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Systematic review of the occurrence of infantile colic in the community

P L B J Lucassen, W J J Assendelft, J Th M van Eijk, J W Gubbels, A C Douwes, W J van Geldrop

Abstract
Aims—To assess the occurrence of infantile colic in the community and the need for professional help; and to study the influences of potential determinants of infantile colic.

Methods—Surveys were identified by a systematic search in Medline (1966–98) and Embase (1988–98). Retrieved publications were checked for references. Studies selected were community based, prospective, and retrospective surveys on the occurrence of infantile colic published in English, German, French, or Dutch. Occurrence rates were calculated as percentages. Methodological quality of the surveys was assessed by two assessors independently with a standardised criteria list containing items on method of data gathering, definition of colic, and drop out rate.

Results—Fifteen community based surveys were identified. The methodological quality varied considerably and was generally low. Even the two most methodologically sound prospective studies yielded widely varying cumulative incidence rates of 5–19%. Referral rates or the need to seek help because of crying were consistently lower than occurrence rates for prolonged crying as such. Gender, socioeconomic class, type of feeding, family history of atopy on estimates of occurrence of infantile colic, exact data on its occurrence are needed. Health care and to plan research on infantile colic is conceived as one distinct entity with prolonged crying as the main symptom and several optional additional features. Secondly, infantile colic is conceived as a collection of different entities, each defined separately.

Different methods have been used to establish the diagnosis, including audiotape recordings,17 parental diaries,18 the Crying Patterns Questionnaire (CPQ),19 non-specified questionnaires, and interviews, personal or by telephone. Crying has been classified in various ways, such as amount of crying in hours per day or answers to a broad question on whether the baby cried a lot. Moreover, some studies assessed crying prospectively with an inception early in life, whereas others used a retrospective data gathering method, sometimes up to 14–28 months.20

To evaluate the impact of infantile colic on health care and to plan research on infantile colic, exact data on its occurrence are needed. We aimed to perform a systematic review of community based surveys to assess the occurrence of infantile colic and to assess the need for professional help related to study quality (method of data gathering, definition of infantile colic, and drop out rate). We also aimed to assess occurrence rates according to source of recruitment. Finally, we planned to assess the influence of prognostic factors such as gender and socioeconomic class, and aetologic factors such as type of feeding, parental smoking, and family history of atopy on estimates of occurrence of infantile colic.

Methods
SELECTION OF STUDIES
In March 1998 we performed a Medline (1966–98) and an Embase (1988–98) search with the following search strategy: “colic” and
**Table 1** Community based prospective studies with occurrence rates for infantile colic, ranked according to methodological quality

<table>
<thead>
<tr>
<th>First author</th>
<th>Source of study population</th>
<th>Infant’s age at assessment</th>
<th>Methods of data collection</th>
<th>Definition of infantile colic as used for occurrence estimate</th>
<th>Period of data reporting on occurrence</th>
<th>Eligible (n)</th>
<th>Recruited (n)</th>
<th>Completed study (n)</th>
<th>Occurrence of infantile colic (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canivet‡‡‡</td>
<td>Newborns from hospital</td>
<td></td>
<td>Weekly diary for 1 day</td>
<td>1 Wessel’s criteria if medication prescribed</td>
<td>0–3 months</td>
<td>409</td>
<td>209</td>
<td>152</td>
<td>1 5%</td>
</tr>
<tr>
<td>Sweden</td>
<td>Infants followed from birth to 12 weeks</td>
<td></td>
<td>Weekly diary for 1 day, questionnaire (crying a problem?)</td>
<td>2 Wessel’s criteria without the 3 weeks criterion</td>
<td>2</td>
<td>11%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Høgdal§</td>
<td>Newborns from hospital</td>
<td></td>
<td>Weekly diary for 1 day, questionnaire (crying a problem?)</td>
<td>3 Crying/screaming &gt;1 hour/day during 4 days/week in one week</td>
<td>3</td>
<td>17%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HagdallØ</td>
<td>Infants followed from birth to 6 months</td>
<td></td>
<td>Questionnaire given at scheduled visit</td>
<td>4 Crying is a problem for the mother</td>
<td>4</td>
<td>3%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rinne°°°</td>
<td>Newborns from hospital</td>
<td></td>
<td>Structured telephone interviews at age 1–2–6 months</td>
<td>Unexplained paroxysms of crying or fussing for at least 90 minutes each day for a minimum of 6 of the preceding 7 days or periods lasting at least 3 hours a day in 3 of the preceding 7 days</td>
<td>4</td>
<td>19%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubin±±±</td>
<td>Infants from birth to 1 year</td>
<td></td>
<td>Questionnaire given at birth to be returned at 3 months</td>
<td>Unexplained prolonged crying</td>
<td>0–3 months</td>
<td>1269</td>
<td>1146</td>
<td>1019</td>
<td>26%</td>
</tr>
<tr>
<td>Michelsson†</td>
<td>Well baby clinics</td>
<td></td>
<td>Questionnaire given at birth to be returned at 3 months</td>
<td>Crying which mothers felt the need to seek help or Crying for more than 3 hours per day</td>
<td>0–3 months</td>
<td>nr‡</td>
<td>nr</td>
<td>78</td>
<td>5%</td>
</tr>
<tr>
<td>Høgdal§</td>
<td>Infants under age 1 year</td>
<td></td>
<td>Questionnaire and 24-hour diary at arbitrary visit∥</td>
<td>5 item scale, ranging from no colic to a lot of colic: colic defined as “a lot of colic” and “quite a lot of colic”</td>
<td>0–3 months</td>
<td>1582</td>
<td>1443</td>
<td>1204</td>
<td>28%</td>
</tr>
<tr>
<td>RautavaØ</td>
<td>Birth register</td>
<td></td>
<td>Well baby clinics</td>
<td>Question: how much does the baby cry?</td>
<td>0–3 months</td>
<td>nr‡</td>
<td>nr</td>
<td>113</td>
<td>12%</td>
</tr>
<tr>
<td>Finland</td>
<td>Infants at age 3 months</td>
<td></td>
<td>Questionnaire given at scheduled visit</td>
<td>Data on infants under 3 months crying more than 3 hours/day are given</td>
<td>0–3 months</td>
<td>nr‡</td>
<td>nr</td>
<td>1221</td>
<td>13%</td>
</tr>
<tr>
<td>Lehtonen¶</td>
<td>Newborns from hospital</td>
<td></td>
<td>Questionnaire given at birth to be returned at 3 months</td>
<td>Paroxysms of crying for 3 or more hours per day, 3 days or more per week during at least 3 weeks</td>
<td>0–3 months</td>
<td>nr‡</td>
<td>nr</td>
<td>959</td>
<td>13%</td>
</tr>
<tr>
<td>Hide‡‡‡</td>
<td>Infants from birth to 1 year</td>
<td></td>
<td>Questionnaire given at birth to be returned at 3 months</td>
<td>Mother’s interpretation of the infant’s cry as colic</td>
<td>0–3 months</td>
<td>nr‡</td>
<td>nr</td>
<td>843</td>
<td>16%</td>
</tr>
<tr>
<td>UK</td>
<td>Health visitors recorded data at 6–12–26–52 weeks</td>
<td></td>
<td>Questionnaire given at birth to be returned at 3 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*QS = quality score: range 0–6 (for details see table 3). †Study with prospective and retrospective part; only prospective data in table. ‡nr = not reported. §Study on Finnish and Colombian infants; only data on Finnish infants in table. ¶#Wessel’s criteria: crying for 3 hours or more on at least 3 days in at least 3 weeks.

**Crying** as keywords, and “colic”, “cry”, and “fuss” as free text words were combined with “epidemiology” (explode) as key word and “incidence”, “prevalence”, and “morbidity” as free text words. To contain sensitivity of the search, we did not search with the “restrict to focus” option. The searches were limited to infants younger than 1 year and restricted to English, German, French, and Dutch languages. We checked the references of retrieved publications for missing studies. The first author screened all citations in articles about incidence or prevalence of infantile colic in community based samples. Publications on consultation rates for crying and studies on non-white infants were excluded because our aim was to generate data on infants in Western societies.

We defined community based studies as those including infants recruited from well baby clinics or community populations. Studies recruiting infants born in hospital, but otherwise without problems, were also accepted as representative of the general population. We labelled a study prospective when data collection was performed during the crying period and retrospective when data were collected after resolution of the crying problem.

**Methodological quality**

We evaluated methodological quality with a self developed scale, based on Laupacis and colleagues and Fletcher and colleagues. We used different versions for prospective and retrospective surveys. Each study was scored on the items “definition of infantile colic”, “method of obtaining data on crying behaviour”, and “drop out”. The adequacy of each item could be scored “yes” or “no”. Each item had a weight of 1 or 2. In prospective studies the quality score ranged from 0 to 6, with a low score indicating high susceptibility to bias. The score of retrospective studies had a range from 0 to 5. Two of us (WJvG, PLBJL) scored all surveys independently. We were not blinded for information on authors and journal, because one of us was well acquainted with the material already. Disagreement was solved by consensus. The degree of agreement before the consensus meeting was expressed as a percentage agreement and as kappa.
Table 2  Community based retrospective studies with occurrence rates for infantile colic, ranked according to methodological quality

<table>
<thead>
<tr>
<th>First author</th>
<th>Country</th>
<th>Source of study population</th>
<th>Method of data collection</th>
<th>Definition of infantile colic as used for occurrence</th>
<th>Period of data reporting on occurrence</th>
<th>Invited (n)</th>
<th>Participated (n)</th>
<th>Occurrence of infantile colic (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>van der Wal</td>
<td>Netherlands</td>
<td>Infants at age 2–3 months</td>
<td>Questionnaires to be filled out by nurse/physician at scheduled visit and questionnaire at home</td>
<td>1 Wessel’s criteria or needed medication 0–3 weeks</td>
<td>0–3 months</td>
<td>254</td>
<td>224</td>
<td>12%</td>
</tr>
<tr>
<td>Canivet†‡</td>
<td>Sweden</td>
<td>Newborns from hospital</td>
<td>Telephone interview at age 5–7 months 1. Questionnaire given at birth (n = 78) 2. Telephone interview at 3–4 months (n = 141)</td>
<td>Crying a lot 3 Difficult to comfort</td>
<td>0–3 months</td>
<td>242</td>
<td>219</td>
<td>17%</td>
</tr>
<tr>
<td>St James-Roberts‡‡</td>
<td>UK</td>
<td>Infants under age 1 year</td>
<td>Birth register</td>
<td>Referral to professional for crying or farther more than 3 hours per day</td>
<td>1–3 months</td>
<td>100</td>
<td>ns‡</td>
<td>10%</td>
</tr>
<tr>
<td>Álvarez†</td>
<td>Denmark</td>
<td>Infants under age 1 year</td>
<td>Mailed questionnaire (CPQ)</td>
<td>Crying for more than 3 hours per day</td>
<td>0–3 months</td>
<td>174</td>
<td>140</td>
<td>15%</td>
</tr>
<tr>
<td>Crowcroft‡</td>
<td>UK</td>
<td>Questionnaire administered by health visitor at age 1 month</td>
<td>Birth register</td>
<td>Question: was your baby colicky?</td>
<td>0–1 month</td>
<td>72995</td>
<td>67172</td>
<td>18%</td>
</tr>
<tr>
<td>Thomas§</td>
<td>USA</td>
<td>Infants 2 weeks to 12 months of age</td>
<td>Source not reported</td>
<td>Recurrent episodes of unexplained crying and irritability &gt;1 week</td>
<td>2–52 weeks</td>
<td>1022</td>
<td>964</td>
<td>20%</td>
</tr>
<tr>
<td>Ståhlberg</td>
<td>Finland</td>
<td>Mailed questionnaire to each 10th child at age 14–38 months</td>
<td>Birth register</td>
<td>Gas problems or infantile colic leading to unexplained periods of crying and restlessness 'Early infancy'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*QS = quality score; range 0–5 (for details see table 4).  
‡Study with prospective and retrospective part; only prospective data in table.  
§CPQ: crying patterns questionnaire.  
†The definition including the 3 weeks criterion was considered unrealistic to search for retrospectively (see table 1).  
‡nor reported.  
#Wessel’s criteria: crying for 3 hours or more on at least 3 days in at least 3 weeks.
reported a relatively low incidence of infantile colic (5%). The other high quality prospective study reported a much higher figure (19%).

None of the surveys separately reported the presence of gastrointestinal symptoms. Three surveys measured consolability.

Surveys recruiting cases from well baby clinics reported lower occurrence rates compared to recruitment from birth registers and hospitals. One survey did not state the source of recruitment.

Eight studies reported on occurrence in boys and girls separately: seven found no difference in occurrence of colic, and one reported a significantly higher proportion of boys crying more than three hours per day. Five studies reported on influence of socioeconomic class: three found no differences, while two reported slightly higher rates in higher socioeconomic classes.

Seven surveys compared breast fed and formula fed infants: four found no difference, and one reported a much higher figure (19%). In two studies the occurrence rates among breast fed infants were slightly higher, and in one it was slightly lower. Only two studies reported separately on a positive family history of atopy: both found no association between the presence of a positive family history of atopy and the presence of infantile colic. In two studies influence of parental smoking was detected.

Discussion

Occurrence rates of infantile colic in community based samples vary greatly because of differences in study design, site of recruitment, definition, and method of data collection. The two best prospective studies yielded occurrence rates of 5% and 19% respectively. Our review stresses the importance of a uniform definition and good documentation methods.

Gender, socioeconomic status, type of feeding, parental smoking, and family history of atopy have not been consistently measured and in studies that presented data, no consistent influence on occurrence estimates were detected. For some surveys small study size with related low power, might have caused the inability to detect differences in subgroups.

We are interested to find that in a prospective study of 160 Korean infants (which we excluded) no case of infantile colic was found. This survey was adequate according to the quality criteria in this study as the researchers used a 24 hour diary and a definition of infantile colic that included a time criterion. Confirmation of this finding in other non-Western societies is needed as differences in diet or care taking activities may be responsible for differences in occurrence of infantile colic, possibly providing clues for prevention or treatment.

In our systematic review, we used an unvalidated quality assessment method. We were not aware of any existing methods for assessing quality of occurrence studies. Although the low agreement for some items may be a result of inadequate reporting in the original publication, inconsistencies in our method could also have played a role. Further development of quality assessment methods for occurrence studies is therefore needed.

The various surveys in the review actually assessed three different concepts of infantile colic: crying of a certain duration; crying as a problem for the mother; and crying leading to a need to seek professional help. Comparing the need for professional help with crying of certain duration (for example, more than three hours a day) is therefore needed.

Table 4 Quality score of retrospective studies, individual items, and total score

<table>
<thead>
<tr>
<th>Items (weight) *</th>
<th>tan Der Wal**</th>
<th>Canivet*</th>
<th>Lothe†</th>
<th>St James-Roberts**</th>
<th>Alvarez*</th>
<th>Crocso†</th>
<th>Thomas°</th>
<th>Ståhlberg**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drop out—selection: % not included &lt;20% (1)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Outcome (method)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Amount of crying in 1 category</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Yes/no answer to question whether child cried much (0)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Outcome (period of data collection)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Total quality score (0–6)</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

*Weight: score to compliance with item.
+ compiled to item; − not compiled to item; ? not stated.
†Loss to follow up includes non-participation and not completing the study after recruitment.
hours per day), in those studies which assessed both,12 29 most mothers seem to cope without professional help. It is not clear whether this discrepancy is caused by characteristics of the mother, characteristics of the infant (crying pattern and related features), or both. It is possible that consolability, the presence of gastrointestinal symptoms, and acoustic cry features (a more “painful” sound) are determinants of the decision to seek professional help. Moreover, distinguishing between crying of normal and excessive duration remains a problem. An older study had shown that healthy infants in Western societies cry for about 150 minutes per day at 2 weeks of age, for almost three hours per day (median) at 6 weeks and for about 60 minutes per day at 12 weeks.40 Recent research shows similar figures: St James Roberts and Hall34 measured a mean cry duration in normal infants aged 1–3 months of about two hours per day; and Lehtonen and Korvenranta33 assessed maximum crying levels about two hours per day; and Lehtonen L, Rautava PT. Infantile colic: natural history and treatment. _Curr Probl Pediatr_ 1990; 20:79–83.


8 Lester BM, Bouyahad CFZ, Garcia-Colli CT, Hole WT. Colic for developmentalists. _Infant Mental Health J_ 1990;11:321–33.


43 Wel MF van der, Boom DC van den, Pauw-Plomp H, Jonge GA de. Mothers’ reports of infant crying and soothing in the multi-cultural city of Amsterdam, the Netherlands. Submitted.

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