

# Association of Maternal Self-Medication and Over-the-Counter Analgesics for Children

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## KEY WORDS

medicine use, children, parents, paracetamol, pain

## ABBREVIATIONS

BMR—backward model reduction

DEMOCOPHES—Demonstration of a study to Coordinate and Perform Human biomonitoring on a European Scale

HRQoL—health-related quality of life

OR—odds ratio

OTC—over-the-counter

PCM—paracetamol

SRH—self-rated health

Dr Jensen conceptualized and designed the study, designed the data collection instrument, carried out the recruitment, data collection, and statistical analyses, and drafted the initial manuscript; Miss Gottschau carried out the data collection and statistical analyses, and reviewed and revised the initial manuscript; Dr Siersma supervised the statistical analyses, and reviewed and revised the initial manuscript; Dr Graungaard assisted in the design of the study and data collection instrument, and reviewed and revised the initial manuscript; Professor Holstein supervised the design of the data collection instrument and the statistical analysis, and reviewed and revised the initial manuscript; Dr Knudsen supervised the design of the data collection instrument, coordinated recruitment and data collection, supervised statistical analyses, and reviewed and revised the initial manuscript; and all authors approved the final manuscript as submitted.

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**WHAT'S KNOWN ON THIS SUBJECT:** Self-medication with over-the-counter (OTC) analgesics, particularly paracetamol (PCM), among children is widespread and increasing. Parents often administer the medicine. The health care system has little knowledge or possibility to regulate OTC medication, and use of PCM for children may be partly unjustified.



**WHAT THIS STUDY ADDS:** Maternal frequent self-medication with OTC analgesics is associated with frequent use of OTC analgesics, particularly PCM, among 6- to 11-year-old schoolchildren, even when the child's frequency of pain is accounted for.

## abstract

**OBJECTIVE:** Self-medication with over-the-counter (OTC) analgesics, such as paracetamol (PCM), among children and adolescents is increasing and constitutes an important public health issue internationally. Reasons for this development are unclear; parental influence is suggested. Our objective was to examine whether self-medication with OTC analgesics among school-aged children is influenced by maternal self-reported health and medicine use, taking the child's frequency of pain into account.

**METHODS:** A quantitative cross-sectional survey was conducted on 131 children aged 6 to 11 years and their mothers in the framework of the Demonstration Of A Study To Coordinate And Perform Human Biomonitoring On A European Scale (DEMOCOPHES) European project. Participants were selected from 1 urban and 1 rural area of Denmark, and equally distributed in age and gender. Data were collected through structured interviews with all children and self-report questionnaires for mothers regarding health, pain, and medicine use.

**RESULTS:** After adjusting for several sociodemographic and health parameters, maternal use of OTC analgesics was significantly associated with self-medication with OTC analgesics, particularly PCM, in our population of schoolchildren, even when the child's pain was adjusted for (odds ratio 3.00,  $P = .008$ ). A clear association between child pain and OTC analgesic use was not found. Additionally, maternal health (self-rated health, chronic pain, chronic disease, daily medicine intake) did not significantly influence child use of OTC analgesics.

**CONCLUSIONS:** Maternal self-medication with OTC analgesics is associated with self-medication of OTC analgesics, predominantly PCM, among school-aged children, perhaps more than the child's pain. Maternal health seems of less importance. Information to parents about pain self-management is important to promote appropriate PCM use among schoolchildren. *Pediatrics* 2014;133:e291–e298

Use of over-the-counter (OTC) analgesics to treat pain among children is common behavior internationally.<sup>1–3</sup> This treatment is often managed by parents without consulting a physician.<sup>4</sup> The act of self-administering OTC medicine, or giving it to one's child without medical supervision, is termed self-medication.<sup>1</sup> In many highly developed countries, self-medication for children and adolescents in case of pain and other minor ailments has increased within the past decades.<sup>5,6</sup> The reasons for this development are still unclear. A recent US survey showed that in 1 week, twice as many children aged 0 to 11 years received OTC drugs as prescription medications.<sup>7</sup>

Paracetamol (PCM) is the most widely used analgesic to treat mild pain in children in the United States<sup>7</sup> and internationally.<sup>8</sup> Correspondingly, it is the most frequently sold and used OTC preparation for children.<sup>1,7,9</sup> It is offered in pharmacies and supermarkets worldwide. Because individual purchase of OTC preparations is not registered, the health care system's knowledge and regulation of PCM use is limited.

PCM was introduced in the 1950s as a mild analgesic and antipyretic. It is considered safe for pediatric patients when administered in therapeutic dosage. Taking PCM frequently can lead to medicine-induced headache.<sup>10</sup> Overdosing can lead to liver damage and, in worst case, liver failure.<sup>8</sup> Intoxication may happen after a single overdose accident, as well as after repeated doses above recommendations.<sup>11</sup> This is noteworthy because parental dosing errors with PCM are not uncommon.<sup>12</sup> US data showed more than 70 000 emergency department visits in a 2-year period because of unintentional medicine overdose in 0- to 18-year-old children, PCM accounting for 10% of those visits.<sup>13</sup>

Several factors might affect the use of OTC analgesics for children and adolescents. In European adolescents, female

gender and a self-reported poor self-rated health (SRH) predict a more frequent use of OTC medications, including analgesics.<sup>14,15</sup> Being bullied by peers also seems to promote use of pain medications in schoolchildren.<sup>16</sup>

Recently, parental influence on child self-medication has gained attention. Several studies have examined the influence of parental socioeconomic status. Some show an association with high income and level of education,<sup>14,17</sup> whereas another found an association with low socioeconomic status.<sup>18</sup> Parental attitudes toward OTC medicines may affect the self-medication for their child.<sup>19,20</sup> Additionally parental health and pain symptoms have been suggested to be of importance.<sup>2</sup> Mothers could be of particular influence, because they most often purchase and administer OTC medications, including PCM.<sup>21</sup>

The current extensive self-medication with OTC analgesics for children constitutes an important public health issue internationally.<sup>7</sup> By increasing our understanding of what influences child use of analgesics we can improve safety and efficacy of preparations such as PCM. Further knowledge of parental aspects that promote administration of analgesics for children may contribute. The purpose of this study was to examine the influence of maternal health and medicine use on medication with OTC analgesics, especially PCM, among school-aged children.

## METHODS

### Setting

This study was carried out in school settings of 2 locations: an urban and a rural area in Denmark during the fall of 2011. Recruitment and sampling was closely connected with the Danish part of Demonstration of a study to Coordinate and Perform Human Biomonitoring on a European Scale (DEMOCOPHES), a European Union project demonstrating the feasibility of a coordinated approach on human biomonitoring at the European

level by examining levels of chemicals (mercury, cadmium, phthalates, and cotinine) in comparable populations of schoolchildren and their mothers in 17 European countries.<sup>22,23</sup>

### Design/Population

The design was a quantitative cross-sectional survey by using structured interviews with children and corresponding self-report questionnaires for mothers.

In DEMOCOPHES, 144 Danish children aged 6 to 11 years and their mothers were included. The participants were recruited from 4 schools in each area. All parents of first to sixth grade pupils received written information about DEMOCOPHES and this study via the schools' E-mail systems. Furthermore, information was posted in local newspapers. Participants were invited to self-assign on a project Web site.

The children were equally distributed in age, gender, and urban/rural location. Only children who had lived in the area for 5 years and stayed with their mothers a minimum of 16 days per month were included. Children or mothers with diabetes, liver or kidney disease, or who did not understand Danish were excluded.

At the day of participation, all DEMOCOPHES participants were invited to also take part in this study; 131 pairs of mother and child agreed. Reasons for not participating were lack of time (9 pairs), discomfort after blood sampling (2 pairs), and unwillingness of the child (2 pairs).

### Data Collection

Collection of data took place in the school nurses' facilities of 3 schools. All participants had specific appointments; 1 hour was scheduled for each pair. They delivered questionnaires, and urine, hair, and blood samples, and subsequently the mother filled out the questionnaire for the current study while the child was

interviewed by the first author (J.F.J.) in a separate room. J.F.J. is trained in structured interviewing<sup>20</sup> and has 3 years' experience as a physician in hospitals and general practice. If a mother had problems answering the questionnaire, she could ask J.F.J. for advice.

The structured interview guide contained 21 items regarding health and health-related quality of life (HRQoL), experiences with pain, and medicine use of the child. The questionnaire for mothers contained 39 items: 25 concerning health, pain, and medicine use of the child, and 14 concerning health of the mother. Completing the questionnaire and interview took 10 to 15 minutes.

HRQoL of the children was measured by the validated Pediatrics Quality of Life inventory.<sup>24</sup> Items regarding child pain were developed from the Lübeck Pain Screening Questionnaire.<sup>25,26</sup> Items on medicine use were designed specifically for this survey. Maternal SRH was assessed by 1 item from the Danish Short Form-36 inventory.<sup>27</sup> The final questionnaires were pilot tested with 5 mother-child pairs before use. Only minor corrections were made.

## Measurements

Two items in the self-report questionnaire covered the use of OTC analgesics for children: if the child had received OTC analgesics in the past 3 months (replies were dichotomized into yes versus no/do not know), and how often in the past year the child was given PCM (replies were dichotomized into every second month or more often versus not at all/only a few times). These items constitute the 2 key outcomes for this study (Fig 1).

To clarify child recurrent pain, both the child and mother reported if the child often experienced pain and described the frequency (Fig 1). Pain occurring a minimum of weekly in a period of 3 months was described as recurrent pain in accordance with previous studies.<sup>25</sup> Maternal health was described by 5 items

for the mother concerning SRH, pain, chronic disease, and medicine use (Fig 1). Maternal SRH was dichotomized into excellent/very good versus good/fair/poor. Maternal use of analgesics was dichotomized into less than once a month versus monthly or more often.

## Statistics

Data were analyzed with SPSS for Windows statistical software, version 20 (IBM SPSS Statistics, IBM Corporation, Chicago, IL). *P* values < .05 were considered significant.

Sociodemographic variations in medicine use were assessed by  $\chi^2$  tests. Associations between maternal health

and the key outcomes were assessed by univariate and multivariate logistic regression analyses. Because the included maternal health factors might be correlated and hide each other's effects in a full multivariate model, we did a backward model reduction (BMR) for each health factor; iteratively, the health factor with the lowest *P* value was removed until only the examined health factor and factors with *P* < .05 were left in the model.

## Ethics

The DEMOCOPHES study was approved by the regional ethics committee (approval no H-3–2011–075). Participation was

KEY OUTCOMES:
<p><b>Outcome 1, child use of analgesics in the past 3 months:</b></p> <p>Mother: <i>Within the last three months, has your child received non-prescription analgesics?</i> (yes <input type="checkbox"/>, no <input type="checkbox"/>, do not know <input type="checkbox"/>, name of medicine _____)</p>
<p><b>Outcome 2, child use of paracetamol in the past year:</b></p> <p>Mother: <i>Within the last year, how often has your child received Panodil, Pinex or Pamol? (I.e. the pharmacy names of medicine containing paracetamol in Denmark)</i> (not at all / only a few times <input type="checkbox"/>, about once every second month <input type="checkbox"/>, about once a month <input type="checkbox"/>, 2-3 times a month <input type="checkbox"/>, weekly or more often <input type="checkbox"/>)</p>
DETERMINANTS:
<p><b>Child recurrent pains:</b></p> <p>Child/Mother: <i>Within the last three months have you (has your child) often experienced pain anywhere in the body or head?</i> (yes <input type="checkbox"/>, no <input type="checkbox"/>)</p> <p>Child/Mother: <i>How often do you feel (does your child mention) the pain?</i> (Once a month or less <input type="checkbox"/>, 2-3 times a month <input type="checkbox"/>, weekly <input type="checkbox"/>, a few times every week <input type="checkbox"/>, daily <input type="checkbox"/>)</p>
<p><b>Maternal health:</b></p> <p>Self-rated health (SRH): Mother: <i>In general, how would you say your health is?</i> (Excellent <input type="checkbox"/>, very good <input type="checkbox"/>, good <input type="checkbox"/>, fair <input type="checkbox"/>, poor <input type="checkbox"/>)</p> <p>Chronic / recurrent pains: Mother: <i>Do you suffer from recurrent or chronic pain?</i> (no <input type="checkbox"/>, yes <input type="checkbox"/>, yes previously, but not currently <input type="checkbox"/>)</p> <p>Use of over-the-counter analgesics: Mother: <i>How often do you take over-the-counter pain relieving medicine?</i> (not at all / only a few times <input type="checkbox"/>, about once every second month <input type="checkbox"/>, about once a month <input type="checkbox"/>, 2-3 times a month <input type="checkbox"/>, weekly or more often <input type="checkbox"/>)</p> <p>Chronic disease: Mother: <i>Do you suffer from any long-term illness, chronic disease, disability or complication from an injury?</i> (yes <input type="checkbox"/>, no <input type="checkbox"/>, - if yes, please describe: _____)</p> <p>Daily medicine intake: Mother: <i>Do you take any medications daily?</i> (yes <input type="checkbox"/>, no <input type="checkbox"/>, - if yes, please list here _____)</p>

**FIGURE 1**

Key items of the structured interview guide/questionnaire.

voluntary and it was at any time possible to withdraw from the study, or part of it. All participants received a cinema ticket for their contribution. Children were not asked questions interpreted as worrying or burdening to them. The current study and DEMOCOPHES were reported to the Danish Data Protection Agency. All data are anonymous and stored according to Danish law regarding data storage.

## RESULTS

Table 1 shows the population characteristics and the proportion of children who used OTC analgesics. In total, 59 children (45%) had been given OTC analgesics in the last 3 months. Of these, 49 children received PCM, 2 were given ibuprofen, and 8 mothers did not register the name of the given analgesic. Of the 131 children, 29 (22%) had received PCM at least every second month in the past year. Only 2 children reported to self-administer OTC analgesics.

There was no significant difference in child age, gender, or HRQoL for any of the 2 child self-medication outcomes. Neither was maternal age, education, or the family's place of residence or income associated with use of OTC analgesics for the child (Table 1).

The 41 children reporting recurrent pains showed a tendency to self-medicate with OTC analgesics more frequently; however, this association was insignificant. Maternal report of child recurrent pain was associated with self-medication of the child with PCM at least every second month in the past year (Table 1).

A third of the mothers reported chronic pains (headache or musculoskeletal pains); a similar proportion reported chronic disease (hypertension, asthma, or allergy). One in 4 mothers took medicine daily (asthma or allergy medications, antihypertensives, analgesics, or antidepressants). Fifty-one mothers (39%) used OTC analgesics at least monthly. Maternal monthly self-medication with

OTC analgesics was significantly associated with a more frequent use of analgesics for her child in both child self-medication outcomes (Table 1).

### Maternal Health and Child Use of OTC Analgesics

The univariate analysis in Table 2 shows that maternal monthly self-medication with OTC analgesics was significantly associated with a more frequent use of OTC analgesics for her child in the past 3 months and the previous year (odds ratio [OR] 2.82 and OR 2.79,  $P < .05$ ). This association remained significant when adjusting for background factors (child age, gender, and number; maternal age and education level; place of residence; and household income), the other maternal health parameters, and child recurrent pains (OR 3.07 and OR 4.71,  $P < .05$ ).

After BMR, the association between maternal monthly self-medication with analgesics and child self-medication with analgesics within the past 3 months remained significant (OR 3.00,  $P < .05$ ). However, BMR resulted in the association between maternal monthly use of OTC analgesics and frequent self-medication with PCM in the past year becoming insignificant (OR 2.54,  $P = .069$ ). No other maternal health parameters showed association with child self-medication with OTC analgesics.

### Child Recurrent Pain and Use of OTC Analgesics

Table 2 shows that child report of recurrent pain was significantly associated with the child's use of OTC analgesics in the past 3 months when adjusting for background and health factors, whereas maternal report of child recurrent pain was not. However, the mother's report of child recurrent pain predicted child self-medication with PCM at least every second month in the past year by an OR of 7.02,  $P < .05$ , after BMR.

## DISCUSSION

### Main Findings

This study demonstrates a clear association between self-medication with OTC analgesics in schoolchildren and their mothers. It appears that maternal medicating behavior regarding OTC analgesics influences whether her child receives an OTC analgesic, particularly PCM, even when the child's pain is taken into consideration.

Our study did not find any association between maternal SRH, chronic pain, chronic disease, or daily medicine intake and the self-medication with OTC analgesics for her 6- to 11-year-old child. We found a weak association between reports of child recurrent pain and the child receiving OTC analgesics more often; however, this was not consistently significant.

### Relation to Previous Studies

The number of published works about child self-medication is small, so this makes the basis for comparison limited. However, our results are in accordance with previous studies showing an association between maternal and child self-medication with OTC medications.<sup>17,20,28</sup> We did not detect any influence of socioeconomic factors, as suggested by earlier studies, perhaps due to our limited study population. In 2003, Tobi et al<sup>15</sup> found a high parental education level to be associated with increased child OTC drug use. Correspondingly, Du and Knopf<sup>1</sup> showed more frequent child self-medication in families with well-educated mothers and high family income in Germany, whereas Holstein et al<sup>18</sup> found higher rates of medication for aches among children from lower socioeconomic groups. Two studies found no influence of parental socioeconomic status.<sup>4,17</sup>

Our findings concur with recent research indicating that parents' own health and medicating behavior influence the self-medication of their children.

**TABLE 1** Characteristics of the Study Population and Children's Use of OTC Analgesics and PCM ( $n = 131$ )

	Total	Child Given OTC Analgesics in Past 3 mo <i>n</i> (Valid Percent)	Pearson $\chi^2$ , <i>P</i>	Child Given PCM Every Second Month in Past Year <i>n</i> (Valid Percent)	Pearson $\chi^2$ , <i>P</i>
<b>Children</b>					
Total	131	59 (45)		29 (22)	
Girls	69	35 (51)	.17	17 (25)	.47
Boys	62	24 (39)		12 (19)	
Age 6–7 y	41	19 (46)	.81	9 (22)	.99
Age 8–9 y	46	19 (41)		10 (22)	
Age 10–11 y	44	21 (48)		10 (23)	
First born	62	30 (48)	.71	12 (19)	.72
Second born	47	19 (40)		11 (23)	
Third+ born	22	10 (46)		6 (27)	
Recurrent pains, child report	41	23 (56)	.09	13 (32)	.08
No recurrent pains, child report	90	36 (40)		16 (18)	
Recurrent pains, mother report	40	22 (55)	.13	16 (40)	.001
No recurrent pains, mother report	91	37 (41)		13 (14)	
Child with chronic disease	25	11 (44)	.88	10 (40)	.02
No chronic disease	103	47 (46)		19 (18)	
Missing	3				
Lowest quartile physical HRQoL <sup>a</sup>	36	17 (47)	.76	10 (28)	.34
Highest 3 quartiles physical HRQoL	95	42 (44)		19 (20)	
Lowest quartile psychosocial HRQoL	35	18 (51)	.38	9 (26)	.55
Highest 3 quartiles psychosocial HRQoL	96	41 (43)		20 (21)	
<b>Mothers</b>					
Age 31–37 y	27	9 (33)	.58	3 (11)	.33
Age 38–40 y	34	17 (50)		8 (24)	
Age 41–43 y	34	16 (47)		7 (21)	
Age 44–52 y	36	17 (47)		11 (31)	
Primary/secondary school	15	7 (47)	.64	3 (20)	.84
Short-cycle higher education/Bachelor	75	36 (48)		18 (24)	
Master, PhD, etc.	41	16 (39)		8 (20)	
SRH poor/fair/good <sup>b</sup>	35	16 (46)	.93	9 (26)	.55
SRH very good/excellent	96	43 (45)		20 (21)	
Chronic pains, current or previous	43	21 (49)	.62	12 (28)	.30
No chronic pains	86	38 (44)		17 (20)	
Missing	2				
Monthly use of analgesics	51	31 (61)	.005	17 (33)	.02
No monthly use of analgesics	79	28 (35)		12 (15)	
Missing	1				
Chronic disease	43	18 (42)	.57	11 (26)	.53
No chronic disease	87	41 (48)		18 (21)	
Missing	1				
Daily medicine intake	31	13 (42)	.66	8 (26)	.54
No daily medicine intake	97	45 (46)		20 (21)	
Missing	3				
<b>Family/Household</b>					
Rural	65	30 (46)	.80	15 (23)	.87
Urban	66	29 (44)		14 (22)	
Low income, <78 000 \$/year	43	19 (44)	.91	11 (26)	.36
Middle income, 78 000–105 000 \$/y	33	14 (42)		9 (27)	
High income, >105 000 \$/y	51	24 (47)		8 (16)	
Missing	4				

<sup>a</sup> HRQoL of the children was assessed from the child report of the Pediatric Quality of Life inventory.

<sup>b</sup> SRH of the mothers was assessed by a validated item from the Short Form-36 inventory.

Parents have shown to be the most important source of OTC medications for 11- to 13-year-old schoolchildren.<sup>29</sup> In 2012, Andersen et al<sup>2</sup> found that

children aged 2 to 17 years whose parents suffer from headaches receive more medicine for headaches, even when the child's symptom is

adjusted for. Parental attitudes and experience with medication seem to affect their willingness to administer medicine to their children,<sup>19,20</sup> and possibly for the



**TABLE 2** ORs and *P* Values for Associations Between Child Recurrent Pain, Maternal Health Factors, and Children's Use of OTC Analgesics

	Univariate		Multivariate (Background) <sup>a</sup>		Multivariate (Background+Health) <sup>b</sup>		Final Model <sup>c</sup>	
	OR (95% CI)	<i>P</i> Value	OR (95% CI)	<i>P</i> Value	OR (95% CI)	<i>P</i> Value	OR (95% CI)	<i>P</i> Value
Outcome 1: The child has been treated with analgesics within previous 3 mo (ANG-3 mo).								
Child recurrent pain, child report	1.92 (0.91–4.05)	.09	2.68 (1.11–6.50)	.03	1.71 (0.60–4.84)	.31	2.21 (0.88–5.53)	.09
Child recurrent pain, mother report	1.78 (0.84–3.78)	.13	2.13 (0.91–5.02)	.08	1.65 (0.59–4.61)	.34	2.11 (0.86–5.17)	.10
Mother SRH poor/satisfactory <sup>d</sup>	1.04 (0.48–2.26)	.93	0.86 (0.37–1.99)	.73	1.02 (0.37–2.80)	.97	0.94 (0.39–2.62)	.89
Mother chronic pains	1.21 (0.58–2.51)	.62	1.36 (0.59–3.12)	.48	0.99 (0.34–2.88)	.99	0.89 (0.36–2.21)	.80
Mother monthly use of analgesics	2.82 (1.37–5.84)	.005	3.24 (1.46–7.19)	.004	3.07 (1.26–7.47)	.01	3.00 (1.33–6.73)	.008
Mother chronic disease	0.81 (0.39–1.69)	.57	0.75 (0.34–1.65)	.47	0.64 (0.23–1.80)	.40	0.67 (0.29–1.55)	.35
Mother daily medicine intake	0.84 (0.37–1.89)	.67	0.81 (0.33–2.01)	.66	0.77 (0.25–2.41)	.66	0.64 (0.25–1.67)	.36
Outcome 2: The child has been treated with PCM at least every second month in the past year (PCM-year).								
Child recurrent pain, child report	2.15 (0.92–5.03)	.08	2.04 (0.73–5.68)	.17	0.65 (0.18–2.35)	.51	1.00 (0.31–3.21)	.99
Child recurrent pain, mother report	4.00 (1.69–9.48)	.002	7.12 (2.22–22.84)	.001	11.44 (2.53–51.82)	.002	7.02 (2.14–23.07)	.001
Mother SRH poor/satisfactory <sup>d</sup>	1.32 (0.53–3.25)	.55	1.18 (0.43–3.25)	.74	1.64 (0.45–5.99)	.46	0.83 (0.28–2.48)	.74
Mother chronic pains	1.57 (0.67–3.68)	.30	1.21 (0.46–3.17)	.70	0.28 (0.06–1.32)	.11	0.31 (0.08–1.19)	.09
Mother monthly use of analgesics	2.79 (1.20–6.51)	.02	2.66 (1.05–6.73)	.04	4.71 (1.33–16.62)	.02	2.54 (0.93–6.92)	.07
Mother chronic disease	1.32 (0.56–3.11)	.53	1.08 (0.42–2.78)	.88	0.98 (0.25–3.8)	.98	0.69 (0.23–2.02)	.49
Mother daily medicine intake	1.34 (0.52–3.44)	.54	1.02 (0.34–3.01)	.98	0.89 (0.21–3.77)	.88	1.00 (0.32–3.15)	.99

CI, confidence interval.

<sup>a</sup> Multivariate analysis adjusted for 7 background factors: child gender, child age, First/Second/Third+ born child, maternal age, maternal education level, place of residence, and household income.

<sup>b</sup> Multivariate analysis adjusted for the 7 background factors and the other health factors (child pain, mother SRH, mother chronic pains, mother use of analgesics, mother chronic disease).

<sup>c</sup> Final model: After BMR of health factors, when only the examined health factor and health factors significantly associated with the outcome are left in the model.

<sup>d</sup> SRH of the mothers was assessed by a validated item from the Short Form-36 inventory.

children to self-administrate OTC products in adolescence. A qualitative survey by Hatchette et al<sup>30</sup> concluded that maternal advice and medicating behavior affects the pain self-management in adolescents.

Interestingly, we did not find a correlation between child recurrent pains and use of OTC analgesics, as other studies have found.<sup>14</sup> This also may be explained by a relatively small study population. However, a survey has shown that although medication with analgesics among adolescents has increased in the past decades, the prevalence of self-reported pain is unchanged.<sup>31</sup> Thus, other factors may account for the increasing self-medication among children and adolescents.

### Limitations

The 2-question outcome of this study is simplistic; however, this design was chosen to maximize compliance and dedication of the participants, and

receive the most accurate information with a small population. Previous OTC medication studies have applied 1-question outcomes.<sup>6,17</sup>

Our limited sample size may result in associations between maternal health and child self-medication to remain undetected. Our population also meant we could not investigate the influence of paternal health. However, Danish research shows that in 90% of families, the mother is the main administrator of medicine to the children.<sup>20</sup> Correspondingly, most OTC medicine ads are targeted for women. Maternal influence might be of more importance than paternal.

The retrospective design means that our results might be influenced by recall bias. Previous medication studies have applied short report periods of 2 days or 1 week.<sup>1,17</sup> Our report period of 3 months and 1 year could lead to imprecise replies. However, this period was chosen to identify a long-term use of analgesics rather than the

specific use during a few randomly selected days.

The validity of self-reported medicine use is unknown. One study demonstrates a high agreement between adolescents' and mothers' reports of child medication for aches.<sup>32</sup> Further validation of PCM intake by measurements of urine concentrations was not performed, as it reflects PCM intake only of the previous day.

### Implications/Perspectives

Because parents are responsible for the self-medication of their children, it is important to understand what leads to the parent giving a drug or not, and to target parents risking inappropriate use of OTC analgesics. This article contributes to this understanding. It seems that mothers who react to pain by self-medicating with analgesics tend to treat their child the same way. Taking analgesics can be seen as a coping strategy to lessen the discomfort of pain.<sup>33</sup> Children adopt the coping

strategies of their parents, and self-medication behavior may be passed on within families. This socialization pathway explaining the association between parental health and child self-medication has previously been described.<sup>2,34</sup> Our results suggest that maternal illness, pain, or prescription medicine intake plays a smaller role in PCM use for children. Perhaps a mother's view of PCM affects the use for her child more than her own health does.

Because PCM is available OTC, the purchase is mainly controlled by package size and price, besides health information campaigns. However, it is important to facilitate the appropriate parental use of PCM for children to improve safety and efficacy of the drug. Parents should be informed about indications as well as risks, storage, and dosing.

When should a child receive PCM? Opinions are varied also among health care personnel.<sup>35</sup> PCM is considered a safe and effective treatment of fever and mild childhood pain, and has few risks associated with intermittent use. It should not be used to treat colds, coughs, sleep problems, or mood swings in children, as previous studies disclose.<sup>34</sup> Sometimes a child's recurrent pain is a sign of psychological issues that need attention. Functional pain is a well-known

phenomenon in children, where analgesics are of little benefit.<sup>36</sup> In other cases, analgesics may mask serious symptoms and thereby postpone treatment of an underlying disease. Persistent pain of unknown reason in a child should always be examined by a physician.<sup>35</sup>

Excessive PCM use involves risks of medicine-induced headache and hepatotoxicity. New research implies that PCM may affect the decreasing reproductive abilities of Danish men.<sup>37</sup> Additionally, PCM is the most frequently used drug in teenage suicide attempts, perhaps because it is well-known and accessible at home.<sup>29</sup> Therefore, it is relevant to look into the attitude of "Try giving PCM and see if it helps" that seems to exist in the population and perhaps among health care employees.

Debating use of OTC analgesics in the medical community and improving communication with parents about childhood pain management may affect and ensure the safety of child PCM use.<sup>7,35</sup> In this regard, health education programs, such as the US PROTECT initiative, to keep children safe from accidental overdoses are valuable.

## CONCLUSIONS

Maternal self-medication with OTC analgesics influences the use of OTC

analgesics, predominantly PCM, for her child, even when the child's frequency of pain is taken into account. Other maternal health parameters, such as maternal SRH, chronic pain, chronic disease, or daily medicine intake were of less importance to self-medication with PCM in our population of 6- to 11-year-old children.

To further investigate the self-medication with OTC analgesics for children, prospective studies documenting child pain and analgesic use are needed. Intervention studies implementing parental education might clarify how pain management campaigns targeted for parents affects child analgesic use. An investigation of OTC analgesic use among physicians, nurses, and pharmacists may show varying administration across countries or sections of the health care system. Finally, measuring PCM levels in blood or urine will give objective information about the extent of PCM exposure.

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## Association of Maternal Self-Medication and Over-the-Counter Analgesics for Children

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