Taylor AM, Simmenes EB, Way S. Parent Reports of Exclusive Breastfeeding After Attending a Combined Midwifery and Chiropractic Feeding Clinic in the United Kingdom: A Cross-Sectional Service Evaluation. *J Evid Based Complementary Altern Med*. 2016;21(2):85—91.

5. Evans K., Evans R., Royal R, Westerman A., James S. Effect of caesarean section on breast milk transfer to the normal term newborn over the first week of life. *Arch Dis Childhood — Fetal Neonatal Ed*. 2003; 88(5):380—2.

6. Prior E, Santhakumaran S, Gale C, Philipps LH, Modi N, Hyde MJ. Breastfeeding after cesarean delivery: a systematic review and meta-analysis of world literature 1 — 3. *Am J Clin Nutr*. 2012;95(5):1113—35.

7. Smith LJ, Kroeger. Impact of birthing practices on breastfeeding. Boston: Jones and Bartlett Publishers; 2010.

8. Pérez-ríos N, Ramos-valencia G, Ortiz AP. Cesarean Delivery as a Barrier for Breastfeeding Initiation: The Puerto Rican Experience. *J Hum Lact*. 2008; 24(3):293—302.

9. Health and Social Care Information Centre. Hospital Episode Statistics: NHS Maternity Statistics — England, 2014-15 [Internet]. NHS digital. 2015. Available from: http://digital.nhs.uk/catalogue/PUB19127.

10. Pollard M. Evidence-Based Care for Breastfeeding Mothers. Abingdon: Routledge; 2012.

11. Stellwagen L, Hubbard E, Chambers C, Lyons Jones K. Torticollis, facial asymmetry and plagiocephaly in normal newborns. *Arch Dis Chidhood*. 2008; 93(10):827—31.

12. Wall V, Glass R. Mandibular Asymmetry and Breastfeeding Problems: Experience From 11 Cases. *J Hum Lact*. 2006; 22(3):328—34.

13. Smith LJ. Impact of Birthing Practices on the Breastfeeding Dyad. *J Midwifery Women's Heal*. 2007; 52(6):621—30.

14. Holleman AC, Nee J, Knaap S. Chiropractic management of breast-feeding difficulties : a case report. *J Chiropr Med* [Internet]. National University of Health Sciences; 2011; 10(3):199—203. Available from: http://dx.doi.org/10.1016/j.jcm.2011.01.010.

15. Miller J, Miller L, Sulesund A-K, Yevtushenko A. Contribution of Chiropractic Therapy to Resolving Suboptimal Breastfeeding: A Case Series of 114 Infants. *J Manipulative Physiol Ther.* 2009; 32(8):670—4.

16. Gilbert R, Salanti G, Harden M, See S. Infant sleeping position and the sudden infant death syndrome: systematic review of observational studies and historical review of recommendations from 1940 to 2002. *Int J Epidemiol*. 2005; 34(4):874—87.

17. Lullaby Trust. The Lullaby Trust: Evidence Base [Internet]. Lullaby Trust. 2014 [cited 2016 Apr 23]. Available from: http://www.lullabytrust.org.uk/file/Evidence-Base-updated-Oct-14.pdf.

18. American Academy of Paediatrics Task Force on Infant Sleep Position and Sudden Infant Death Syndrome. Positioning and SIDS. *Pediatrics*. 1992; 89(6):1120-1126.

19. American Academy of Pediatrics Task Force on Sudden Infant Death Syndrome. The changing concepts of sudden infant death syndrome: Diagnostic coding shifts, controversies regarding the sleeping environment, and new variable to consider in reducing risk. *Pediatrics*. 2005; 116, 1245-1255.

20. Majnemer A, Barr RG. Association between sleep position and early motor development. *The Journal of Pediatrics*. 2006; 149 (5), 623-629. e621.

21. Collett BR, Breiger D, King D, Cunningham ML, Speltz ML. Neurodevelopmental implications of "deformational" plagiocephaly. *J Dev Behav Pediatr*. 2005; 26(5):379-89.

22. Hutchinson BL, Stewart AW, Mitchell EA. Characteristics, head shape measurements and developmental delay in 287 consecutive infants attending a plagiocephaly clinic. *Acta Paediatr*. 2009; 98(9):1494-9.

23. Speltz ML, Collett BR, Scott-Miller M, Starr JR, Heike C, Wolfram-Aduan AM, King D, Cunningham ML. Case-control study of neurodevelopment in deformational plagiocephaly. *Pediatrics*. 2010; 125(3):537-542.

24. Vallone S. Evaluation and treatment of breastfeeding difficulties associated with of cervicocranial dysfunction: a chiropractic perspective. *Journal of Clinical Chiropractic Pediatrics*. 2016; 15(3):1301-1305.

Is tongue tie really the problem? Incidence of ankyloglossia in an infant population presented with suboptimal feeding: a cross-sectional survey

By Amy S. Miller, MSc[1] Joyce E. Miller, DC, PhD[2]

1. PhD student, Bournemouth University, UK
2. Professor, AEEC University, Bournemouth, UK

Corresponding author: Joyce E. Miller, DC, PhD
Email: jmiller@aecc.ac.uk

ABSTRACT

As the number of infants presenting to chiropractors with the problem of suboptimal breastfeeding is increasing, further questions about this population are raised. The incidence of ankyloglossia (tongue tie) diagnosis appears to be high in this population. However, there is little literature or clarity on the role of the ankyloglossia in the often complex clinical presentation of feeding difficulties, particularly on sustaining breastfeeding in the medium to long term. This study was designed to describe a population of infants presented to a chiropractic teaching clinic with the problem of suboptimal breastfeeding, and assess this population for diagnosis and management of ankyloglossia. This will be used as a starting point for further research into these common problems of ankyloglossia and suboptimal breastfeeding. Inclusion criteria were infants presenting to this clinic with the complaint of feeding difficulties, as reported by the mother. Data were collected using maternal questionnaires and a total of 131 infants were included over a period of five months. Ankyloglossia had been diagnosed prior to presentation to the chiropractor in 39% of infants, and of these, 77% had undergone frenulotomy (tongue tie cut) once or more. Given the high incidence of ankyloglossia diagnosis and frenulotomy in these infants with persistent feeding difficulties, both the diagnosis and management of this problem must be reflected upon and questioned. This study highlights a clinical need for a) clearer diagnostic criteria for ankyloglossia and, b) further research with a focus on sustained breastfeeding following frenulotomy and other treatments.

Keywords: Ankyloglossia; breastfeeding, chiropractic, frenulotomy, pediatric, suboptimal breastfeeding

Introduction

There is little consensus worldwide on the impact of ankyloglossia on breastfeeding difficulties, and the impact of frenulotomy on improving breastfeeding in these cases. While frenulotomy is encouraged in some countries, including the United States, it is not recommended in Canada or Japan, and has even been abandoned in the Netherlands.[1] Worldwide prevalence estimates vary greatly, partly due to a lack of definitive diagnostic criteria.[1] The current UK guidelines from the National Institute for Health and Clinical Excellence (NICE) state that there is little evidence for frenulotomy in improving the public health goal of higher long-term breastfeeding rates, and that conservative measures including massaging and exercising the frenulum should be implemented.[2]

There is growing evidence for the role of musculoskeletal dysfunctions contributing to suboptimal breastfeeding, and infants with suboptimal breastfeeding are increasingly presented to the chiropractor.[3-6] It was noted in a previous study that the incidence of ankyloglossia (tongue tie) in a population presented for chiropractic care with suboptimal breastfeeding appeared to be disproportionately high at 58%,[7] compared to worldwide estimates of 3-16%.[8-11] In cases of suboptimal breastfeeding, musculoskeletal issues are also common,[7] and it is anatomically plausible that ankyloglossia and musculoskeletal problems may coexist or even be directly associated.

It would seem perfectly reasonable to chiropractors, and indeed allied health care professionals, that an adult with tight hamstrings could have changes in posture and biomechanics of their low back. Similarly, a tight lingual frenulum has the potential to alter the biomechanics of the tongue, jaw and neck, and cause the infant to use suboptimal motor patterns in an attempt to suck.

Further, asymmetries of the head, jaw and neck are common in infants, and have been associated with birth trauma, birth intervention and prolonged second stage of labour.[12] This is reflected in the population of infants in this clinic presented with feeding difficulties, where a higher than expected rate of birth intervention was demonstrated.[7] The importance of mobility of the tongue has been demonstrated in an ultrasound study, which described wedging of the anterior tongue between the nipple-areola and the lower lip, and undulation of the posterior tongue.[13] This requires the infant to

be able to a) protrude the tongue as far as the lower lip and, b) have sufficient movement of the posterior tongue to create peristalsis and negative pressure.

There is variable interpretation of the role of ankyloglossia in these cases of suboptimal breastfeeding, making evidence informed management difficult. It has been reported that 50% of infants with ankyloglossia will not encounter feeding difficulties.[1] A systematic review has reported that there is moderate evidence for the effectiveness of frenulotomy.[14] However, this study and many others only measure outcomes immediately after the frenulotomy has been performed, with no further follow up. This approach has been criticised for ignoring the potential of placebo effect.[1] Further it does not provide a wider public health context of sustained breastfeeding, for example amount of breastfeeding at six months, which is the recommendation of the World Health Organization.[15] One web-based survey regarding the breastfeeding difficulties before and after frenulotomy found that 85% of the types of ankyloglossia were posterior.[16] This study demonstrated post-frenulotomy reduction in presence and severity of nipple pain in all ankyloglossia classifications, and improved latch in posterior ankyloglossia.[16] However, it is not clear how long after the procedure the survey was sent out, and relied on recall of pre- and post-frenulotomy breastfeeding difficulties at the time of the survey. A high incidence of posterior tongue tie (78%) was also identified in a prospective cohort study.[17] This study used a breastfeeding self-efficacy scale and a visual analogue scale for nipple pain, and showed improvements in both of these measurements after laser frenultomy.[17]

The evidence for frenulotomy affecting breastfeeding rates in the long term is unclear. Another systematic review states that frenulotomy appears to offer breastfeeding benefits in approximately 50% of cases.[18] However this review only reports follow up breastfeeding outcomes from one study, and this was number of breastfeeds in a 24-hour period measured at two weeks after the intervention. Although the number of breastfeeds did increase in this study, this finding is without context and therefore does not necessarily support frenulotomy as a means to increase continued breastfeeding.

The lack of clarity in the literature is demonstrated in the variable approaches to the diagnosis and management of frenulotomy, and a new perspective is worthy of pursuit. Therefore, this study was designed to investigate a population with suboptimal breastfeeding for report of ankyloglossia, with a view to inform future study into this common and complex problem from a musculoskeletal perspective.

Methods and Material

This cross-sectional survey used data that was collected as part of routine clinical information provided by mothers at initial presentation of their infant to a university-affiliated chiropractic teaching clinic. No recruitment techniques were utilized and the inclusion criteria was infants presenting to this chiropractic teaching clinic with feeding difficulties, as reported by the mother. Exclusion criteria was refusal for data to be used for research and inability to read English. The study period was October 2016 to February 2017, with a total of 131 infants presenting with feeding difficulties during this time. Questions included infant gender, age, feeding type and birth type. As part of a larger study, mothers also rated any difficulty feeding their infant on an 11-point scale, with 0 being no feeding problem, 5 being moderate problem and 10 classified as a serious problem. This question was validated during the development of the UK Infant Questionnaire,[19] and was used at intake and discharge from the clinic. Data were summarised in Microsoft Excel. The survey was part of routine intake questionnaires at the clinic, which had been approved by the AECC Ethics Sub-Committee. All mothers included in the study signed consent for their infant's records to be used for research purposes on an anonymous basis.

Results

A total of 131 infants were included in this initial study. Table 1 shows the demographic profile of infants included. A limited number of cases had descriptive information about the feeding outcome following frenulotomy; seven mothers felt there had been no improvement or worsening in feeding after frenulotomy and two mothers felt it had made a significant improvement in feeding.

Table 1. Demographic profile of infants attending chiropractic clinic for breastfeeding problems

		n	%
Infant gender	Male	58	44%
	Female	73	56%
Infant age	Mean age infant	6 weeks	
	Mode age infant	1 week	
Feeding type	Totally breastfed	70	53%
	More breast milk than formula	38	29%
	More formula than breast milk	13	10%
	Totally formula fed	8	6%
	Other	2	2%
Birth type	Natural birth without interventions	50	38%
	Induced	43	33%
	Forceps	24	18%
	Ventouse	9	7%
	Emergency Caesarean section	23	18%
	Elective Caesarean section	9	7%

Figure 1 shows that at the time of initial presentation, 13 infants (10%) had not been assessed for ankyloglossia; 67 (51%) had been examined and did not have ankyloglossia, and 51 (39%) had been examined and diagnosed with ankyloglossia. Figure 2 shows that of the 51 infants who had a diagnosis

of ankyloglossia, 12 (23%) had not undergone frenulotomy, 30 (59%) had one frenulotomy, and 9 (18%) had two or more frenulotomies.

Figure 1. Diagnosis of ankyloglossia prior to attendance at breastfeeding clinic

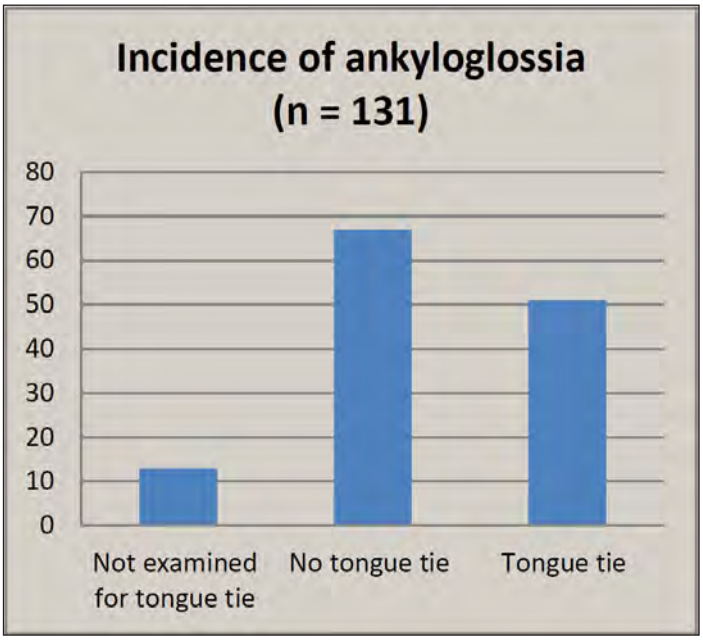
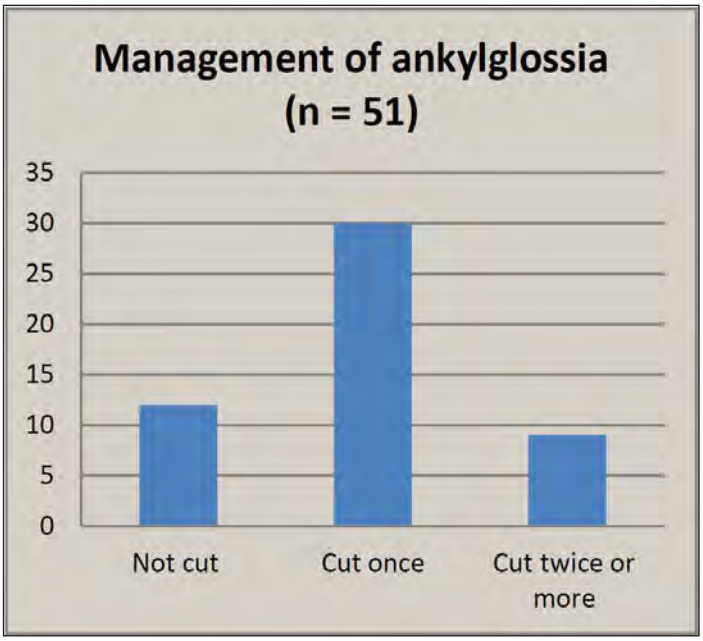
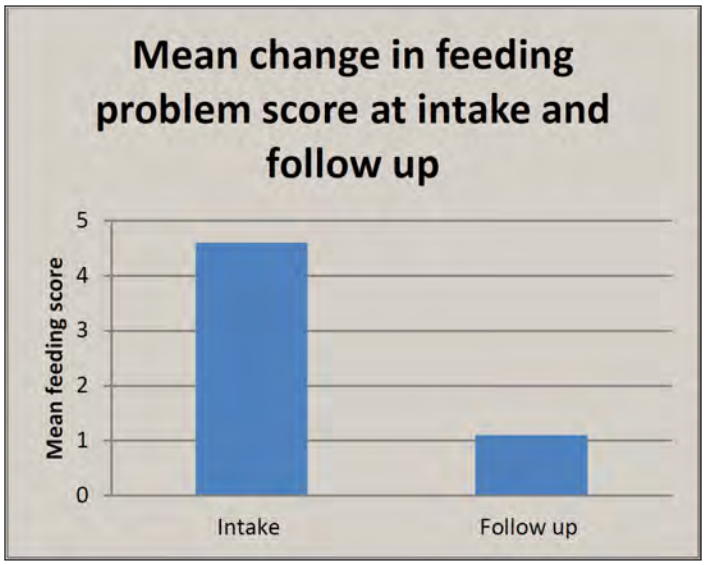


Figure 2. Management of ankyloglossia prior to presentation at the chiropractic teaching clinic



An incidental finding in this study was improvement in feeding with chiropractic management. At intake, the mean score of feeding difficulties on a scale from 0-10 was 4.6, this reduced to 1.1 at follow up. This is shown in Figure 3. Follow up questionnaires were completed by mothers on discharge of the infant from the chiropractic clinic, after an average of four treatments. There was no further or longer term follow-up. The patients were discharged as in routine care when the mothers considered the problem to be resolved or no further improvement was expected. The average change (improvement) was 76%, which was statistically significant and also considered to be broadly clinically significant.[20]

Figure 3. Change in maternal report of feeding problem after treatment in chiropractic clinic



Discussion

This was a survey of ankyloglossia in infants presented for the problem of suboptimal breastfeeding as part of routine intake information gathered in a chiropractic clinic. Prior to presentation at the chiropractic clinic, half of the infants had been examined and told there was no ankyloglossia. Just under half were diagnosed with ankyloglossia and these cases had undergone variable management prior to presentation at the chiropractic clinic. As these infants were later presented to the chiropractic clinic with feeding difficulties, it appears that previous management had not been successful in resolving the feeding in these cases. What is unknown is the quality of the treatment that was performed and one cannot discount the potential for a poorly performed surgical procedure.

There were four key issues highlighted in the results of this study.

1. Diagnosis: what constitutes a valid diagnosis of ankyloglossia?

2. Subgrouping: which babies diagnosed with ankyloglossia

should undergo frenulotomy, and which should not?

3. Management:
   a. insufficient evidence for frenulotomy resolving breastfeeding difficulties, particularly in the medium and long term
   b. insufficient evidence for other modalities in resolving breastfeeding difficulties associated with a diagnosis of ankyloglossia

The two main issues at the early stage of raising ankyloglossia as a potential problem are first, there are few standardised validated tools for diagnosing ankyloglossia. Second, there does not appear to be a validated decision-making tool to determine which infants with diagnosis of ankyloglossia will benefit from frenulotomy, and which will not.

There is a standardized tool, the assessment tool for lingual frenulum function (ATLAFF) developed by Hazelbaker.[21] However, this tool has been shown to be too long and complex to use in a busy clinic, and further could not be used for more 60% of infants who were studied.[9]

A new instrument, the Bristol Tongue Assessment Tool (BTAT)[22] has been developed with a view to solve those difficulties and to assist practitioners in tongue-tie identification. Their goal was to devise a four-step simplified procedure, but this has only recently become available for use and has not been validated.

It is apparent that despite best efforts at diagnosis and treatment, even frenulotomy does not always solve the problem, as cases presented to chiropractors had ongoing difficulty with feeding after the procedure. This raises the question as to whether frenulotomy is firstly, effective, and secondly, the appropriate management in all cases. Ankyloglossia may have been used as a "scapegoat" for the cause of the feeding problem, with other etiologies not sufficiently investigated. There is too little research investigating the role of frenulotomy in suboptimal breastfeeding, along with the quality of the procedure performed, ahead of any other types of intervention, on the effectiveness of frenulotomy on resolving breastfeeding difficulties, and on the long-term implications with regards to sustained breastfeeding. A recent systematic review reported that frenulotomy appears to offer long-term benefits to breastfeeding in a little over 50% of cases.[14] NICE guidelines highlight that breastfeeding is a complex interaction between mother and infant, and that the evidence for frenulotomy in supporting breastfeeding is not of high quality.[2]

While frenulotomy is routine management once a diagnosis of ankyloglossia is made, there is little definitive evidence for long-term effects on breastfeeding. Of the babies diagnosed with ankyloglossia, more than three-quarters had undergone frenulotomy. Despite this, these infants were still presented for further care for the problem of suboptimal breastfeeding. There is insufficient research into the role of biomechanical care for the infant prior to or alongside frenulotomy in order to support and sustain the results of the procedure. The current guideline from the National Institute for Health and Care Excellence (NICE) for frenulotomy states that conservative measures for ankyloglossia include breastfeeding support, massage of the frenulum and exercising the tongue.[2] Chiropractic care has a role in providing musculoskeletal care and support for these infants. Some research has shown resolution of breastfeeding problems with chiropractic care.[3-5] However, the care has not been delineated as to whether it assisted infants who had or had previously had ankyloglossia. Clearly, there is a role for future research that documents these types of cases, since they are so prevalent.

There are some interesting findings in the demographics. In previous studies of infants presented to chiropractors, there has been a slightly higher ratio of male infants to female.[23] Studies have also shown that there is a higher rate of ankyloglossia diagnosis in male infants.[10,24] In this sample, this ratio was reversed, 56% were female and 44% were male.

The aims of this study were simply to describe this population of infants presented to a chiropractic clinic with breastfeeding difficulties, with a particular focus on ankyloglossia status. As such, this study provides more questions than answers. Further, the numbers are too small to define any indications beyond some possible trends. However, it does point out the great need for additional modalities of care for ankyloglossia beyond frenulotomy, and for research to be undertaken into those types of care.

Conclusions

Ankyloglossia was a common problem in this population with suboptimal breastfeeding. Further study to define a valid diagnosis of ankyloglossia, subgroups of suboptimal breastfeeding including ankyloglossia, and subsequent appropriate management, are essential. In addition, alternative or combined treatment options in the management of ankyloglossia should be investigated for effectiveness, including musculoskeletal care to address associated tissues and biomechanics.

References

1. Power RF, Murphy JF. Tongue-tie and frenotomy in infants with breastfeeding difficulties: achieving a balance. *Arch Dis Child* 2015; 100: 489-94.

2. National Institute for Health and Clinical Excellence. Division of ankyloglossia (tongue tie) for breastfeeding [NICE Guideline]. 2005. Available from: https://www.nice.org.uk/guidance/ipg149/chapter/4-About-this-guidance [Accessed 04 April 2017].

3. Vallone, S. Evaluation and treatment of breastfeeding difficulties associated with cervicocranial dysfunction: a chiropractic perspective. *J Clin Chiropr Ped* 2004; 6(1): 349-68.

4. Holleman AC, Nee J, Knaap SFC. Chiropractic management of breastfeeding difficulties: a case report. *J Chiro Med* 2011; 10(3): 199-203.

5. Miller J, Miller L, Sulesund AK, Yevtushenko A. Contribution of Chiropractic therapy to resolving suboptimal breastfeeding: a case series of 114. *J Manipulative Physiol Ther* 2009; 32(8): 670-4.

6. Vallone S. Chiropractic evaluation and treatment of musculoskeletal dysfunction in infants demonstrating difficulty breastfeeding. *J Clin Chiropr Ped* 2016; 15(3): 1301-5.

7. Miller A, Miller J, Taylor A, Way S. Demographic profile of 266 mother-infant dyads presenting to a multidisciplinary breastfeeding clinic: a descriptive study. [Accepted for publication, 2017].

8. Messner AH, Lalakea ML, Aby J, et al. Ankyloglossia: incidence and associated feeding difficulties. *Arch Otolaryngol Head Neck Surg* 2000; 126:36—9.

9. Ricke LA, Baker NJ, Madlon-Kay DJ, et al. Newborn tongue-tie: prevalence and effect on breast-feeding. *J Am Board Fam Pract* 2005;18:1—7.

10. Ballard JL, Auer CE, Khoury JC. Ankyloglossia: assessment, incidence and effect of frenoplasty on the breastfeeding dyad. *Pediatrics* 2002; 110:e63. doi: 10.1542/peds.110.5.e63.

11. Ngerncham S, Laohapensang M, Wongvisutdhi T et al. Lingual frenulum and effect on breastfeeding in Thai newborn infants. *Paeditr Int Child Health* 2013; 33:86-90.

12. Stellwagen L, Hubbard E, Chambers C, Lyons Jones K. Torticollis, facial asymmetry and plagiocephaly in normal newborns. *Arch Dis Child* 2008; 93:827-31.

13. Elad D, Kozlovskya P, Bluma O, Laineb AF, Pob MJ, Botzerc E, Dollbergd S, Zelicoviche M, Sirae LB. Biomechanics of milk extraction during breast-feeding. *Proceedings of the National Academy of Sciences* 2014; 111(14): 5230-5.

14. Finigan V, Long AJ. The effectiveness of frenulotomy on infant-feeding outcomes: A systematic review. *Evid Based Midwifery* 2013; 11(2):40-5.

15. World Health Organisation. Breastfeeding [online]. Available from: http://www.who.int/topics/breastfeeding/en/ [Accessed 12 June 2017].

16. O'Callahan C, Macary S, Clemente S. The effects of office-based frenotomy for anterior and posterior ankyloglossia on breastfeeding. *International Journal of Pediatric Otorhinolaryngology* 2013; 77(5):827-32.

17. Ghaheri BA, Cole M, Fausel SC, Chuop M, Mace JC. Breastfeeding Improvement Following Tongue-Tie and Lip-Tie Release: A Prospective Cohort Study. *The Laryngocope* 2017; 127(5):1217-23.

18. Ito Y. Does frenotomy improve breastfeeding difficulties in infants with ankyloglossia. *Pediatr Int* 2014; 56:497-505.

19. Miller A, Huizinga B, Pinkster M, Telford ACJ, ten Heggeler JM, Miller JE. Development and testing of a multidimensional parent reported outcome measure for common presenting complaints of infancy: the UK infant questionnaire. *J Clin Chiropr Ped* 2016; 15(3): 1292-1300.

20. Hurst H and Bolton J Assessing the clinical significance of change scores recorded on subjective outcome measures. *Journal of Manipulative and Physiological Therapeutics*, 2004;27:26-35.

21. Hazelbaker A. The assessment tool for lingual frenulum function (ATLFF): use in a lactation consultant's private practice [thesis]. Pasadena, California: Pacific Oaks College; 1993.

22. Ingram J, Johnson D, Copeland M, Churchill C, Taylor H, Emond A. The development of a tongue assessment tool to assist with tongue-tie identification. *Arch Dis Child — Fetal Neonatal Ed* 2015: 100(4): doi: 10.1136/archdischild-2014-307503.

23. Miller J. Demographic survey of pediatric patients presenting to a chiropractic teaching clinic. *Chiropractic and Osteopathy* 2010; 18(33): doi: 10.1186/1746-1340-18-33.

24. Walsh J, Links A, Boss E, Tunkel D. Ankyloglossia and Lingual Frenotomy: National Trends in Inpatient Diagnosis and Management in the United States, 1997-2012. *Otolaryngology—Head and Neck Surgery* 2017; 156(4):735-40.

Prevalence of musculoskeletal dysfunction in infants presenting for chiropractic care in Norway: A cross-sectional study

By Catherin Alvestad Slettebo, DC, MSc[1], Joyce E. Miller, DC, PhD[2]

1. AECC University, Bournemouth, UK
Email: gunnsle@online.no
2. Professor, AECC University, Bournemouth, UK

Corresponding author: Joyce E. Miller. DC, PhD
Email: jmiller@aecc.co.uk

Conflict of interest. The authors declare no conflict of interest. No funding was obtained for this study.

ABSTRACT

Background: Musculoskeletal (MSK) injuries are common though considered under-recognized at birth. There are no gold standard routines for examination of the musculoskeletal system in infants, and very little research that investigates clinical examination and MSK findings in infants under the age of six months. **Objectives:** The objectives were to determine the prevalence of neck dysfunction, postural spine problems, and their possible association with parent reported behavioral problems such as suboptimal breastfeeding and supine sleeping in infants younger than six months of age. The aim of this study was to observe any associations between MSK problems of infancy and common behavioral and public health issues. **Methods:** This is a cross sectional questionnaire based observational study in a clinical population. Mothers of infants presented to chiropractic clinics in Norway filled in a questionnaire on the first visit, and this was followed by a clinical examination and questionnaire completed by the Doctors of Chiropractic on the same day. **Results:** In total, 90 infants enrolled in the study. A total of 56 infants (66%) had postural problems. Favorite side of cervical rotation (N=41; 75%) was the most common dysfunction in supine lying. Neck hyperextension was present in 21 infants (38%). The inability to rotate their head equally side to side was present in 49 children (54%). In total 22 (24%) of the infants did not have the ability to sleep or lie comfortably supine. Suboptimal breastfeeding was reported by 22 (25%) parents, and 10 (12%) of the mothers reported pain during feeding. TMJ imbalance was identified in 16 infants (19%). There were statistically significant associations between suboptimal breastfeeding and TMJ imbalance, suboptimal rooting/sucking reflexes, inability to turn head and neck equally and painful breastfeeding, respectively. **Conclusion:** Parents reported several MSK problems in infants along with suboptimal breastfeeding and other ADLs, which were corroborated and specified by the clinical examination. More study is needed to determine a gold standard reference for infant musculoskeletal examinations along with the importance in improving activities of daily living and public health through balance of the MSK system. **Keywords:** cervical spine dysfunctions, musculoskeletal problems, musculoskeletal examination, breastfeeding problems, supine sleep, infants, pediatrics, chiropractic

Keywords: cervical spine dysfunction, musculoskeletal injuries, musculoskeletal problems, musculoskeletal examination, breastfeeding problems, supine sleep, infants, pediatrics, chiropractic

Introduction

Mild to moderate musculoskeletal injuries are common at birth, but frequently missed.[1] Although these injuries are common, their association with quality of life conditions like sleeping, feeding or excessive crying may not always be understood in professional practice. However, birth injuries are implicated in infant complaints. For example, a difficult birth has the highest association with infant colic (now known as excessive crying) than any other factor.[2]

Further, birth injury is implicated in suboptimal breastfeeding.[3, 4,5,6] Breastfeeding is one of the key factors in improved health for the infant and mother,[7,8] and although Initiation might be high, early discontinuation is a trend if the mothers experience problems, discomfort or pain with feeding.[9] A recent study in England on dyads with feeding problems showed that cessation of breastfeeding occurs early within three weeks of age.[10] It is suggested that the infant is the cause in 59% of feeding problems.[11] However, this has been disputed as being much higher (85%) in more current research.[12] It is therefore essential to assess biomechanical problems early in infants to detect any musculoskeletal problems that might influence breastfeeding. In addition to good sucking, rooting and swallowing reflexes, the infant needs appropriate and supportive posture and adequate cervical spine range of motion to establish sufficient breastfeeding. The newborn uses six cranial nerves, 22 bones connecting to 34 sutures, and 60 voluntary and involuntary muscles in order to suck swallow

and breathe.[6] Doctors of chiropractic may contribute to this important task in light of the anatomy and biomechanical problems involved.[4,13,14,15,16,17,18,19,20,21,22]

There is a need for more precise and early assessment of the newborn infant, with a full clinical examination including biomechanical features like examination of the infant's neck and spine, cranium, and TMJ in addition to postural assessment, primitive reflexes (for example suck and rooting reflexes) and appropriate neurological examinations. These examinations are routine in chiropractic practice but the findings have not previously been documented in the research literature. This is key to further understanding of any association of observational findings with parent reports of behaviors.

This study was designed to specifically look at the prevalence of neck dysfunction, and other biomechanical problems in the infant that may be associated with suboptimal breastfeeding and other key ADLs. The chief goal of this study was to track routine clinical practice of infant care in chiropractic practices in Norway, by documenting and comparing parent report of infant problems and doctor of chiropractor's clinical findings.

Methods

The study was an observational cross-sectional study of infants routinely presented to a chiropractic clinic. Inclusion criteria were infants who were presented by their parents with a clinical complaint and who consented. Exclusion criteria were parents who did not wish their child to be included. The study was completely anonymous and no identifying data was kept except in the routine legal way as it is always kept in each clinic. Doctors of chiropractors collected the study data in multidisciplinary clinics in Norway. The chiropractic providers had a certificate in pediatric treatment, or were undertaking a professional program like MSc Advanced Professional Practice in Pediatrics.

The study included a parent questionnaire and an examination by a doctor of chiropractic. The chiropractic examination in this study was divided into five parts: Neck dysfunction, postural problems, suck and rooting dysfunctions, TMJ dysfunction and other dysfunction present (but not assessed in detail in the study). The chiropractic examination evaluated neck function based on passive cervical rotational motion, occipital glide test and neck flexion rotation test, as well as palpation for tender spots in upper and lower cervical spine. A detailed list of clinical examinations and instructions were given to each doctor of chiropractic.

The study did not differ from routine clinical practice. There were no interventions and there were no measurements before or after treatment, as part of the study. The data was collected in infants aged 0-6 months, on their first consultation at chiropractic offices in Norway. All data collection material was either sent to the participating chiropractors electronically ready to print, or by post already printed. The data was collected from end of January 2016 until end of April 2016. The study was registered with REK (Regionale komiteer for medisinsk helsefaglig forskningsteknikk), a regional study ethics committee in Norway. No further ethical oversight was required.
All infants were examined and measured once in this study. The data were first entered into an Excel spreadsheet and then exported to SPSS where appropriate statistical analysis could be undertaken. Each row in the spreadsheet contained the answer set from a given respondent, and each column would represent a question in the questionnaire (variables). Blank cells were questions that respondents did not answer. To determine if there was an association between dysfunctions and breastfeeding in infants less than four months of age, we used Pearson Chi-Square test.

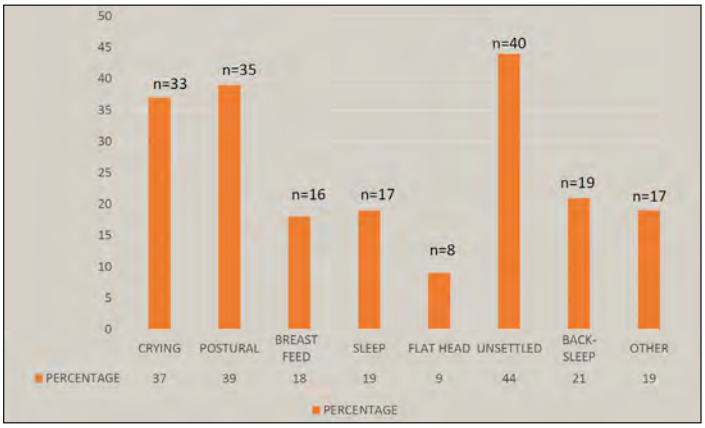
Selective answers to questions are always a limitation in this type of study; six mothers did not answer the questions regarding breastfeeding issues. The reason for this can be is that they already had terminated the breastfeeding. The mothers could therefore have problems answering these questions. The questionnaire should have included a question to identify if the mother had stopped breastfeeding due to conditions related to fuss, or difficulties in the breastfeeding situation. One doctor of chiropractic did report a few missing questionnaires and a few practitioners did leave a blank cell on the examination section. Otherwise there were no further problems filling in the questionnaires.

Results

Population: Gender, age and type of birth

In total, 90 infants enrolled in the study. A total of 56 (66%) infants had postural problems. Forty-two (47%) of the par-

Figure 1. Chief complaints of infants presented to doctors of chiropractic in Norway (N=90 infants reported 185 problems)



ticipants were male and 47 (53%) were female. The mean age was 8.2 weeks. The most common age at presentation was two weeks. Out of 90 infants 46 (51%) had a normal vaginal birth, and 44 (49%) of the infants had an assisted birth.

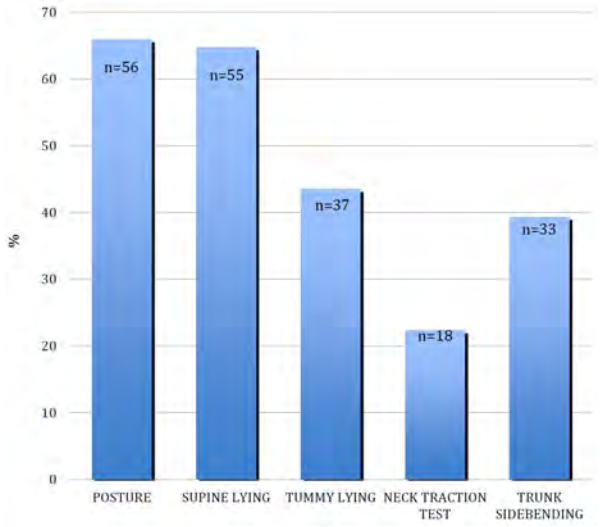
Presenting chief complaints

Parents could report as many problems as the child had. Therefore, there were sometimes multiple complaints for each infant. The most common complaint and reason for seeking chiropractic was unsettled baby (n=40, 44%), followed by postural problem (n=35, 39%) and crying (n=33, 37%). Breastfeeding problems were reported in 16 (18%) infants as the presenting complaint (Figure 1).

Parent reported behaviors

Twenty-two of the mothers (25%) reported breastfeeding problems, and another 10 (12%) mothers reported pain during feeding. Thirty (36%) of the infants had a favorite side during feeding. There were 49 (54%) parents who reported that their child could not turn their head and neck equally to both sides. Uncomfortable supine sleep was reported in 22 (24%) infants. Another 37 (42%) infants had a problem with tummy time. Regarding breastfeeding, 59 of the infants were "100% breastfed," 13(14%) were "75% breastfed" and 18 (20%) were receiving "50%" or less feeding from the breast.

Figure 2. Clinical Posture Dysfunctions in infants 0-6 months of age (N=90)

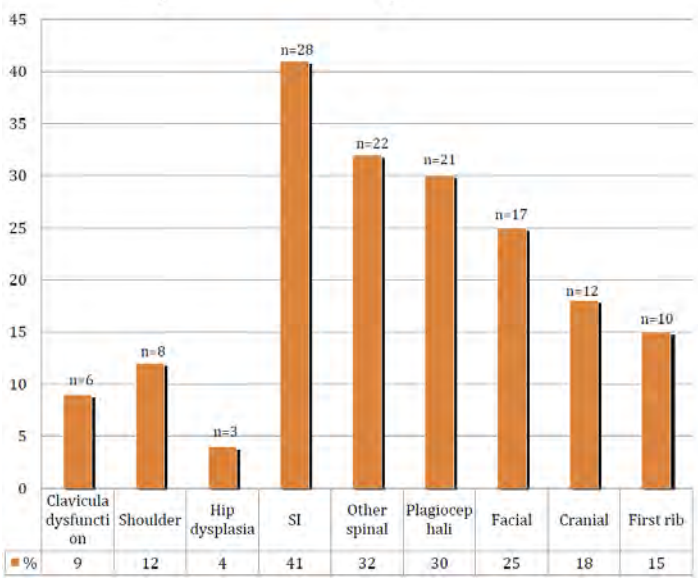


*POSTURE: Abnormal posture assessed after a clinical examination and observation. The infants posture and movements were observed for dysfunctions in quantity and quality according to infant´s age.[23,24,25]
*SUPINE LYING: Posture was observed in the supine back position according to infant´s age.
*TUMMY LYING: Posture was observed in the prone position according to infant´s age.
*NECK TRACTION TEST: Pull to sit maneuvers was performed with the infant in symmetrical supine position.23
*TRUNK SIDEBENDING: The infant´s trunk was bent sideways against the thorax to the rights, then to the left, and compared.

Postural clinical examination findings

After a clinical assessment, abnormal postural findings[23,24,25] were present in 56 (66%) infants. Neck dysfunctions found by clinical chiropractic examinations were present in 74 (87%) out of 90 infants. Also 55 (65%) infants did not have normal supine posture for his/her age. Favorite side of the neck and head (n=41; 73%) was the most common finding, second was neck hyperextension (n=21; 38%), third was trunk hyperextension (n=11; 20%), followed by hip asymmetry (n=5; 9%) and multiple malpositions (n=6; 11 %) when assessing posture dysfunctions in supine lying. Postural problems are depicted in Figure 2.

Figure 3. Distribution of MSK dysfunctions in infants presented for chiropractic care (N=90)



Dysfunctional suck reflex, rooting reflex and TMJ imbalance
Dysfunctional suck reflex was identified in 17 (19%) infants under the age of 4 months. Abnormal rooting reflex was present in 12 (14%) subjects. The clinicians found 16 (19%) patients with TMJ imbalance. There were many other MSK dysfunctions identified in this study (Figure 3).

An analysis of the association between the infant´s inability to turn equally his/her neck to both sides and breastfeeding was significant, with Pearson Chi-Square value of 6.408 and p-value of 0.011. Also, there were statistically significant associations between suboptimal breastfeeding and TMJ imbalance, suboptimal rooting/sucking reflexes, and painful breastfeeding, respectively (Table 1 on next page).

Discussion

This is the first study to investigate musculoskeletal (MSK) presentation, examination and findings that describe common chiropractic pediatric practice. Since transitioning to

Table 1: Associations between dysfunctions reported and breastfeeding problems in infants less than 4 months of age (N=90)

Association between:	Pearson Chi-Square	P-value	Significant P = <0.05
TMJ dysfunction and breastfeeding problems	17.432	0.000	Yes
Neck dysfunction and breastfeeding problems	0.484	0.487	No
Suck reflex and breastfeeding problems	14.841	0.000	Yes
Rooting reflex and breastfeeding problems	7.107	0.008	Yes
Inability to turn head and neck equally and breastfeeding problems	6.408	0.011	Yes
Reported painful breastfeeding by mothers and breastfeeding problems	14.560	0.000	Yes
Uncomfortable supine back sleep and breastfeeding problems	0.923	0.337	No

certain postures at specific ages are important for reaching milestones and methodical development in children, 25 postural assessments were considered important in this examination. It is key to identify the infant's quantity and quality of movements and postures when assessing infants under the age of six months. Mothers had excellent ability to identify postural problems in their own infant. Postural problems were the second most common reason for seeking chiropractic help for their child in this study, comprising just under half of the complaints. Furthermore, mothers noticed postural problems early with the most common age of presentation at two weeks.

As such, there were several MSK problems identified by mothers, all of which could and did affect important infant activities of daily living (ADLs) such as breastfeeding, supine sleep and full and equal cervical spine rotation. Since sleep and feeding are the major occupations for a newborn, these are key ADLs for optimal development and as such, are important public health issues; the same could be argued for cervical spine rotation as inability may result in positional plagiocephaly, a risk for developmental delay.[26,27,28]

Unsettled baby was a main complaint registered by nearly half of the parents in the study. Slightly fewer parents reported crying as a chief complaint. Often parents reported that these problems go hand in hand. These also coincided with postural problems. It is logical that there is a link to postural problems as a baby who cannot get into a comfortable position is likely to be characterized as unsettled by the parents. With a mean age for this population of eight weeks, this is considered a time when parents have noticed excessive crying and/or unsettled behavior and/or postural preferences, have found no remedy and thus, present to a chiropractor. This correlates with other research literature,[29] which suggest that chiropractic care may be the last port of call for infant complaints. This population further corroborates the research literature as half of the births had been assisted, and does suggest a high rate of complicated births among patients seeking chiropractic care. Babies with assisted births are more likely to have postural problems and excessive crying.[1,2,12] Another study that looked at maternal report of feeding practice, 10 found that more than half of infants who stopped breastfeeding reported an assisted birth.

A focus of this study was the prevalence of infant problems, which are public health concerns for the short and long-term health of the baby. Three of these are breastfeeding, ability to sleep supine, and head shape. Together these comprised a third of the study population. This is a place where chiropractic care can help to shoulder the major burden of public health problems for infants and restore these children to full function to prevent long-term problems. Chiropractic care has been shown to assist mothers to continue breastfeeding, [4,10,12,30,31,32] supine sleep[33,34] and head shape.[13,35] Even though the complaints of positional head deformation were low (under 10%), more than half of the babies had difficulties rotating their head equally to both sides. If this condition is not corrected, then the head shape problems are likely to develop.[28,36] Further, there is evidence that developing plagiocephaly can result in breastfeeding problems and is associated with long-term developmental problems.[37,38] It was interesting that only two-thirds of the mothers totally breastfed their baby in this study. Considering this study was in Norway, a country known for one of the highest rates of total breastfeeding in the world, and one-third of the mothers were unable to totally breastfeed their newborn indicates a big problem for the dyad and society which has not been widely reported previously.

A study like this has several limitations. One weakness of the study is that there were many examiners performing tests, and inter-examiner reliability can be questioned. However, this could be a strength as well and it did reflect routine practice. Many of the examinations in the study allowed for subjective judgments, although the prescriptive description has taken as much personal judgment as possible out of the equation. Another limitation is that examination signs such as decreased active and passive range of motion are proven to indicate upper neck dysfunction in adults, but not studied in children.[39,40,41] It is suggested that these tests can be valid in children too, although with different normal values.[42,43]

Studies have shown that an infant needs to achieve skills typical for a three-month-old baby for proper development.[23, 24,25] It is of value to assess abnormal postures in early life, especially with focus on infants below three months of age. It is therefore of interest that nearly two-thirds of the children

in this study had abnormal supine posture, and that almost 40% of the parents did identify postural problem as a main complaint. If postural impediments can be removed early, it is likely that normal development can ensue with re-building of any aberrant neurological pathways.[25,44] Also, uncomfortable postures can reduce quality of sleeping.[45] Of course, supine position is required to reduce the risk of SIDS and supine sleep is seven times safer than any other position.[46] Parents are aware of the problem and reported uncomfortable supine sleep in one-quarter of the children. This is a major area for chiropractors to positively impact the public health.

The neck has an important role in the natural postural development and milestone achievements.[25] This group of patients did have a very high frequency of cervical spine dysfunction (87%). This could be viewed as over-identification. However, some prior studies have also found the same trend in patients seeking chiropractic care.[3,4,21,30,32,47] The parents in this study identified several MSK problems, including the inability to turn the head and neck equally to both sides. Parents are keen observers of their infant and they recognize these postural problems early.[33]

One key finding in this study was a significant association between the infant´s ability to equally turn his/her neck to both sides with breastfeeding problems. This has not been previously documented. Another interesting finding was that more than one-third of the mothers reported that their infants had a favorite breast during breastfeeding. Evidence has suggested a clinical rationale for addressing the cervical spine and chiropractic assessment in infants with suboptimal breastfeeding.[3,4,30,31,32,47] Neck dysfunction was found in most of the infants, as were palpation findings in the neck. These findings were further identified by orthopedic tests (cervical flexion rotation test[49,50,51,52,53] and occipital glide test[54]). There is no definite theory for the cause of reduced neck rotation. The ability to turn the head equally is not the same as torticollis, generally caused by muscle involvement whereas the former is often caused by dysfunctional cervical joint motion, something, which can be easily corrected with skilled chiropractic techniques.

Future research should focus on which clinical examinations have the highest sensitivity and specificity to detect infant MSK problems that most commonly lead to disruption in normal ADLs. Reliability of different clinical examinations like neck flexion rotation test, occipital glide test, and trunk flexion test in infants requires further study. Researches into orthopedic tests are important because there is a demand for reproducible tests when assessing infants. Reliable and valid examination procedures are required to create a gold standard musculoskeletal examination for the infant patient.

Conclusion

Parents were able to identify and report musculoskeletal problems in infants along with irritability, crying, suboptimal breastfeeding and other ADLs, which were corroborated and specified by the clinical examination. More study is needed to determine a gold standard reference for infant musculoskeletal examinations along with their implications in improving activities of daily living and public health.

References

1. Stellwagen I, Hubbard E, Chambers C, Jones. Torticollis, facial asymmetry and plagiocephaly in normal newborns. *Archives of Disease in Childhood* 2008; 93, (10): 827-31.

2. Zwart P,Vellema-Goud M, Brand, LP. Characteristics of infants admitted to hospital for persistent colic, and comparison with healthy infants. *Acta Paediatrica* 2007; 96:401-405. DOI:10.1111/j.1651-2227.2007.00090.

3. Vallone S. Evaluation and treatment of breastfeeding difficulties associated with cervikocranial dysfunction; a chiropractic perspective. *Journal of Clinical Chiropractic Pediatrics* December 2016; 15,3:1301-1305.

4. Alcantara J, Alcantara JD, Alcantara, JU. The chiropractic Care of Infants with Breastfeeding Difficulties. *Explore* 2015; Nov/Des, Vol., 11:6.

5. Holtrop DP. Resolution of suckling intolerance in a 6-month-old chiropractic patient. *J Manipulative Physiol Ther*. 2000; 23:615-8.

6. Smith LJ. Impact of birthing practices on the breastfeeding Dyad. *J of Midwifery and Women´s Health* 2007; 52,(6): 621-30.

7. Jackson KM, Nazar AM. Breastfeeding, the immune response, and long- term health *Am Osteopath Assoc*. 2006; 106.203-7.

8. Rollins NC, Bhandari N, Hajeebhoy, et al. Why invest, and what it will take to improve breastfeeding practices? *The Lancet* 2016; 387:491—504.

9. Miller J, Miller L, Sulesund, A-K, Yevtushenko A. Contribution of chiropractic therapy to resolving suboptimal breastfeeding; A Case series of 114 infants. *J Manipulative Physiol Ther*. 2009; 10,32(8): 670-4. Doi: 10.1016/j.jmpt.2009.08.023 PMID: 198366404.

10. Homdrum AKS, Miller J. Maternal rapport of feeding practise: a cross-sectional survey of 1753 mothers presenting infants to a chiropractic-teaching clinic. *Journal of Clinical Chiropractic Pediatrics* 2015; vol.15: 1 PDF. http://jccponline.com/Feeding-Practices.html.

11. Lawrence R. Breastfeeding: a guide for medical profession. Chicago: *Mosby.* 1994.

12. Miller J, Beharie MC, Taylor AM, Simmens EB, Way S. Parent reports of Exclusive Breastfeeding After Attending a Combination Midwifery and Chiropractic Feeding Clinic in United Kingdom: A Cross-sectional Service Evaluation. *Journal of Evidence-Based Complementary & Alternative Medicine* 2016, Vol.21,(2):85-91 DOI: 10.1177/215658721565399.

13. Collins K, Alcantara J, Holt K. Resolution of Breastfeeding and Gastrointestinal Complaints in Infants Twins with Plagiocephaly & Scaphocephaly Following Birth Trauma; A Case series. *J. Pediatric, Maternal & Family Health* 2015; February 10: 34-41.

14. Drobbin D, Stallman J. Resolution of Breastfeeding and Latching Difficulty Following Subluxation Based Chiropractic Care: Case Report and review of the Literature. *J Pediatric, Maternal & Family Health* 2015; July: 102-108.

15. Neally R, Alcantara J. Resolution of failure to Thrive in a 4-Month-Old Infant Following Adjustments of Subluxation: Case Study & Selective review of the Literature. *J Pediatric, Maternal & Family Health* 2015; December 17:149-152.

16. Fry LM. Chiropractic and breastfeeding dysfunction: A literature review. *Journal of Clinical Chiropractic Pediatrics* 2014; 14, 2:1151-1155.

17. Bernard M, Alcantara J. The chiropractic care of a 6 days-old neonate with Breastfeeding Difficulties and Breastfeeding Jaundice. *Chiropractic Journal of Australia* 2012; 42,3,9: 108-113.

18. Hubbard MA. Pediatric cholelithiasis and breastfeeding difficulties: A Chiropractic report. *Journal of Clinical Chiropractic Pediatrics* 2014; March: 114-1150.

19. Tutt GM, Mesidor RG. Resolution of torticollis, Plagiocephaly & Breastfeeding Difficulties in an Infant Following Subluxation Based Chiropractic Care. *J Pediatric, Maternal & Family Health* 2014; April: 14-20.

20. Slak L, Wilson KA. Resolution of Breastfeeding Difficulty Following Subluxation Based Chiropractic Care. *J Pediatric, Maternal & Family Health* 202013; January 17: 7-10.

21. Stewart A. Paediatric chiropractic and Infant Breastfeeding difficulties. A pilot Case Series Involving 19 cases. *Chirpr H Aust*. 2012; 42:98-107.

22. Lavigne V. A Narrative Review and case report: Frenotomy Procedure in Neonate with Tongue-tie. *Journal of Clinical Chiropractic Pediatrics* 2012; 2, December: 1025-32.

23. Prechtl HFR. Development of postural control in infancy. In: Von Euler C, Forssberg H, Lagercrantz H, editors. *Neurobiology of Infant Behaviour* 1989; Vol.5.

24. Einspieler C, Cioni G, Paolicelli PB. The early markers for later dyskinetic cerebral palsy and different from those for spastic cerebral palsy. *Neuropediatrics* 2002; 33, (2): 73-78.

25. Gajewska E, Sobieska M, Kaczmarek, Suwalska A, Steinborn B. Achieving Motor development Milestones at the Age of Three Months may determine but Does Not Guarantee, proper Further development. *Scientific World Journal* 2013; 354218. Published online 2013, December 9. Doi 10.1155/2013/354218.

26. Martiniuk AL, Vujovich-Dunn D, Park M, Yu W, Lucas BR. Plagiocephaly and Developmental Delay. A Systematic Review. *J Dev Behav Pediatr*. 2017; 38,1:67-78.doi.1097/DBP.0000000000000376

27. Mawji RN, Vollman A, Fung T, Hatfield J, McNeil D A, Sauvé R. risk factors for positional plagiocephaly and appropriate time frames for preventing massage. *Pediatr Child Health* 2014; 19,8:423-427.

28. Leung AY, Mandrusiak A, Watter P, Gavranich J, Johnston lM. Clinical assessment of head orientation profile development and its healthy term infants: A prospective study. *Early Hum Dev*, May 2016; 96: 31-8. DOI: 10.1016/j.earlhumdev.2016.03.001. Epub 2016. Mar 28.

29. Miller J, Newell D. Prognostic significance of subgroups classification for infant patients with crying disorders: A prospective cohort study. *Can Chiropr Assoc*. 2012; 25, (1):40-48.

30. Miller J, Miller, L, Sulesund, A-K, Yevtushenko, A., 2009. Contribution of chiropractic therapy to resolving suboptimal breastfeeding; A Case series off 114 infants. *J Manipulative Physiol Ther*. 2009; 10,32, (8): 670-4. Doi: 10.1016/j.jmpt.2009.08.023 PMID: 198366404.

31. Tow J, Vallone, SA. Development of an integrative relationship in the chiropractic care of breastfeeding newborn: lactation consultant and chiropractor. *J Clin Chiropr Pediat*. 2009; 626-632.

32. Vallone S. Chiropractic evaluation and treatment of musculoskeletal dysfunction in infants demonstrating difficulty breastfeeding. *J Clin Chiropractic Pediatrics* 2004; 6:349-368.

33. Nicolas-Schmid P, Hetlevik MA, Miller J. Infants presentations and outcome at a chiropractic clinic in the UK: Parent report of treatment outcomes using the United Kingdom Infant Questionnaire UKIQ). JCCP 2016; 15:1236-141.

34. Wright C, Beard H, Coc J, Scott P, Miller J. Parents 'choices of non-supine sleep position for newborns: A cross-sectional study. *Journal of Health Visiting* 2014; 9, 2,9:500-504.

35. Douglas NA, Browning M, Miller J. 2016. Chiropractic care for the Cervical Spine as a treatment for plagiocephaly. *J Clin Chiropr Pediat*. December 2016; 15,3:1272-1278.

36. Philippi H, Faldun A, Jung T, Bergman H, Bauer K, Groß D. Patterns of infantile postural asymmetry: A standardizes video-based analysis. *Neuropediatrics* 2005; 36-117. DOI: 10.1055/s-2005-868102.

37. Lal S, Abbasi AS, Jamro S. Responses to Primary Torticollis Physiotherapy. *Journal of Surgery Pakistan* (International) 2011; 16,4:153-156.

38. Wei JL, Schwatz KM, Weaver AL, Orvidas l. Pseudotumor of infancy and congenital muscular torticollis. *Laryngoscope* 2001; 111:688-90.

39. Jull G, Amiri M, Bullock-Saxton J, Darnell, R. Lander C. Cervical musculoskeletal impairment in frequent intermittent headache. Part 1: subjects with single headaches. *Cephalalgia* 2007; 30, (7): 93-802.

40. Zito G, Jull G, Story I. Clinical tests of musculoskeletal dysfunctions in the diagnosis of cervicogenic headache. *Man Ther.* 2006; 11:118-154.

41. Zwart JA. Neck mobility in different headache disorders. *Headache* 1997; 3: 6-11.

42. Arbogast KB, Gholve PA, Fridman JE, Maltese MR, Tomasello MF, Dormans JP. Normal cervical spine range of motion in children 3-12 years. *Spine* 2007; 32: E309-E315.

43. Lynch-Caris T, Majeske KD, Brelin-Fornari J, Nashi S. Establishing references values for cervical spine range of motion in pre-pubescent children. *J Biomech.* 2008; 41: 2714-2719.

44. Jung M W m Landenberg M, Jung T, Lindenthal T, Philippi H. Vojta therapy and neurodevelopment treatment in children with infantile postural asymmetry: a randomised controlled trial. *J. Phys. Ther. Sci.* 2017; 29, 29:301-306. Published online 2017 Feb 24. Doi: 10.1589/jpts.29.301.

45. Modesto IF, Avelar AFA, Pedreira MLG, Pradella-Hallinan, M, Avena MJ, Pinheiro EM. Effect of sleeping Position on Arousals From Sleep in preterm Infant. *Journal for Specialists in Pediatric Nursing* 2016; 1,8 Doi:10.111/jspn.12147.

46. Gunn AJ, Gunn TR, Mitchell EA. Is changing the sleep environment enough? Current recommendations for SIDS. *Sleep Med Rev.* 2000; 4,(1):453-69.

47. Holleman A, Nee J, Knaap SF. Chiropractic management of breastfeeding difficulties: a case report. *J Chiropr. Med.* 2011; 10,3:199-203. Doi: 10.1016/J.Jcm.2011.01.010.

48. Monson RM, Deitz J, Kartin D. The relationship between awake positioning and motor performance among infants who slept supine. *Pediatrics Physical Therapy* 2003; 15:196-203.

49.Budelman K, von Piekartz H, Hall T. Is there a difference in head posture and cervical spine movement in children with and without paediatric headache? *Eur J Pediatr.* 2013; 171:1349-1356. Doi 10.1007/s00431-013-2046-z.Epub 2013 May.

50. Hall T, Briffa K, Hopper D. The influence of the lower cervical joint pain on range of motion and interpretation of flexion-rotation test. *J Man Manip Ther.* 2010; 18, 3:126-202.

51. Hall T, Briffa K, Hopper D, Robinson K. The relationship between cervicogenic headache and impairment determined by flexion-rotation test. *J Orthop Sports Phys Ther.* 2010; 40,4: 225-229.

52. Hall T, Briffa K, Hopper D, Robinson K. Long term stability and minimal detectable change of the cervical flexion-rotation test. *J Orthop Sports Phys Ther.* 2010; 40,4:225-229.

53. Hall T, Robison K, Fujinawa O, Akasaka K, Pyne E. Intertester reliability and diagnostic validity of the cervical flexion-rotation test. *J Manipulative Physiol Ther.* 2008; 31 :292-300.

54. Beyer B, Sobczak S, Salem W, Feipel V, Dugailly PM. 3D motion reliability of occipital condylar glide testing: From concepts to kinematics evidence. *Manual Therapy* 2015; 1-6.

Demographic profile of pediatric patients attending a Norwegian chiropractic practice

By Anne Helene Abusal Moksness, DC, MSc[1] and Joyce E. Miller, DC, PhD[2]

1. Private practice, Norway
Email: anne.helene@nemus.no
2. Professor, AECC University, Bourneouth, UK

Corresponding author: Joyce E. Miller, DC, PhD.
Email: jmiller@aecc.ac.uk

ABSTRACT

Background: The use of chiropractic care for the pediatric patient in Norway has been under investigated along with the demographic profile of the presenting patients. Chiropractic is considered one of the most popular complementary and alternative medicine (CAM) therapies for children worldwide and many chiropractors provide care to children. Doctors of chiropractic sometimes claim to treat a wide variety of pediatric health conditions. This has been considered a controversial area of chiropractic care, both within, and outside the profession. Routine presentations are not widely investigated. **Objective:** To investigate the demographic profile of pediatric patients aged 0-18 years of age presenting to a Norwegian chiropractor and their primary complaints. **Methods:** A retrospective cross sectional study of electronic patient files to locate patients presenting in the correct age group. The data were recorded anonymously. Two main software packages were used to analyze data; Microsoft Excel 2000 spreadsheet and SPSS V 21. **Results:** 258 pediatric patients were enrolled in the study. The most common age at presentation was one month (n=68). 49% were female; boys more commonly presented in infancy, girls more commonly in adolescence. On average there were three visits per patient. The patients had two or more presenting complaints (average 2.5). The most common presenting complaint was favored (asymmetrical) head position (n=84, 33%), followed by infant positioning/postural difficulties (n= 81; 31%) and inconsolable crying (n=79, 31%). No serious adverse events were reported; 5% reported an intermittent and self-limiting mild side effect lasting less than 24 hours. Approximately 13% of pediatric patients were referred from health care professionals. 85% of parents/children reported either full recovery or good improvement following a chiropractic treatment protocol. **Conclusion:** The infant was the most common age in pediatric presentations to a Norwegian chiropractic practice. The most common complaints were musculoskeletal in origin followed by excessive crying. On average pediatric patients had three treatment sessions, and most parents/patients reported full recovery or good improvement with no adverse events.

Keywords: chiropractic, infant crying, sleeping difficulties, pediatric, demographic, manual therapy, cross-sectional study

Introduction

Chiropractic care is considered one of the most popular complementary and alternative medicine (CAM) therapies for children.[1] Chiropractic care of pediatric conditions has been considered a controversial area of expertise, both within, and outside the profession.[2]

Studies have been done that record the presentation of the pediatric patient in chiropractic practice and their characteristics. A recent Norwegian study found that the youngest children constituted the largest pediatric group in chiropractic practice which was in line with studies from Denmark and England.[3] In addition, the study revealed a greater proportion of males than females when the child presented under five years of age, that MSK problems are common, and that there was a tendency for MSK complaints to become chronic as a considerable proportion of patients had been waiting more than a year before seeking chiropractic care.[3] In terms of what conditions chiropractors treat, findings suggest the most common conditions treated by chiropractors are musculoskeletal in origin.[4] There was a low presentation level of children with non-MSK ailments to chiropractors in Norway.[3]

When chiropractors focus their practice on musculoskeletal conditions, they reported more referrals from the medical community.[5] In Switzerland, 22% of chiropractors receive weekly or monthly referrals of pediatric patients from pediatricians.[6] Chiropractic is under the medical umbrella in Switzerland. In Norway, the chiropractic profession is authorized to practice as primary contact practitioners and their patients qualify for partial reimbursement from the national health care system. In addition, chiropractors are able to authorize sick leave and they can refer patients directly for radiological

procedures or to other medical specialists for further assessment.[7]

The objective of the study was to investigate the descriptive characteristics of pediatric patients in one chiropractic clinic in Norway, and to illustrate whether these findings corroborate with previous studies.

Methods

The study was designed as a retrospective health service evaluation, a cross sectional study and it was scheduled to include a minimum of 200 subjects for the raw data collection. The patient records were obtained from an electronic clinical patient record database from a single chiropractor, working at a single chiropractic clinic alongside two chiropractors (NEMUS Arendal, Norway). A manual search through the clinic electronic patient database was performed to identify the pediatric patients attending the clinic for the first time (new patients), in the time period from January 1, 2013 to December 31, 2014. The number of new patients (non age specific) attended the clinic in the same time period for comparison was also identified.

Inclusion criteria for the study included patient ages (0-18 years of age) at presentation, calculated using date of birth compared to date of presentation. No other exclusion criteria were set for the raw data collection. The study sought to investigate the demographic profile (age, gender) of pediatric patients along with their presenting complaints (as described by parents in younger children, or by the patient him/herself in older children).

The number of visits in an episode of care was recorded. Treatment modalities divided into:

• High velocity low amplitude (HVLA) spinal manipulation fit to age — defined as a maneuver consisting of three distinct phases: the preload phase, the thrust phase and the resolution phase, usually associated with an audible `pop` or `click` which is caused by an event termed cavitation, occurring within synovial fluid of the joint.

• Mobilization - a passive movement of a skeletal joint.

• ´Press and hold´ - a low force by hand technique addressed to a restricted barrier in children 0 to 12 months of age.

• Soft tissue work (STW) - may be comprised by different manual soft tissue techniques such as massage, trigger point therapy, stretching and other.

Report of benefit or not, and if there were any reported adverse events or side effects by parent or child was also investigated as described by parent or child, recorded by practitioner. Reports of side effect were divided into the following:

• No reported side effect/adverse event.
• Mild (irritable 24-48 hours), resolving on its own.
• Moderate (the patient was referred to GP for complications).
• Severe - true adverse event (the patient was acutely referred to Hospital).

The data were analyzed using Microsoft Excel and Statistical Package for Social Sciences (SPSS) version 2.1. Age group divisions were applied into the following: early infancy (0-3 months), late infancy (4-6 months and 7-12 months), preschool age (1-5 years of age), school aged (5-12 years of age) and adolescence (over 12 years of age).

Results

The manual search identified 258 subjects younger than 18 years of age at the time of new patient consultation; none were excluded from the study. This accounted for 15% of the total clinic new patient population in the same time period. The mean age at first presentation in the cohort was 35 months (2 years and 9 months of age). The most common age at presentation was 1 month of age (26%; n=68), and 50.4% of the presenting pediatric population was male.

Tables 1 and 2 show the demographic presentation of the children attending this chiropractic clinic and an overview of their presenting complaints. On average, each pediatric patient had 2.5 presenting complaints. The most common presenting complaint regardless of age was favored (asymmetrical) head position (n=84, 32.5%), followed by infant positioning/postural difficulties (n= 81, 31.4%) and inconsolable crying (n=79, 30.6%). Sixty-six (25.6%) subjects presented due to restless supine sleeping, 52 patients (20%) with breastfeeding/feeding issues and 17.8% (n=46) patients presented with asymmetrical flattening of the head (non synostotic plagiocephaly). Neck pain accounted for 10.8% of the patients (n=28) and low back pain accounted for 8.9% (n=23).

Table 3 depicts the types of therapies given. Press and hold was the most commonly utilized manual therapy technique in the cohort (60%, n=155), followed by mobilization (53%,

Table 1: Frequency of children in each age category attending a Norwegian chiropractor (N=258).

Age at presentation	N=258			Referral rate (n=) from health care practitioners in each age group.
	Total	Male	Female	
0-3 months	157	84	73	17
4-6 months	18	9	9	4
7-12 months	16	9	7	2
1-5 years	11	5	6	1
5-12 years	23	14	9	1
> 12 years	33	10	23	8
Total	258 (100%)	130 (50.4%)	128 (49.6%)	33 (12.8%)

Table 2: Frequency and percentage of presenting complaints in a pediatric population presenting to a Norwegian chiropractor (n=258). All presenting children could present with more than one complaint. On average, each child presented with 2.5 complaints.

Presenting complaints	0-3 months (n=157)	3-6 months (n=18)	7-12 months (n=16)	1-5 years (n=11)	5-12 years (n=23)	>12 years (n=33)	Presenting complaint n=	% of n=258
Neck pain	0	0	0	1	11	16	28	(10.8%)
Mid back pain	0	0	0	1	5	12	18	(6.9%)
Low back pain	0	0	0	2	5	16	23	(8.9%)
Headache/migraines	0	0	0	0	4	5	9	(3.4%)
Pain in extremities	0	0	0	1	3	5	9	(3.4%)
Postural asymmetry	24	2	1	0	2	1	30	(11.6%)
Nonsynostotic plagiocephaly (NSP)	37	4	5	0	0	0	46	(17.8%)
Favored head position (FHP)	67	12	5	0	0	0	84	(32.6%)
Inconsolable/Excessive crying	75	1	2	1	0	0	79	(30.6%)
Restless supine sleeping	42	6	11	7	0	0	66	(25.6%)
Sleep disturbance not related to supine sleeping	15	3	4	7	1	1	31	(12.0%)
Feeding/breastfeeding difficulties	45	6	1	0	0	0	52	(20.1%)
Infant positioning difficulties (tummy time, nappy change etc.)	63	13	5	0	0	0	81	(31.4%)
Check up following trauma/birth trauma	19	4	2	2	3	11	41	(15.9%)
Question of delayed motor development	3	5	4	2	0	0	14	(5.4%)
Nocturnal enuresis	0	0	0	0	4	0	4	(1.5%)

Table 3: Frequency of manual therapy in a pediatric population attending a Norwegian chiropractor (more than one therapy could be applied or there could have been no therapy provided at all).

Age groups	N=	High velocity low amplitude adjustment (HVLA) modified to age	Mobilization	Soft tissue work	Press and hold	No therapy – wait and see approach	No therapy – refer out
0-3 months	157	37	110	33	135	9	1
4-6 months	18	14	14	3	15	0	0
6-12 months	16	16	8	9	5	0	1
1-5 years	11	10	2	4	0	0	0
5-12 years	23	22	2	13	0	0	0
>12 years	33	31	1	23	0	0	1
Total	258	130	137	85	155	9	3

n=137) and HVLA manipulation modified to suit the age (50%, n=130). Each child may have received more than one treatment modality. In addition, some children were not given manual therapy (n=12; 4.6%), either because there were no findings relating the presenting complaint to an issue concerning the musculoskeletal system, or they were referred back to GP, other health care professional or diagnostic imaging. Any parental/self-reported change in the condition was recorded and 85% (n=218) of parents or patient reported good or full improvement following chiropractic care (Table 4). There were no reports that a child was worse following a chiropractic evaluation/treatment. Mild side effects (mild irritability lasting no longer than 24 hours) were reported by 5.4% (Table 5, n=14) and there were no reported adverse events following care requiring any additional care or referral to Primary Care Physician or to hospital. As seen in Table 6, 12.8% (n=33) of patients were referred to the clinic

Table 4: Reported change in a pediatric population following a course of treatment in pediatric patients attending a Norwegian chiropractor.

Age groups	N=	Child is worse	No change	Improvement	Full recovery
0-3 months	157	0	28	66	62
4-6 months	18	0	2	9	8
6-12 months	16	0	3	6	7
1-5 years	11	0	1	5	5
5-12 years	23	0	4	13	6
>12 years	33	0	2	20	11
Total	258	0	40	119	99

Table 5: Reported side effects/adverse events in a pediatric population attending a Norwegian chiropractor.

Age groups	N=	No reported side effect/adverse event	Mild (irritable 24-48 hrs)	Moderate (refer to GP)	Severe (refer to hospital)
0-3 months	157	146	11	0	0
4-6 months	18	18	0	0	0
6-12 months	16	15	1	0	0
1-5 years	11	11	0	0	0
5-12 years	23	23	0	0	0
>12 years	33	31	2	0	0
Total	258	244	14	0	0
GP= General practitioner, AE= Adverse event.					

Table 6: Distribution of referrals (informal) (n=33) from health care practitioners in children attending a Norwegian chiropractor (n=258).

Health care practitioners	N=
Primary care physician	10 (3.9%)
Physiotherapist	2 (0.8%)
Pediatric physiotherapist	18 (6.9%)
Mid wife	1 (0.4%)
Other chiropractors	2 (0.8%)
Not referred by HCP (parental referral source)	225 (87.2%)
Total	258 (100%)

from HCP. Most commonly referrals were seen in the youngest population, 0-3 months (n=17, 52% of referrals) and with children older than 12 years of age (n=8, 24% of referrals).

Discussion

This study sought to investigate the demographic profile of pediatric patients attending a Norwegian chiropractic practice, and hopefully assist the understanding regarding why parents bring their child to a chiropractor. Thus, this study sought to serve as a spring-board for higher level research into efficacy of treatment for the types of conditions that routinely present.

The age groups presenting most often were the youngest age group (<3 months of age), followed by the oldest age group (13-18 years of age), showing similar results to previous studies revealing that the highest pediatric users of health care of any type are infants and teenagers.[3,4,8,9,11,12] In a survey of Danish chiropractic practices, infants (defined as children less than one year of age) were the most common pediatric patients, with one-third of them between 0 and 4 months of age.[7] It has also been noted that matured chiropractic practices tend to intake the full range of age groups but most prominently the infant patient.[4] In this study the pediatric population made up roughly 15% of the total new patient population seen by the chiropractor. Studies have shown that pediatric patients take up 10-15% of the chiropractic practice around the world,[9] with higher percentages in those practices that have advanced education to attend the pediatric population population.[10]

There was a close to even split between girls and boys attending the clinic. However, when dividing by age groups, in infancy, the presenting child was more likely to be male and as the child reached adolescence, the ratio of girls versus boys at presentation was approximately 2:1. Thus, this survey precisely corroborates previous work showing more boys than girls presenting as infants[3,4] and a higher number of girls than boys presenting in puberty.[3,11,12,13,14] One of the explanations could be that as newborn boys often are usually slightly larger, they could be more likely to have intrauterine constraint or a difficult birth which could require post-natal musculoskeletal attention.[3] Girls in puberty are thought to be more susceptible to injury and pain, and it has in previous studies been suggested that testosterone could be protective of musculoskeletal problems in teenaged boys.[15]

The more common presenting complaints overall were postural in nature. The number one presenting complaint was favored head position, followed by infant positioning difficulties and inconsolable crying (formerly known as infantile colic and now considered a pain syndrome of infancy (PSI).[16] These are likely different sides of the same coin indicating discomfort or pain in the infant. Asymmetrical head position and infant positioning difficulties could include difficulties with infant tummy time, or parents complaining about irritability around nappy changing, inability to sleep supine or difficulty with positioning during breastfeeding and asymmetrical flattening of the head (non-synostotic plagiocephaly or positional head deformation). These conditions could also incite increased bouts of crying. Generally, all of these can be characterized as musculoskeletal complaints, although they may not be described as such by the parent. Still, by and large, it was the parent that made the decision to see the chiropractor. What they do know is that they want their baby to be more comfortable. Musculoskeletal pain has shown to alter mood in older children.[3,8] Why would it not be the same with younger children, who can only respond through changes in their behavior? Infants cannot really say, "it hurts here," but only show their problem by selecting favored postures that hurt less, or show other types of irritability.[8] The lack of full cervical rotation is a sign of a MSK problem and doesn't differ from antalgic postures (posture held for the sake of comfort) in the adult population where the musculoskeletal irritant must be removed in order to facilitate resistance-free and normal full range of motion.

Many parents who present their infants will often give a self-diagnosis such as infantile colic, or complain of their infant's excessive crying. Excessive crying is the cause of 10 to 20% of all early pediatrician visits in infants aged two weeks to three months. This condition is not without risks. Although often described as benign and self-limiting, excessive crying has been associated with parental exhaustion and stress, shaken baby syndrome and other long-term risks.[17,18] Supine sleep disturbance is a public health concern for children as the inability to sleep supine is a risk for sudden infant death syndrome (SIDS)[19] and more than a quarter of the infants in this study suffered from irritability in supine sleep. As SIDS is a key public health issue, it is important that these infants are offered treatment so that they can comfortably sleep supine, for their own safety.

The population that suffered with non-synostotic plagiocephaly required more treatment sessions (5-11 treatments) than average (3), the cause most likely being that the condition usually has been longstanding by the time of presentation. Non-synostotic plagiocephaly may become a long-term debilitating problem that is associated with both short-term and long-term developmental delay and thus may require multimodal follow-up over a longer period of time.[20] In children who presented with favored head position, many also suffered with breastfeeding issues. Thus favored head position in infants may be a risk factor for suboptimal breastfeeding in infancy.[21] Crying infants have been described as a stress-increasing factor in mothers/parents and there have been studies looking at inconsolable infant crying and its effect on maternal postpartum depressive symptoms.[22] This may in turn be a risk for giving up breastfeeding.[23] It may be that one simple musculoskeletal problem can have several ramifications that can affect both short and long-term health of the child.

This study showed that teenagers present with complaints similar to the adult population, with musculoskeletal complaints such as neck and back pain being the most common. Preschool children (1-5 years of age) also point to neck, back or limbs as their cause of pain. Spinal pain was the most common presenting complaint in the school aged and adolescent population. Musculoskeletal complaints in children have been associated with both physical and psychological consequences.[3,8] These complaints can alter participation in physical activity and sports, which again might result in negative consequences for life-long health.[8] A recent study showed that levels of exercise steadily decrease with increasing age in children, which could be a factor in spinal pain acceleration with age[3,24] and children with high lumbar isometric muscle endurance have been found to be less likely to report back pain.[11]

The most common manual therapy treatment administered was press and hold technique,[25] followed by mobilization. As the age of the child increased, so did the differentiation in treatment modalities, and a large proportion of the cohort were treated with age specific HVLA manipulation.[26] In addition, one out of 20 children did not receive manual therapy, the cause likely being that they had a presentation that did not correlate with a true musculoskeletal condition. Three children were referred back to their GP or referred by the

chiropractor for diagnostic imaging for further evaluation, thereby manual therapy was not applicable.

Parents reported good results. In all, 85% of the patients/parents reported a full recovery and good improvement following chiropractic care. This rate is similar to what previous studies have found.[17] Also, as previously reported, the rate of reported side effects and adverse events was very low; 5% reported a mild side effect (irritable/soreness for up to 24-48 hours) and none reported adverse events. Previous studies reporting on side effects and adverse reporting have shown similar results.[4,6,17,27] It is likely that adverse events in chiropractic care of pediatric patients are rare.[28] Still, this must be investigated in a prospective way, rather than retrospectively as in this research study.

Referrals were uncommon. The most frequently referred age groups were the most common age groups (infants and teens) at presentation. The youngest age group was referred twice as often as any other age group.

This study uncovered that the types of pediatric problems that were most commonly presented to a chiropractic clinic included public health issues that could put young children at risk for developmental delay and suboptimal breast feeding, favored head position and positional plagiocephaly.[21,23] Another concern raised by parents who brought their child in for a checkup was problematic supine sleeping in infants. Supine sleeping is considered an important factor in the prevention of sudden infant death syndrome (SIDS).[19] Chiropractic care could be considered part of the assessment and treatment protocol for supine sleeping difficulties in infants. This is a key part of the public health agenda for infants, just as is breastfeeding and therefore studies investigating the use of chiropractic care to assist children in order to support public health initiatives should be considered. This study supports previous studies suggesting that further investigation in MSK pain in childhood and adolescence is important. MSK complaints are common, they are likely to progress and for some become a longtime problem.[29]

The key limitation of this study is that it was done in one chiropractic clinic, with only patients presenting to a single chiropractor. This may not have been representative of other practices in Norway or even internationally. As the data collected were the patient records of the author, there was room for bias and unsystematic reporting. Further, in this type of study, no claims can be made for generalization to the larger population, as there was no randomization and the study was purely observational.

Conclusion

The children in this study primarily presented with musculoskeletal problems and infant excessive crying. On average, the patients had three treatment sessions and most cases reported full recovery or good improvement. Further research is a necessity to better understand musculoskeletal pain in the pediatric population, as there appears to be increasing prevalence as the child ages. As such, musculoskeletal problems may occur at a young age and it may follow children into adulthood, creating a potential need for early chiropractic intervention.

References

1. Barnes PM, Bloom B and Nahin RL. Complementary and alternative medicine use among adults and children: United States 2007. *Natl Health Stat Report* 2008; (12):1-23.

2. French SD, Walker, BF and Perle SM. Chiropractic care for children: too much, too little or not enough? *Chiropr Osteopat* 2010; (18):17. Allen-Unhammer A, Wilson FJH and Hestbaek L, 2016. Children and adolescents presenting to chiropractors in Norway: National Health Insurance data and detailed survey. *Chiropractic & Manual Therapies*, 24, 29-38.

3. Miller J. Demographic survey of pediatric patients presenting to a chiropractic teaching clinic. *Chiropr Osteopat* 2010; (18):33.

4. Blanchette MA, Rivard M, Dionne CE and Cassidy, JD. Chiropractors' Characteristics Associated With Physician Referrals: Results From a Survey of Canadian Doctors of Chiropractic. *J Manipulative Physiol Ther* 2015; (38):395-406.

5. Humphreys BK. Possible adverse events in children treated by manual therapy: a review. *Chiropr Osteopat* 2010; (18):12.

6. Kvammen OC and Leboeuf-Yde C. 2014. The chiropractic profession in Norway 2011. *Chiropr Man Therap* 2014; (22):44.

7. Hestbaek L, Jørgensen A and Hartvigsen J. A description of children and adolescents in Danish chiropractic practice: results from a nationwide survey. *J Manipulative Physiol Ther* 2009; (32):607-615.

8. Doyle M. A multinational survey of the demographics of chiropractic paediatric care. *Clinical Chiropractic* 2011; 14(4):150-151.

9. Pohlman KA, Hondras MA, Long CR and Haan AG. 2010. Practice patterns of doctors of chiropractic with a pediatric diplomate: a cross-sectional survey. *BMC Complement Altern Med* 2010; (10):26.

10. Bo Andersen L, Wedderkopp N and Leboeuf-Yde C. Association between back pain and physical fitness in adolescents. *Spine* (Phila Pa 1976). 2006; (31):1740-1744.

11. Hershkovich O, Friedlander A, Gordon B, Arzi H, Derazne E, Tzur D, Shamis A and Afek A.Associations of body mass index and body height with low back pain in 829,791 adolescents. *Am J Epidemiol* 2013; (178):603-609.

12. Hershkovich O, Friedlander A, Gordon B, Arzi H, Derazne E, Tzur D, Shamiss A and Afek A. Association between body mass index, body height, and the prevalence of spinal deformities. *Spine J* 2014; (14):1581-7.

13. Lardon A, Leboeuf-Yde C, Le Scanff C and Wedderkopp N. Is puberty a risk factor for back pain in the young? a systematic critical literature review. *Chiropr Man Therap* 2014; (22):27.

14. Weber Hellstenius SA. Recurrent neck pain and headaches in preadolescents associated with mechanical dysfunction of the cervical spine: a cross-sectional observational study with 131 students. *J Manipulative Physiol Ther* 2009; (32):625-634.

15. Gudmundsson G. Infantile colic: is a pain syndrome. *Medical Hypothesis* 2010; (75):528-529.

16. Akhnikh S, Engelberts AC, van Sleuwen BE, L'Hoir MP and Benninga MA. Theexcessively crying infant: etiology and treatment. *Pediatr Ann* 2014; (43):69-75.

17. Wolke D, Rizzo P and Woods S. Persistent infant crying and hyperactivity problems in middle childhood. *Pediatrics* 2002; (109):1054-60.

18. Thogmartin JR, Siebert CF and Pellan WA. Sleep position and bed-sharing in sudden infant deaths: an examination of autopsy findings. *J Pediatr* 2001; (138):212-217.

19. Collett BR, Starr JR, Kartin D, Heike CL, Berg J, Cunningham ML, Speltz M. Development in toddlers with and without deformational plagiocephaly. *JAMA Pediatrics* 2011; (165):653-658.

20. Losee JE, Mason AC, Dudas J, Hua LB and Mooney MP. Nonsynostotic occipital plagiocephaly: factors impacting onset, treatment and outcomes. *Plast Reconstr Surg* 2007; (119):1866-73.

21. Radesky JS, Kistin CJ, Zuckerman B, Nitzberg K, Gross J, Kaplan-Sanoff M, Augustyn M and Silverstein M. Patterns of mobile device use by caregivers and children during meals in fast food restaurants. *Pediatrics* 2014; (133):843-849.

22. Bascom EM, Napolitano MA. Breastfeeding duration and primary reasons for breastfeeding cessation among women with postpartum depressive symptoms. *J Hum Lact* 2016; 32(2):282-91.

23. Blikstad A. Physical activity and inactivity and the association with musculoskeletal conditions in Norwegian school-aged children. MSc dissertation. Anglo-European College of Chiropractic/ Bournemouth University. 2014.

24. Miller JE, Newell D and Bolton JE. Efficacy of chiropractic manual therapy on infant colic: a pragmatic single-blind, randomized controlled trial. *J Manipulative Physiol Ther* 2012; (35):600-607.

25. Marchand AM. A Proposed Model With Possible Implications for Safety and Technique Adaptations for Chiropractic Spinal Manipulative Therapy for Infants and Children. *J Manipulative Physiol Ther* 2015; (38):713-26.

26. Miller JE and Benfield K. Adverse effects of spinal manipulative therapy in children younger than 3 years: a retrospective study in a chiropractic teaching clinic. J Manipulative Physiol Ther 2008; (31):419-423. Todd AJ, Carroll MT, Robinson A and Mitchell EK. Adverse Events Due to Chiropractic and Other Manual Therapies for Infants and Children: A Review of the Literature. *J Manipulative Physiol Ther* 2015; (38):699-712.

27. Aartun E, Hartvigsen J, Wedderkopp N and Hestbaek L. Spinal pain in adolescents:prevalence, incidence, and course: a school-based two-year prospective cohort study in 1,300 Danes aged 11-13. *BMC Musculoskelet Disord* 2014; (15):187.

The Human Intestinal Microbiome in Health and Disease.

Susan V. Lynch, Ph.D., and Oluf Pedersen, M.D., D.M.Sc.

N Engl J Med 2016; 375:2369-2379December 15, 2016DOI: 10.1056/NEJMra1600266

The large majority of studies on the role of the microbiome in the pathogenesis of disease are correlative and preclinical; several have influenced clinical practice.

The Use of Probiotics in Pediatric Gastroenterology: A Review of the Literature and Recommendations by Latin-American Experts.

Sylvia Cruchet, Raquel Furnes, Aldo Maruy, Eduardo Hebel, Jorge Palacios, Fernando Medina, Nelson Ramirez, Marina Orsi, Lysette Rondon, Vera Sdepanian, Luis Xo chihua, Manuel Ybarra, Roberto Arturo Zablah

Pediatr Drugs (2015) 17:199—216 DOI 10.1007/s40272-015-0124-6

ABSTRACT

Objective: The stability and composition of intestinal flora plays a vital role in human wellbeing throughout life from as early as birth. Over the past 50 years, several studies have been conducted to evaluate the effect of probiotic administration in pediatric gastroenterology. This document aims to provide a recommendation score on probiotic utilization in pediatric gastroenterology, together with a review of current knowledge concerning its benefits, tolerability, and safety. **Study Design:** Published literature was selected without study design restriction: clinical guidelines, meta-analyses, randomized controlled trials (RCTs), cohort studies, out-comes research and case-controlled studies were selected using the following MESH-validated terms: probiotics, diarrhea, acute diarrhea, antibiotic-associated diarrhea, traveler's diarrhea, bacterial diarrhea, nosocomial diarrhea, prophylactic diarrhea, Helicobacter pylori infection, colic, infantile colic, necrotizing enterocolitis (NEC), inflammatory bowel disease, constipation, and allergy. Once the validity and the quality of results were evaluated, a recommendation score and level of evidence were assigned for pediatric gastrointestinal-related conditions, according to the updated Evidence-Based Medicine guidelines: 1a for systematic review (SR) of RCTs, 1b for individual RCT, 1c for SR and individual RCT, 2a for SR of cohort studies, 2b for individual cohort studies, 2c for outcomes research, and 3a for SR of case-control studies. **Results and Conclusions:** The Latin American Expert group consensus recommends the use of the following probiotics for pediatric gastrointestinal conditions: prevention of acute infectious diarrhea (AID): 1b for Bifi-dobacterium lactis, Lactobacillus rhamnosus GG (LGG), and L. reuteri; prevention of nosocomial diarrhea: 1 b for B. lactis Bb12, B. bifidum, LGG and Streptococcus thermophiles; treatment of AID: 1a for LGG and S. boulardii, 1b for L. reuteri; prevention of antibiotic-associated diarrhea: 1b for LGG and S. boulardii; prevention of traveler's diarrhea: 1b for S. boulardii; prevention of infantile colic: 1a for L. reuteri DSM 17938; treatment of infantile colic: 1b for L. reuteri DSM 17938; prevention of NEC: 1a for B. breve, mixtures of Bifidobacterium and Streptococcus, LGG, L. acidophilus and L. reuteri DSM 17938; induction and maintenance of remission in ulcerative colitis: 1b for VSL#3; improving symptoms of irritable bowel syndrome: 2c for LGG and VSL#3.

Aerophagia Induced Reflux in Breastfeeding Infants with Ankyloglossia and Shortened Maxillary Labial Frenula (Tongue and Lip Tie).

Scott A. Siegel

Int J Clin Pediatr 2016;5(1):6-8

ABSTRACT

Background: Infants with tongue and possible lip tie often have a poor latch in which there is often an inadequate seal around the breast and disorganized swallowing. As a result, many of these infants swallow air during breastfeeding. Many of these infants suffer from symptoms of reux. **Methods:** This was a retrospective analysis of questionnaire/intake surveys of 1,000 infants over 5 years in private surgical practice. The inclusion of these infants was determined based on painful breast-feeding, poor lip seal, infant taking H2 blockers or proton pump inhibitors. These infants underwent release of their restrictions with CO2 laser. **Results:** This study shows a correlation between aerophagia in infants with short maxillary labial frenula (maxillary lip tie) and ankyloglossia and reux. A new term has been created to describe this entity: aerophagia induced re ux (AIR). Five hundred twenty (52%) showed improvement or complete reversal of symptoms of reux to the end point of cessation of reux medication. Two hundred eighty-three (28.3%) had no change in reux, and 191 (19.1%) showed post- surgical improvement in post-feed irritability and less reux symptoms but not successfully weaned off medications. **Conclusion:** There appears to be a relationship between maxillary lip tie (ankyloglossia and shortened maxillary labial frenula) and AIR. Treatment of these infants with a relatively simple frenotomy procedure may reduce or eliminate reux. As a result, many of these infants may be spared from invasive testing or medications that have been shown to have potentially signicant side effects. This may change diagnostic and treatment algorithms.

Keywords: Aerophagia; Reflux; Ankyloglossia; Infants; Breastfeeding; Lip tie

---

Suck-Swallow-Breathe Dynamics in Breastfed Infants.

Vanessa S. Sakalidis, BHlth Sc (Hons), PhD, Donna T. Geddes, DMU, Post Grad Dip (Sc), PhD

http://journals.sagepub.com/doi/pdf/10.1177/0890334415601093

Journal of Human Lactation, Vol 32, Issue 2, 2016

ABSTRACT

Despite the importance of the suck-swallow-breathe reflex during breastfeeding, a large proportion of our understanding is derived from bottle-feeding studies. Given the differences in the delivery of milk during breast and bottle feeding, it is imperative that a more general view of the suck-swallow-breathe and milk removal process during breastfeeding is available. This systematic review aimed to assess the evidence for the mechanism of milk removal during breastfeeding; evaluate how the term infant coordinates sucking, swallowing, breathing (SSwB) and cardiorespiratory patterns; and how these patterns change with maturation during breastfeeding. A literature search of PubMed and MEDLINE was performed to assess the mechanism of milk removal and patterns of sucking, swallowing, breathing, and cardiorespiratory control during breastfeeding in healthy term infants. Seventeen studies were selected and a narrative synthesis was performed. Nine studies assessing the infant sucking mechanism consistently provided evidence that vacuum is essential to milk removal from the breast. The limited data on swallowing and breathing and cardiorespiratory control showed mixed results. Overall, results highlighted the high variability in breastfeeding studies and suggested that swallowing, breathing, and cardiorespiratory patterns change with maturation, and within a breastfeed. These findings show potential for devising breastfeeding interventions for populations at risk of SSwB problems. However, consistent methods and definitions of breastfeeding parameters are required before interventions can be adequately developed and tested.

Manipulation Peak Forces Across Spinal Regions for Children Using Mannequin Simulators.

John J. Triano, DC, PhD, Steven Lester, DC, MSc, David Starmer, DC, MHS, and Elise G. Hewitt, DC

Journal of Manipulative and Physiological Therapeutics March/April 2017

ABSTRACT

Objective: The purpose of this work was to create an exploratory database of manipulation treatment force variability as a function of the intent of an experienced clinician sub-specializing in the care of children to match treatment to childhood category. Data of this type are necessary for realistic planning of dose-response and safety studies on therapeutic benefit. **Methods:** The project evaluated the transmitted peak forces of procedures applied to mannequins of different stature for younger and older children. Common procedures for the cervical, thoracic, and lumbar spine and sacroiliac joint were administered to estimate variability by a single experienced practitioner and educator in pediatric manipulation attempting to modulate for childhood category. Results described for peak components in the cardinal axes and for peak total forces were cataloged and compared with consensus estimates of force from the literature. **Results:** Mean force values for both components and total force peaks monotonically increased with childhood category analogous to consensus expectations. However, a mismatch was observed between peak values measured and consensus predictions that ranged by a factor of 2 to 3.5, particularly in the upper categories. Quantitative data permit a first estimate of effect size for future clinical studies. **Conclusions:** The findings of this study indicate that recalibration of spinal manipulation performance of experienced clinicians toward arbitrary target values similar to consensus estimates is feasible. What is unclear from the literature or these results is the identity of legitimate target values that are both safe and clinically effective based on childhood categories in actual practice. (*J Manipulative Physiol Ther* 2017;40:139-146)

Key Indexing Terms: Chiropractic; Manipulation; Pediatrics; Biomechanics; Simulation

---

Impact of physical activity during pregnancy on obstetric outcomes in obese women.

Tinius RA, Cahill AG, Cade WT.

J Sports Med Phys Fitness. 2017 May;57(5):652-659. doi: 10.23736/S0022-4707.17.06222-3. Epub 2015 Nov 12.

ABSTRACT

Background: Maternal obesity is associated with complications and adverse outcomes during the labor and delivery process. In pregnant women with a healthy body weight, maternal physical activity during pregnancy is associated with better obstetric outcomes; however, the effect of maternal physical activity during pregnancy on obstetric outcomes in obese women is not known. The purpose of the study was to determine the influence of self-reported physical activity levels on obstetric outcomes in pregnant obese women. **Methods:** A retrospective chart review was performed on 48 active obese women and 48 inactive obese women (N.=96) who received prenatal care and delivered at the medical center during the past five years. Obstetric and neonatal outcomes were compared between the active and inactive groups. **Results:** Obese women who were active during pregnancy spent less total time in labor (13.4 hours vs. 19.2 hours, P=0.048) and were less likely to request an epidural (92% vs. 100%, P=0.04). When stratified by parity, active multiparous women spent significantly less total time in labor compared to inactive multiparous (6.2 hours vs. 16.7 hours, P=0.018). There were no statistical differences between groups in rates of cesarean deliveries or neonatal outcomes. **Conclusions:** Maternal physical activity during pregnancy appears to improve obstetric outcomes in obese women, and this improvement may be more pronounced among multiparous women. Our finding is of particular importance as pregnant obese women are at higher risk for adverse labor and delivery outcomes.

Musculoskeletal Effects of Pregnancy on the Lower Extremity: A Literature Review.

Anselmo DS, Love E, Tango DN, Robinson L.

J Am Podiatr Med Assoc. 2017 Jan;107(1):60-64. doi: 10.7547/15-061.

ABSTRACT

Pregnant women are often burdened with musculoskeletal symptoms of the lower extremity due to the physical, hormonal, and anatomical changes that occur throughout pregnancy. These symptoms are associated with musculoskeletal dysfunctions, modified gait, joint laxity, muscle imbalance, and increased body mass. This article reviews the literature involving the lower-extremity changes experienced by women during pregnancy and their respective pathophysiologic causes.

Medicinal Plants for Management of Gastroesophageal Reflux Disease: A Review of Animal and Human Studies.

Salehi M, Karegar-Borzi H, Karimi M, Rahimi R.

J Altern Complement Med. 2017 Feb;23(2):82-95. doi: 10.1089/acm.2016.0233. Epub 2016 Dec 20.

ABSTRACT

Objectives: Gastroesophageal reflux disease (GERD) is a prevalent gastrointestinal disease that causes troublesome symptoms and/or complications. The major therapeutic strategy for GERD focuses mainly on symptom alleviation using proton pump inhibitors (PPIs), which does not produce a perfect response in all patients. An approach with new therapeutic agents for GERD seems to be essential. The aim of this study was to review animal and human studies investigating the effect of medicinal plants in GERD as well as mechanisms underlying their therapeutic effects. **Methods:** Medline, Scopus, and Cochrane Central Register of Controlled Trials were searched for animal or human studies. The data collected covered January 1966-October 2015. **Results:** A total of 22 studies were included in this review, of which nine were animal studies and 13 were human studies. Ceratonia siliqua as a medicinal plant and rikkunshito as a multicomponent herbal preparation were the most frequently studied herbal medicines in GERD. Antioxidant and anti-inflammatory activities were the main mechanisms demonstrated in animal studies for ameliorating the effects of medicinal plants in GERD. Other mechanisms include downregulation of genes encoding inflammatory proteins, improvement of barrier function and gastric mucus, a decrease in gastric acid, and induction of tonic contractions of the lower esophageal sphincter. All herbal preparations used in human studies have led to the alleviation of symptoms related to GERD. Myrtus communis and Cydonia oblonga showed marked reduction in GERD symptoms comparable to omeprazole. The therapeutic effect of Cydonia oblonga persisted after discontinuation of the drug. Tongjlang and rikkunshito showed therapeutic effects for non-erosive reflux disease (NERD) where PPIs failed to show a promising effect. Studies on Ceratonia siliqua have been solely focused on regurgitation in infants, and a remarkable decrease in the number of regurgitations was demonstrated. **Conclusion:** The multiple mechanisms of action of medicinal plants in GERD other than anti-secretory properties appear to provide more efficient treatment and helped to manage the histopathological changes associated with this disorder. Further studies are needed to understand the effects of medicinal plants on GERD better.

Herbal medicines in children with attention deficit hyperactivity disorder (ADHD): A systematic review.

Anheyer D, Lauche R, Schumann D, Dobos G, Cramer H.

Complement Ther Med. 2017 Feb;30:14-23. doi: 10.1016/j.ctim.2016.11.004. Epub 2016 Nov 18.

ABSTRACT

Objective: The purpose of this review is to identify evidence in herbal therapy in the treatment of ADHD concerning effectiveness and drug tolerability. **Method:** For this Medline/PubMed, Scopus and the Cochrane Central Register of Controlled Trials (Central) were searched from their inception to 15 July 2016. Only randomized controlled trails (RCT) with children (0-18years) suffering from ADHD were included in this review. **Results:** Nine RCTs with 464 patients comparing herbal pharmaceuticals to placebo or active control were included. Seven different herbs were tested in the treatment of ADHD symptoms. Low evidence could be found for Melissa officinalis, Valeriana officinalis and Passiflora incarnata. Limited evidence could be found for pine bark extract and Gingko biloba. The other herbal preparations showed no efficacy in the treatment of ADHD symptoms. **Conclusion:** While there is still a lack of sufficient numbers of RCTs no concrete recommendations for use can be made so far.

Keywords: ADHD; Children; Herbal medicine; Systematic review

Complementary and alternative medicine among hospitalized pediatric patients.

Oren-Amit A, Berkovitch M, Bahat H, Goldman M, Kozer E, Ziv-Baran T, Abu-Kishk I.

Complement Ther Med. 2017 Apr;31:49-52. doi: 10.1016/j.ctim.2017.02.002. Epub 2017 Feb 7.

ABSTRACT

Objectives: To estimate the prevalence and describe the characteristics of complementary and alternative medicine (CAM) use among hospitalized children, and to discover the awareness of medical staff regarding CAM use. **Design/Setting:** Parents of children aged 0-18 years admitted to the Pediatric Division at Assaf Harofeh Medical Center in Israel between January and July of 2015 (n=146) were provided a questionnaire regarding socio-economic status and evaluating the CAM use. The medical charts of the participants were reviewed in order to establish whether or not CAM use was documented. **Results:** Of those who completed the questionnaire, 78 (54.3%) were using CAM. The major indications for CAM use were colic and teething. CAM use was advised by the family in 44.9%, physician 34.6%, pharmacist 34.6%, friends 30.8%, previous experience 23.1, advertisements 18%, nurses 6.4%, and homeopaths 2.6%. The family physician was aware of CAM use was in 42%. During the admission, only five patients were asked about CAM use (3.4%) by the medical staff. Reviewing the medical charts revealed there was no documentation of CAM use in any of the participants. Socio-demographic analysis of our population revealed no differences between users and non users of CAM, but significant differences in belief in CAM (p=0.018) were found. CAM use was age related; the older the child the less the use (p=0.010). Conclusion: CAM use is common among hospitalized pediatric patients and is often overlooked by the medical staff. CAM use should be included in the medical history.

High-Protein and High-Dietary Fiber Breakfasts Result in Equal Feelings of Fullness and Better Diet Quality in Low-Income Preschoolers Compared with Their Usual Breakfast.

Kranz S, Brauchla M, Campbell WW, Mattes RD, Schwichtenberg AJ.

J Nutr. 2017 Mar;147(3):445-452. doi: 10.3945/jn.116.234153. Epub 2017 Jan 11.

ABSTRACT

Background: In the United States, 17% of children are currently obese. Increasing feelings of fullness may prevent excessive energy intake, lead to better diet quality, and promote long-term maintenance of healthy weight. **Objective:** The purpose of this study was to develop a fullness-rating tool (aim 1) and to determine whether a high-protein (HP), high-fiber (HF), and combined HP and HF (HPHF) breakfast increases preschoolers' feelings of fullness before (pre) and after (post) breakfast and pre-lunch, as well as their diet quality, as measured by using a composite diet quality assessment tool, the Revised Children's Diet Quality Index (aim 2). **Methods:** Children aged 4 and 5 y (n = 41; 22 girls and 19 boys) from local Head Start centers participated in this randomized intervention trial. Sixteen percent of boys and 32% of girls were overweight or obese. After the baseline week, children rotated through four 1-week periods of consuming ad libitum HP (19-20 g protein), HF (10-11 g fiber), HPHF (19-21 g protein, 10-12 g fiber), or usual (control) breakfasts. Food intake at breakfast was estimated daily, and for breakfast, lunch, and snack on day 3 of each study week Student's t tests and ANOVA were used to determine statistical differences. **Results:** Children's post-breakfast and pre-lunch fullness ratings were ≥1 point higher than those of pre-breakfast (aim 1). Although children consumed, on average, 65 kcal less energy during the intervention breakfasts ($P < 0.007$) than during the control breakfast, fullness ratings did not differ ($P = 0.76$). Relative to the control breakfast, improved diet quality (12%) was calculated for the HP and HF breakfasts ($P < 0.027$) but not for the HPHF breakfast (aim 2). **Conclusions:** Post-breakfast fullness ratings were not affected by the intervention breakfasts relative to the control breakfast. HP and HF breakfasts resulted in higher diet quality. Serving HP or HF breakfasts may be valuable in improving diet quality without lowering feelings of satiation or satiety. This trial was registered at clinicaltrials.gov as NCT02122224.

Keywords: RCDQI; breakfast; diet quality; fiber; fullness; hunger; preschool; protein; spontaneous compensation

---

Musculoskeletal Traumatic Injuries in Children: Characteristic Imaging Findings and Mimickers.

Ho-Fung VM, Zapala MA, Lee EY.

Radiol Clin North Am. 2017 Jul;55(4):785-802. doi: 10.1016/j.rcl.2017.02.011. Epub 2017 Mar 27.

ABSTRACT

Musculoskeletal traumatic injuries in children demonstrate characteristic imaging findings. The physis is the most susceptible structure to traumatic injury. The periosteum in children plays a key role in rapid bone healing and stability. The main complications of fractures in children are premature physeal closure, potential limb length discrepancy, and angular deformities. Understanding the normal bone growth, healing, and complications of pediatric fractures is crucial for appropriate imaging diagnosis. This article discusses currently available imaging modalities with up-to-date techniques, underlying mechanisms, and characteristic imaging findings of musculoskeletal traumatic injuries and mimickers encountered in daily clinical practice.

KEYWORDS: Bone bridge; Bone growth disturbance; Greenstick fracture; Pediatric musculoskeletal injury; Salter-Harris classification

Beverage Consumption Patterns at Age 13 to 17 Years Are Associated with Weight, Height, and Body Mass Index at Age 17 Years.

Marshall TA, Van Buren JM, Warren JJ, Cavanaugh JE, Levy SM.

J Acad Nutr Diet. 2017 May;117(5):698-706. doi: 10.1016/j.jand.2017.01.010. Epub 2017 Mar 2.

ABSTRACT

Background: Sugar-sweetened beverages (SSBs) have been associated with obesity in children and adults; however, associations between beverage patterns and obesity are not understood. **Objective:** Our aim was to describe beverage patterns during adolescence and associations between adolescent beverage patterns and anthropometric measures at age 17 years. **Design:** We conducted a cross-sectional analyses of longitudinally collected data. **Participants/Setting:** Data from participants in the longitudinal Iowa Fluoride Study having at least one beverage questionnaire completed between ages 13.0 and 14.0 years, having a second questionnaire completed between 16.0 and 17.0 years, and attending clinic examination for weight and height measurements at age 17 years (n=369) were included. **Exposure:** Beverages were collapsed into four categories (ie, 100% juice, milk, water and other sugar-free beverages, and SSBs) for the purpose of clustering. Five beverage clusters were identified from standardized age 13 to 17 years mean daily beverage intakes and named by the authors for the dominant beverage: juice, milk, water/sugar-free beverages, neutral, and SSB. **Outcomes:** Weight, height, and body mass index (BMI; calculated as kg/m2) at age 17 years were analyzed. **Statistical Analyses:** We used Ward's method for clustering of beverage variables, one-way analysis of variance and x^2 tests for bivariable associations, and y-regression for associations of weight or BMI (outcomes) with beverage clusters and demographic variables. Linear regression was used for associations of height (outcome) with beverage clusters and demographic variables. **Results:** Participants with family incomes <$60,000 trended shorter (1.5±0.8 cm; P=0.070) and were heavier (2.0±0.7 BMI units; P=0.002) than participants with family incomes ≥$60,000/year. Adjusted mean weight, height, and BMI estimates differed by beverage cluster membership. For example, on average, male and female members of the neutral cluster were 4.5 cm (P=0.010) and 4.2 cm (P=0.034) shorter, respectively, than members of the milk cluster. For members of the juice cluster, mean BMI was lower than for members of the milk cluster (by 2.4 units), water/sugar-free beverage cluster (3.5 units), neutral cluster (2.2 units), and SSB cluster (3.2 units) (all P<0.05). **Conclusions:** Beverage patterns at ages 13 to 17 years were associated with anthropometric measures and BMI at age 17 years in this sample. Beverage patterns might be characteristic of overall food choices and dietary behaviors that influence growth.

Keywords: Beverage; Body mass index (BMI); Height; Milk; Sugar-sweetened beverages

Association between maternal intake of n-6 to n-3 fatty acid ratio during pregnancy and infant neurodevelopment at 6 months of age: results of the MOCEH cohort study.

Kim H, Kim H, Lee E, Kim Y, Ha EH, Chang N.

Nutr J. 2017 Apr 18;16(1):23. doi: 10.1186/s12937-017-0242-9.

ABSTRACT

Background & Aims: Long-chain polyunsaturated fatty acids (LC-PUFAs) are essential for infant neurodevelopment. The nutritional adequacy of dietary LC-PUFAs depends not only on the LC-PUFAs intake but also on the n-6 to n-3 fatty acid ratio (n-6/n-3 PUFAs). This study aimed to identify the association between the maternal dietary n-6/n-3 PUFAs and motor and cognitive development of infants at 6-months of age. **Methods:** We used data from 960 participants in the Mothers and Children's Environmental Health (MOCEH) study, which is a multi-center prospective cohort study. Dietary intake of pregnant women was assessed by a one-day 24-hour recall method. Food consumption of infants was estimated based on the volume of breast milk and weaning foods. The duration of each feed was used to estimate the likely volume of milk consumed. Dietary intake of infants at six months was also assessed by a 24-hour recall method. Cognitive and motor development of infants at 6 months of age was assessed by the Korean Bayley scales of infant development edition II (BSID-II) including the mental developmental index (MDI) and the psychomotor developmental index (PDI). **Results:** Maternal intakes of n-6/n-3 PUFAs and linoleic acid (LA)-to-a-linolenic acid (ALA) ratio (LA/ALA) were 9.7 ± 6.3 and 11.12 ± 6.9, respectively. Multiple regression analysis, after adjusting for covariates, showed that n-6/n-3 PUFAs was negatively associated with both the MDI (ß = -0.1674, P = 0.0291) and PDI (ß= -0.1947, P = 0.0380) at 6 months of age. These inverse associations were also observed between LA/ALA and both the MDI and PDI (MDI; ß = -0.1567; P = 0.0310, PDI; ß = -0.1855; P = 0.0367). Multiple logistic regression analysis, with the covariates, showed that infants whose mother's LA/ALA were ranked in the 2nd, 3rd, and 4th quartile were at approximately twice the risk with more than twice the risk of delayed performance on the PDI compared to the lowest quartile (1st vs. 2nd; OR = 2.965; 95% CI = 1.376 - 6.390, 1st vs. 3rd; OR = 3.047; 95% CI = 1.374 - 6.756 and 1st vs. 4th; OR = 2.551; 95% CI = 1.160 - 5.607). **Conclusions:** Both the maternal dietary n-6/n-3 PUFAs and LA/ALA intake were significantly associated with the mental and psychomotor development of infants at 6 months of age. Thus, maintaining low n-6/n-3 PUFAs and LA/ALA is encouraged for women during pregnancy.

Keywords: Bayley scales of infant development; Infants; Linoleic acid-to-a-linolenic acid ratio; Long-chain polyunsaturated fatty acids; Psychomotor development

Prospective associations of meat consumption during childhood with measures of body composition during adolescence: results from the GINIplus and LISAplus birth cohorts.

Harris C, Buyken A, von Berg A, Berdel D, Lehmann I, Hoffmann B, Koletzko S, Koletzko B, Heinrich J, Standl M.

Nutr J. 2016 Dec 5;15(1):101.

ABSTRACT

Background: Higher meat and protein intakes have been associated with increased body weight in adults, but studies evaluating body composition are scarce. Furthermore, our knowledge in adolescents is limited. This study aimed to investigate the prospective associations of intakes of different meat types, and their respective protein contents during childhood, with body composition during adolescence. **Methods:** Dietary (using food frequency questionnaires) and body composition (measured by bioelectrical impedance) data were collected from the 10- and 15-year follow-up assessments respectively, of the GINIplus and LISAplus birth cohort studies. Sex-stratified prospective associations of meat and meat protein intakes (total, processed, red meat and poultry) with fat mass index (FMI) and fat free mass index (FFMI), were assessed by linear regression models (N = 1610). Results: Among males, higher poultry intakes at age 10 years were associated with a higher FMI at age 15 years ß = 0.278 (SE = 0.139), p = 0.046]; while higher intakes of total and red meat were prospectively associated with higher FFMI [0.386 (0.143), p = 0.007, and 0.333 (0.145), p = 0.022, respectively]. Additionally in males, protein was associated with FFMI for total and red meat [0.285 (0.145) and 0.356 (0.144), respectively]. **Conclusions:** Prospective associations of meat consumption with subsequent body composition in adolescents may differ by sex and meat source.

Keywords: Adolescence; Body composition; Fat free mass; Fat mass; longitudinal study; Meat intake; Protein

A Systematic Review of the Soft-Tissue Connections Between Neck Muscles and Dura Mater: The Myodural Bridge.

Palomeque-Del-Cerro L, Arráez-Aybar LA, Rodríguez-Blanco C, Guzmán-García R, Menendez-Aparicio M, Oliva-Pascual-Vaca Á.

Spine (Phila Pa 1976). 2017 Jan 1;42(1):49-54. doi: 10.1097/BRS.0000000000001655.

ABSTRACT

Study Design: Systematic review. **Objective:** To elucidate the existence of soft tissue connections between the neck muscles and cervical dura mater. **Summary Of Background Data:** Several studies discuss the existence of a cervical myodural bridge; however, conflicting data have been reported. **Methods:** Searches were conducted in the PubMed, Web of Science, Cochrane Library, and PEDro databases. Studies reporting original data regarding the continuity of non-post-surgical soft tissue between the cervical muscles and dura mater were reviewed. Two reviewers independently selected articles, and a third one resolved disagreements. Another two researchers extracted the methodology of the study, the anatomical findings, and evaluated the quality of the studies using Quality Appraisal for Cadaveric Studies Scale. A different third researcher resolved disagreements. **Results:** Twenty-six studies were included. A soft tissue connection between the rectus capitis posterior minor, the rectus capitis posterior major, and the obliquus capitis inferior muscles seems to be proved with a strong level of evidence for each one of them. Controversy exists about the possible communication between the dura mater and the upper trapezius, rhomboideus minor, serratus posterior superior, and splenius capitis by means of the ligamentum nuchae. Finally, there is limited evidence about the existence of a soft tissue connection between rectus capitis anterior muscle and the dura mater. **Conclusion:** There is a continuity of soft tissue between the cervical musculature and the cervical dura mater; this might have physiological, pathophysiological, and therapeutic implications, and going some way to explaining the effect of some therapies in craniocervical disorders.

Level Of Evidence: N/A.

Impact of imposed exercise on energy intake in children at risk for overweight.

Fearnbach SN, Masterson TD, Schlechter HA, Ross AJ, Rykaczewski MJ, Loken E, Downs DS, Thivel D, Keller KL.

Nutr J. 2016 Oct 21;15(1):92.

ABSTRACT

Background: Exercise not only has a direct effect on energy balance through energy expenditure (EE), but also has an indirect effect through its impact on energy intake (EI). This study examined the effects of acute exercise on daily ad libitum EI in children at risk for becoming overweight due to family history. **Methods:** Twenty healthy-weight children (ages 9-12 years, 12 male/8 female) with at least one overweight biological parent (body mass index ≥ 25 kg/m2) participated. Children reported to the laboratory for one baseline and two experimental visits (EX = exercise, SED = sedentary) each separated by one week in a randomized crossover design. Two hours into the EX day session, children exercised at 70% estimated VO2max for 30 minutes on a cycle ergometer. Objective EI (kcal) was measured at a standard breakfast (~285 kcal) and ad libitum lunch, snack and dinner. Meals were identical on the EX and SED days. Activity-related EE (kcal) was estimated with accelerometers worn on the non-dominant wrist and ankle. Relative EI (kcal) was computed as the difference between Total EI and Activity-related EE for each testing day. Paired t-tests were performed to test differences in Total EI, Activity-related EE and Relative EI between the EX and SED days. **Results:** Across all meals, Total EI was not statistically different between the EX and SED days ($t = 1.8$, $p = 0.09$). Activity-related EE was greater on the EX day compared to the SED day ($t = 10.1$, $p < 0.001$). By design, this difference was predominantly driven by activity during the morning ($t = 20.4$, $p < 0.001$). Because children consumed a similar number of kcal on each day, but had greater Activity-related EE on the EX day, Relative EI was lower ($t = -5.15$, $p < 0.001$) for the EX day (1636 ± 456 kcal) relative to the SED day (1862 ± 426 kcal). **Conclusions:** Imposed exercise was effective in reducing Relative EI compared to being sedentary. Morning exercise may help children at risk for becoming overweight to better regulate their energy balance within the course of a day.

Keywords: Children; Energy balance; Energy expenditure; Energy intake; Exercise; Obesity

---

Application of Kinesio Taping method for newborn swallowing difficultly: A case report and literature review.

Chien-Lin Lin, MD, BS, Wei-Ting Wu, MD, Ke-Vin Chang, MD, PhD, Hong-Yi Lin, MD, Li-Wei Chou, MD, PhD

Medicine (2016) 95:31 www.md-journal.com

ABSTRACT

Background: Preterm infants are at an increased risk of sucking problems, swallowing difficulty, and poor nourishment. During the neonatal period, the neurobehavioral organization of a preterm baby is poor compared with that of appropriate gestational age infants. Kinesio Taping has been widely used for edema control, joint protection, and proprioception training. With the help of augmentation of the sensory input for muscle facilitation and inhibition through tapping, the coordination of the target muscle groups can be improved. Until now, no research is available on the use of Kinesio Taping for the swallowing difficulty of infant. **Methods:** We reported a preterm infant suffering from brain edema at birth and swallowing difficultly until 40 weeks. The swallowing reflex was delayed. Moreover, lip closure and rooting reflex combined with the dysfunction grade of jaw movement were poor. We performed KT methods on the baby under the theory of the direction of the tape for facilitate or inhibit the muscle. **Result:** After the Kinesio Taping treatment, the sucking function was improved with good lip closure. One week later, the baby was discharged without the use of an oral gastric tube. **Conclusion:** Kinesio Taping contributed significantly to the improvement of impaired sucking and swallowing and could be implemented as a regular rehabilitative approach for infants suffering from these difficulties.

Abbreviation: KT = Kinesio Taping.
Keywords: facilitation, inhibition, Kinesio Taping method, swallowing difficulty

Association between sports type and overuse injuries of extremities in children and adolescents: a systematic review.

Chéron C, Le Scanff C, Leboeuf-Yde C.

Chiropr Man Therap. 2016 Nov 15;24:41. eCollection 2016.

ABSTRACT

Background: Sporting activities can cause injuries and overuse injuries of the extremities (OIE) in children have been shown to be more common than injuries caused by trauma. The lower extremity is more frequently affected than the upper extremity in OIE, but it is not known whether injury site and diagnosis vary in different sporting activities. **Purpose:** To identify any differences between sports in relation to diagnoses and anatomical areas most likely to be injured. **Methods:** A search was made in November 2014 and again in June 2016 in PubMed, SportDiscus, PsycInfo and Web of Sciences. Search terms were: « overuse injuries OR cumulative trauma disorders OR musculoskeletal injuries » AND « extremity OR limb » AND « physical activity OR sport OR risk factor OR predictors OR exercises » AND « child OR adolescent OR young adults ». Inclusion criteria were: 1) prospective, retrospective, or cross-sectional study design; 2) age ≤19 years; 3) the articles must clearly state if reported cases were classified as traumatic or overuse injuries; 4) reporting on OIE in relation to a particular sports type, and 5) sample size >50. A blinded systematic review was conducted. **Results:** In all, nine of the 736 identified articles were included, studying soccer, handball, orienteering, running, dance, and gymnastics. The incidence of OIE was given only in a few articles but at least the site and diagnosis of OIE were identifiable. The lower limb is more often affected than the upper in all sports covered, and, in general, the lower leg and knee are the two most often affected areas. However, in handball, the elbow was the second most often reported area, and in gymnastics injuries of the foot appeared to be more frequent than in the other sports. No differences in diagnoses were observed between sports types. **Conclusion:** Our work contributes new information, namely that the site of OIE in children and adolescents appears to vary only somewhat between different types of sports. Further well-designed surveillance studies are needed to improve knowledge that can help prevent injuries in children and adolescents participating in sports activities.

Keywords: Adolescent; Children; Epidemiology; Extremities; Overuse injuries; Pediatrics; Sports type

---

Case Report: Severe Breast Pain Resolved with Pectoral Muscle Massage.

Edith Kernerman, IBCLC and Eileen Park, MSc, IBCLC, ND

Journal of Human Lactation 2014, Vol. 30(3) 287—291 © The Author(s) 2014 Reprints and permissions: sagepub.com/journalsPermissions.nav DOI: 10.1177/0890334414535842 jhl.sagepub.com

ABSTRACT

Many mothers stop breastfeeding because of breast and/or nipple pain, despite recommendations by the World Health Organization to exclusively breastfeed for the first 6 months. Most commonly, such pain is thought to be caused by fungal or bacterial infection; however, many women do not respond to usual treatments for such diagnoses. Furthermore, there is much dispute in the literature about these diagnoses and treatments. We submit a series of three cases of mothers who presented with severe mastalgia (breast pain) and who did not respond to conventional treatments. After treating the patients with pectoral muscle massage and stretching, they each had complete resolution of their pain. We suggest that each of these mothers experienced constriction of the upper thoracic muscles on their mammary neurovasculature.

Keywords: ankyloglossia, assessment tool, breastfeeding, breast milk, breast pain, constriction, lactation, latch, latching, mammary, mastalgia, neurovasculature, nipple pain, pectoral muscle massage, thoracic, tongue tie, vasoconstriction

Primary Care Interventions to Support Breastfeeding: Updated Evidence Report and Systematic Review for the US Preventive Services Task Force.

Patnode CD, Henninger ML, Senger CA, Perdue LA, Whitlock EP.

JAMA. 2016 Oct 25;316(16):1694-1705. doi: 10.1001/jama.2016.8882.Erratum in

ABSTRACT

Importance: Although 80% of infants in the United States start breastfeeding, only 22% are exclusively breastfed up to around 6 months as recommended by a number of professional organizations. **Objective:** To systematically review the evidence on the benefits and harms of breastfeeding interventions to support the US Preventive Services Task Force in updating its 2008 recommendation. **Data Sources:** MEDLINE, PubMed, Cumulative Index for Nursing and Allied Health Literature, Cochrane Central Register of Controlled Trials, and PsycINFO for studies published in the English language between January 1, 2008, and September 25, 2015. Studies included in the previous review were re-evaluated for inclusion. Surveillance for new evidence in targeted publications was conducted through January 26, 2016. **Study Selection:** Review of randomized clinical trials and before-and-after studies with concurrent controls conducted in a developed country that evaluated a primary care-relevant breastfeeding intervention among mothers of full- or near-term infants. Of 211 full-text articles reviewed, 52 studies met inclusion criteria. Thirty-one studies were newly identified, and 21 studies were carried forward from the previous review. **Data Extraction and Synthesis:** Independent critical appraisal of all provisionally included studies. Data were independently abstracted by one reviewer and confirmed by another. **Main Outcomes and Measures:** Child and maternal health outcomes, rates and duration of breastfeeding, and harms related to interventions as prespecified before data collection. **Results:** Fifty-two studies (n = 66 757) in 57 publications were included. Six trials (n = 2219) reported inconsistent effects of the interventions on infant health outcomes; no studies reported maternal health outcomes. Pooled estimates based on random-effects meta-analyses using the DerSimonian and Laird method indicated beneficial associations between individual-level breastfeeding interventions and any breastfeeding for less than 3 months (risk ratio [RR], 1.07 [95% CI, 1.03-1.11]; 26 studies [n = 11 588]), at 3 to less than 6 months (RR, 1.11 [95% CI, 1.04-1.18]; 23 studies [n = 8942]), and for exclusive breastfeeding for less than 3 months (RR, 1.21 [95% CI, 1.11-1.33]; 22 studies [n = 8246]), 3 to less than 6 months (RR, 1.20 [95% CI, 1.05-1.38]; 18 studies [n = 7027]), and at 6 months (RR, 1.16 [95% CI, 1.02-1.32]; 17 studies [n = 7690]). Absolute differences in the rates of any breastfeeding ranged from 14.1% in favor of the control group to 18.4% in favor of the intervention group. There was no significant association between interventions and breastfeeding initiation (RR, 1.00 [95% CI, 0.99-1.02]; 14 studies [n = 9428]). There was limited mixed evidence of an association between system-level interventions and rates of breastfeeding from well-controlled studies as well as for harms related to breastfeeding interventions, including maternal anxiety scores, decreased confidence, and concerns about confidentiality. **Conclusions and Relevance:** The updated evidence confirms that breastfeeding support interventions are associated with an increase in the rates of any and exclusive breastfeeding. There are limited well-controlled studies examining the effectiveness of system-level policies and practices on rates of breastfeeding or child health and none for maternal health.

Comment in: Interventions Intended to Support Breastfeeding: Updated Assessment of Benefits and Harms. [*JAMA*. 2016]

Breastfeeding Improvement Following Tongue-Tie and Lip-Tie Release: A Prospective Cohort Study.

Bobak A. Ghaheri, MD; Melissa Cole, IBCLC; Sarah C. Fausel, BA; Maria Chuop, BS; Jess C. Mace, MPH, CCRP

The Laryngoscope VC 2016 The American Laryngological, Rhinological and Otological Society, Inc.

ABSTRACT

Objectives/Hypothesis: Numerous symptoms may arise that prevent mother-infant dyads from maintaining desired breastfeeding intervals. Investigations into treatments that positively influence breastfeeding outcomes allow for improved patient counseling for treatment decisions to optimize breastfeeding quality. This investigation aimed to determine the impact of surgical tongue-tie/lip-tie release on breastfeeding impairment. **Study Design:** Prospective, cohort study from June 2014 to April 2015 in a private practice setting. **Methods:** Study participants consisted of breastfeeding mother—infant (0—12 weeks of age) dyads with untreated anky- loglossia and/or tethered maxillary labial frenula who completed preoperative, 1 week, and 1 month postoperative surveys consisting of the Breastfeeding Self-Efficacy Scale-Short Form (BSES-SF), visual analog scale (VAS) for nipple pain severity, and the revised Infant Gastroesophageal Reflux Questionnaire (I-GERQ-R). Breastmilk intake was measured preoperatively and 1 week postoperatively. **Results:** A total of 237 dyads were enrolled after self-electing laser lingual frenotomy and/or maxillary labial frenec- tomy. Isolated posterior tongue-tie was identified in 78% of infants. Significant postoperative improvements were reported between mean preoperative scores compared to 1 week and 1 month scores of the BSES-SF ($F(2) 5 212.3$; $P < .001$), the I- GERQ-R ($F(2) 5 85.3$; $P < .001$), and VAS pain scale ($F(2) 5 259.8$; $P < .001$). Average breastmilk intake improved 155% from 3.0 (2.9) to 4.9 (4.5) mL/min ($P < .001$). **Conclusions:** Surgical release of tongue-tie/lip-tie results in significant improvement in breastfeeding outcomes. Improvements occur early (1 week postoperatively) and continue to improve through 1 month postoperatively. Improvements were demonstrated in both infants with classic anterior tongue-tie and less obvious posterior tongue-tie. This study identifies a previously under-recognized patient population that may benefit from surgical intervention if abnormal breastfeeding symptoms exist.

Key Words: Breastfeeding, ankyloglossia, patient outcome assessment, outcome assessment (healthcare), visual analog scale, gastroesophageal reflux.

Level of Evidence: 2c
Laryngoscope, 00:000—000, 2016

Dietary Inflammatory Potential during Pregnancy Is Associated with Lower Fetal Growth and Breastfeeding Failure: Results from Project Viva

Sarbattama Sen, Sheryl L Rifas-Shiman, Nitin Shivappa, Michael D Wirth, James R Hebert, Diane R Gold, Matthew W Gillman, and Emily Oken6

The Journal of Nutrition Nutrition and Disease 2016 American Society for Nutrition.
First published online March 2, 2016; doi:10.3945/jn.115.225581.

ABSTRACT

Background: Inflammation during pregnancy has been linked to adverse maternal and infant outcomes. There is limited information available on the contribution of maternal diet to systemic inflammation and pregnancy health. **Objective:** The objective of this study was to examine associations of maternal prenatal dietary inflammatory index (DII), a composite measure of the inflammatory potential of diet, with markers of maternal systemic inflammation and pregnancy outcomes. **Methods:** We studied 1808 mother-child pairs from Project Viva, a pre-birth cohort study in Massachusetts. We calculated the DII from first- and second-trimester food-frequency questionnaires by standardizing the dietary intakes of participants to global means, which were multiplied by the inflammatory effect score and summed. We examined associations of DII with maternal plasma C-reactive protein and white blood cell count in the second trimester and the following perinatal outcomes: gestational diabetes, preeclampsia, length of gestation, fetal growth, mode of delivery, and duration of breastfeeding. We used multivariable linear and logistic regression models to analyze the strength of these associations. **Results:** Maternal age was (mean 6 SD) 32.2 6 5.0 y, prepregnancy body mass index (BMI; in kg/m2) was 24.9 6 5.2, and DII was 22.56 6 1.42 units with a range of 25.4 to 3.7. DII was positively correlated with prepregnancy BMI (Pearson!s r = 0.13, P < 0.0001). Higher DII scores, reflecting more proinflammatory dietary potential, were associated with higher second- trimester plasma CRP (b: 0.08 mg/L per 1-unit increase in maternal DII; 95% CI: 0.02, 0.14) and lower birth weight for gestational age z score in infants born to obese mothers (b: 20.10 z score per 1-unit increase in maternal DII; 95% CI: 20.18, 20.02). Higher DII scores were associated with lower odds of breastfeeding for at least 1 mo (OR = 0.85; 95% CI: 0.74, 0.98). **Conclusion:** A proinflammatory diet during pregnancy is associated with maternal systemic inflammation and may be associated with impaired fetal growth and breastfeeding failure. *J Nutr* 2016;146:728—36.

Keywords: obesity, inflammation, pregnancy, diet, breastfeeding, fetal growth