

# Parental symptoms and children's use of medicine for headache: data reported by parents from five Nordic countries

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Received: 22 October 2010 / Revised: 10 May 2011 / Accepted: 21 July 2011 / Published online: 13 August 2011  
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## Abstract

**Objectives** To examine the association between parent's headache and symptom load and children's medicine use, and whether these associations are robust across countries and socio-demographic strata.

**Methods** The study population included random samples of children from age 2 to 17 in five Nordic countries (participation rate 67.6%,  $n = 10,317$ ). Outcome measure was child's medicine use for headache. Determinants were the mother's and father's headache and symptom load. Analyses were stratified by country, age group and socio-economic status.

**Results** The prevalence of children's medicine use varied across countries between 13.7 and 21.3%. Girls' medicine use for headache was associated with mother's headache (OR = 2.00), father's headache (OR = 1.85), mother's symptom load (OR = 1.84) and father's symptom load (OR = 1.48). Boys' medicine use was only associated with mothers' headache (OR = 1.68) and symptom load (OR = 1.51). Associations remained significant after adjustment for the child's headache and were robust across countries and socio-demographic strata.

**Conclusions** Parents' symptom experience seems to influence their children's medicine use over and above medicine use indicated by symptoms. Two potential explanations are suggested: a socialization pathway and/or a pathway through adverse living conditions.

**Keywords** Medicine use · Children · Parents · Headache · Pathways · Pharmacoepidemiology

## Introduction

Children and adolescents frequently use medicines for headache, a behaviour that is internationally widespread (Hansen et al. 2003). Use of medicines for headache may be an appropriate response to headache; however, in some instances, medicines are taken without presence of headache (Hansen et al. 2008; Andersen et al. 2009). It is important to know which factors influence young people's medicine use in order to establish an appropriate use of medicines in all age groups as early medicine use may track into adulthood (Andersen et al. 2009). Medicines for headache are potentially toxic (Sweetman and Martindale 2007): paracetamol is the most commonly used drug for self-poisoning among adolescents (Hawton et al. 2003) and overuse may even induce headache (Diener and Limmroth 2004). Previous research has shown that medicine use for pain among children and adolescents is sensitive to factors other than their health, e.g. socio-economic status of parents, belonging to an ethnic minority group, poor self-rated health and exposure to bullying (Holstein et al. 2004; Holstein and Hansen 2005; Holstein et al. 2008b; Due et al. 2007).

A few studies have suggested that parental factors affect children's medicine use. The socio-economic position of

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the parents influences school-age children's and adolescents' medicine use (Du and Knopf 2009; Holstein et al. 2004; Tobi et al. 2003), but whether other family-related factors are associated with children's medicine use has not been reported since the 1980s. A study by Maiman et al. (1986) indicated that mothers who perceived their family as being frequently troubled by health problems were more likely to keep and use over-the-counter medications for their children. Bush and Iannotti (1988) found strong correlations between the mother's and the child's concerns about, e.g., being ill, and the perceived vulnerability or severity of the illness. They concluded that mothers may have a strong influence on their children's health perceptions regarding medicine use. Allotey et al. (2004) showed that in addition to consideration for their children's health, the reduction of inconvenience to the parents of having a sick child led parents to give children pain-relieving medicines. Due to time demands, mothers may need to medicate their children to make them comfortable and mask their symptoms so they can attend school or day care (Vuckovic 1999). A study found that parents are the main source of supply of medicines for headache among 11- to 13-year-old children (Holstein et al. 2008a).

Previous studies have shown wide variation in children's medicine use for headache across countries, gender, age groups and socio-economic position (Hansen et al. 2003; Holstein et al. 2003; Chambers et al. 1997). The above-mentioned studies (Maiman et al. 1986; Bush and Iannotti 1988; Allotey et al. 2004) suggest that also parents' beliefs and concerns regarding health issues in the family may influence their children's medicine use, and one study suggest that parents' headache raise their awareness of their children's headache (Sasmaz et al. 2004), which might lead to the child's use of medicines. Still, we need to know how parents' health may influence their children's medicine use.

The aim of this study was to examine (1) whether children's medicine use for headache is associated with parents' headache and symptom load, and (2) whether these associations differ across countries, gender, age groups and socio-economic status (SES). We limit the analyses to the use of over-the-counter (OTC) medicines because use of such medicines relies on the family's decision.

## Methods

### Design and study population

We used data from the study 'Health and welfare among children and adolescents in the Nordic countries 1996' (Berntsson 2000; Köhler 2000; Nielsen et al. 2001; Halldórsson et al. 2000). The design is a cross-sectional postal

survey among children aged 2–17 from the five Nordic countries: Denmark, Finland, Iceland, Norway and Sweden. The sample was drawn from the national bureau of statistics in each of the five countries. The sample in Denmark did not include the Faroe Islands or Greenland, and the sample from Finland did not include the Swedish-speaking minority. The questionnaire was originally written in Swedish and translated into Danish, Finnish, Icelandic and Norwegian. The parents or the guardian, hereafter named the mother and the father, of the selected child were invited to answer the questionnaire, up to two reminders were sent. The overall participation rate was 67.6% ( $n = 10,317$ ). The national participation rates were as follows: Denmark, 68.6% ( $n = 2,169$ ); Finland, 67.8% ( $n = 2,034$ ); Iceland, 68.1% ( $n = 2,048$ ); Norway, 64.5% ( $n = 1,936$ ); and Sweden, 69.0% ( $n = 2,130$ ). The national research teams in Denmark, Finland, Norway and Sweden compared participating and non-participating respondents by means of register data on socio-demographic characteristics (Köhler 2000; Pedersen and Madsen 2002; Pedersen et al. 2005). The general conclusion from the non-response analysis was that families with few socio-economic resources had high rates of non-participation, i.e. there is a risk of selection bias in the findings.

Child's medicine use for headache was introduced in the analyses as the dependent variable, and parental headache and symptom load were used as independent variables. The mother or the father answered a question about the child's use of medicines for headache, purchased without prescription, during the last 4 weeks. Measures were dichotomized into yes and no. A recent validation study has shown strong agreement between parents' reports on their children's medicine use and 11- and 13-year-old children's self-reported medicine use (Andersen et al. 2007). Parental headache and symptom load were measured by the following items: 'Do you or your partner suffer from any or some of the following symptoms every week or every other week? ...stomach troubles, headache, sleeplessness, dizziness, back ache, loss of appetite, nervousness', with separate reporting for men and women. We want to study the impact of a more pronounced exposure, so we decided to dichotomize the response categories into 'no' + 'mild' versus 'moderate' + 'severe'. As relatively few respondents used the response category 'severe', we decided to combine 'moderate' + 'severe'. The dichotomized variables did not hide important differential effects of severe and moderate symptoms.

The seven items on parental symptoms were combined in a composite measure of each parent's symptom load, which counted 1 point for each symptom, range 0–7. Sensitivity analyses showed that the association between parents' symptoms and their child's medicine use was robust regardless of cut-point, and in order to obtain a

satisfying statistical power, we dichotomized this composite measure into low (0–1) and medium + high (2–7).

The analyses were controlled for a range of potential confounders associated with both the determinant and the outcome measure: country; age of the child categorized into pre-school children (2- to 6-year-olds), young school-age children (7- to 12-year-olds) and adolescents (13- to 17-year-olds); child's headache measured by the item 'Does the child suffer from any of the following complaints?... headache (no, yes)'; and SES measured by three separate questions about educational level, occupation and present employment. This information was recoded into the Nordic Socio Economic Indicator (Berntsson 2000), and each child was categorized by the highest-ranking parent. We excluded the category self-employed, which covers a wide range of people from owners of large-scale industries to owners of tiny farms and shops, i.e. it was not possible to fit this group into a hierarchy of social classes. As our analyses focus on the most exposed children, we keep children with background in the lowest third of SES separate. Finally, analyses were controlled for questionnaire respondent, categorized into mother, father and other, as this variable is related to the design of the data collection.

#### Statistical analyses

All analyses were stratified by gender of children. The logistic regression analyses only included participants with

complete data on the applied variables, which left 4,248 boys and 4,008 girls. In the second step, the analyses were stratified by country, age group and SES in order to see whether the associations between parental headache and symptom load and child's medicine use for headache had the same magnitude and direction in each stratum.

## Results

Table 1 displays basic information about the population. The prevalence of children's medicine use for headache was highest in Finland (21.3%) and lowest in Iceland (13.7%), whereas the prevalence of the children's symptom headache was much lower, on average 3.7%. There were only slight variations in the prevalence of parental headache across countries. However, the prevalence of mother's headache was considerably higher than father's, with mother's headache varying from 18.5% in Norway to 22.6% in Denmark and father's headache from 8.7% in Sweden to 11.4% in Denmark. The prevalence of medium + high symptom load showed great variations, among mothers from 12.9% in Denmark to 22.8% in Iceland, and among fathers from 8.2% in Denmark to 12.2% in Iceland (Table 1).

Table 2 shows that the association between girls' medicine use for headache and parental headache and symptom load was high and significant in models adjusted for

**Table 1** Prevalence of children's medicine use for headache and the applied independent variables by country

	Denmark <i>n</i> = 1,780 (%)	Finland <i>n</i> = 1,593 (%)	Iceland <i>n</i> = 1,572 (%)	Norway <i>n</i> = 1,415 (%)	Sweden <i>n</i> = 1,896 (%)	Total <i>n</i> = 8,256 (%)
Child's medicine use for headache	14.8	21.3	13.7	15.3	18.7	16.8
Child's headache	3.0	4.7	4.3	3.1	3.3	3.7
Mother's headache	22.6	20.3	21.4	18.5	19.8	20.6
Father's headache	11.4	9.9	8.8	9.3	8.7	9.6
Mother's medium + high symptom load	12.9	14.6	22.8	13.9	15.1	15.8
Father's medium + high symptom load	8.2	10.9	12.2	8.3	9.0	9.7
Girls	49.9	48.0	50.0	47.4	47.4	48.6
Boys	50.1	52.0	50.0	52.7	52.6	51.5
Age 2–6	34.3	31.3	35.2	32.9	33.6	33.3
Age 7–12	36.6	38.9	38.3	37.0	37.9	37.7
Age 13–18	29.1	30.8	26.5	30.1	28.5	29.0
High SES	67.8	60.7	66.7	78.5	64.6	67.3
Low SES	32.3	39.3	33.3	21.6	35.4	32.7
Respondent						
Mother	80.2	85.3	86.1	76.9	81.0	81.9
Father	12.9	9.1	8.0	17.1	12.7	11.9
Other	6.9	5.7	5.9	6.0	6.3	6.2

**Table 2** Odds ratio (OR) (95% confidence interval (CI)) for child's medicine use for headache by parental headache and symptom load

All countries	Boys <i>n</i> = 4,248		Girls <i>n</i> = 4,008	
	Model 1	Model 2	Model 1	Model 2
Mother's headache	<b>1.68 (1.36–2.06)</b>	<b>1.45 (1.17–1.81)</b>	<b>2.00 (1.65–2.44)</b>	<b>1.79 (1.46–2.21)</b>
Father's headache	<b>1.39 (1.04–1.85)</b>	1.24 (0.91–1.69)	<b>1.92 (1.49–2.46)</b>	<b>1.88 (1.44–2.44)</b>
Mother's symptom load	<b>1.51 (1.20–1.90)</b>	1.27 (0.99–1.62)	<b>1.84 (1.48–2.28)</b>	<b>1.61 (1.28–2.02)</b>
Father's symptom load	1.14 (0.86–1.53)	1.09 (0.80–1.49)	<b>1.48 (1.13–1.93)</b>	<b>1.41 (1.06–1.87)</b>

Estimates in *bold* are statistically significant,  $P < 0.05$

Model 1: adjusted for respondent, country, child's age group and SES

Model 2: adjusted for respondent, country, child's age group, SES and child's headache

respondent, country, child's age group and SES, e.g. odds for girls' medicine use doubled if the mother had a moderate to severe headache weekly or every other week compared with mothers with mild or no headache (OR = 2.00, CI 1.65–2.44). The associations attenuate slightly when child's headache was added to the statistical model and remained significant for girl's medicine use for headache. Among boys, mother's prevalence of headache was significantly associated with medicine use for headache, in models without adjustment for the boy's headache (OR = 1.68, CI 1.36–2.06), as well as with adjustment (OR = 1.45, CI 1.17–1.81). Mother's symptom load and father's prevalence of headache was associated with boy's medicine use in the model without adjustment for the boy's headache (OR = 1.51, CI 1.20–1.90 and OR = 1.39, CI 1.04–1.85).

Analyses stratified by country, age group and SES showed that the associations were robust across strata. The country-specific analyses mainly showed associations among the girls, except in Denmark and Norway where at least as many associations were significant among the boys. In three countries, Denmark, Finland and Iceland, the odds ratios (OR) for the associations between father's symptom load and the child's medicine use were insignificantly below 1 (data not shown). The age-stratified analyses showed associations between parental headache and symptom load, again primarily among the girls in all age groups (Table 3). The analyses stratified by SES were also mainly statistically significant among the girls. Parental headache was significantly associated with child's medicine use for headache in both higher and lower SES groups, whereas parental symptom load only showed significant associations in the higher SES groups (Table 4).

## Discussion

This paper has two main findings. Parental headache and parental symptom load are associated with children's and adolescents' use of medicine for headache even when the

child's headache is taken into account. These results are robust across the five Nordic countries, in age groups from 2 to 18, and in high and low SES strata.

The number of published studies in this area is very scarce, and therefore the opportunity to compare our findings with others is limited. However, in a general sense, our findings are in keeping with some prior studies that point in a similar direction. A survey study carried out by Osterweis et al. (1979) in the USA in the 1970s found that the family context, e.g. morbidity and medicine use within the family, was an important predictor of young people's medicine use. Hatchette et al. (2006) used qualitative interviews with dyads of mothers and adolescents and found a clear intergenerational transmission of information about pain and pain management. The study by Maiman et al. (1986) suggested that mother's health-related perceptions and habits are important for children's medicine use. A qualitative interview study by Hansen et al. (2008) shows that mothers teach children how to swallow and use medicines. The qualitative study by Allotey et al. (2004) suggests that children's medicine use is a response to processes and perceptions within the family. Finally, a survey study by Holstein et al. (2008a, b) showed that parents are by far the most important source of medications for 11- and 13-year-old adolescents.

In order to understand medicine use behaviour, it would be important also to examine the association between parent's medicine use and their children's medicine use. It is an important question how parents cope with headache and whether this influences the way in which they cope with children's headache. We do not have data to answer these questions, but it is in our opinion also important to examine how parents' health and health beliefs influence the way their children use medicine.

Our study is cross-sectional and does not include data that are sufficiently specific to explain the findings. The findings and the few relevant studies to which we refer suggest two potential lines of explanation for the association between parent's symptom experience and children's medicine use: a socialization pathway and a pathway

**Table 3** Odds ratio (OR) (95% confidence interval (CI)) for child’s medicine use for headache by parental headache and symptom load stratified by age group

All countries	Boys <i>n</i> = 4,248		Girls <i>n</i> = 4,008	
	Model 1	Model 2	Model 1	Model 2
Age 2–6	<i>n</i> = 1,432		<i>n</i> = 1,318	
Mother’s headache	<b>2.08 (1.16–3.74)</b>	<b>2.00 (1.10–3.64)</b>	1.70 (0.95–3.02)	1.63 (0.91–2.92)
Father’s headache	0.95 (0.33–2.68)	1.03 (0.36–2.93)	<b>2.65 (1.39–5.07)</b>	<b>2.76 (1.44–5.29)</b>
Mother’s symptom load	1.87 (0.98–3.54)	1.71 (0.88–3.33)	1.93 (1.04–3.57)	1.92 (1.03–3.57)
Father’s symptom load	0.95 (0.37–2.45)	0.91 (0.34–2.42)	1.43 (0.66–3.09)	1.48 (0.68–3.21)
Age 7–12	<i>n</i> = 1,579		<i>n</i> = 1,535	
Mother’s headache	<b>1.80 (1.31–2.46)</b>	<b>1.53 (1.09–2.14)</b>	<b>2.07 (1.54–2.78)</b>	<b>1.68 (1.23–2.31)</b>
Father’s headache	1.21 (0.77–1.89)	1.17 (0.72–1.88)	1.43 (0.97–2.11)	1.40 (0.93–2.10)
Mother’s symptom load	<b>1.53 (1.08–2.16)</b>	1.21 (0.82–1.77)	<b>1.84 (1.32–2.55)</b>	<b>1.49 (1.05–2.13)</b>
Father’s symptom load	1.10 (0.69–1.75)	1.05 (0.64–1.73)	1.50 (1.00–2.23)	1.43 (0.94–2.18)
Age 13–18	<i>n</i> = 1,237		<i>n</i> = 1,155	
Mother’s headache	<b>1.54 (1.13–2.09)</b>	1.33 (0.96–1.84)	<b>2.05 (1.51–2.77)</b>	<b>1.96 (1.43–2.69)</b>
Father’s headache	<b>1.68 (1.10–2.55)</b>	1.40 (0.89–2.19)	<b>2.34 (1.58–3.48)</b>	<b>2.22 (1.47–3.36)</b>
Mother’s symptom load	<b>1.47 (1.05–2.07)</b>	1.27 (0.89–1.83)	<b>1.87 (1.36–2.59)</b>	<b>1.66 (1.18–2.33)</b>
Father’s symptom load	1.29 (0.85–1.94)	1.23 (0.80–1.88)	1.50 (0.98–2.28)	1.36 (0.87–2.12)

Estimates in *bold* are statistically significant, *P* < 0.05

Model 1: adjusted for respondent, country and SES

Model 2: adjusted for respondent, country, SES and child’s headache

**Table 4** Odds ratio (OR) (95% confidence interval (CI)) for child’s medicine use for headache by parental headache and symptom load stratified by socio-economic status (SES)

All countries	Boys, high: <i>n</i> = 2,854, low: <i>n</i> = 1,394		Girls, high: <i>n</i> = 2,702, low: <i>n</i> = 1,306	
	Model 1	Model 2	Model 1	Model 2
Mother’s headache				
High SES	<b>1.76 (1.35–2.29)</b>	<b>1.54 (1.17–2.03)</b>	<b>2.14 (1.67–2.75)</b>	<b>1.92 (1.48–2.48)</b>
Low SES	<b>1.59 (1.14–2.23)</b>	1.36 (0.94–1.94)	<b>1.85 (1.34–2.56)</b>	<b>1.64 (1.17–2.30)</b>
Father’s headache				
High SES	<b>1.44 (1.00–2.08)</b>	1.42 (0.97–2.08)	<b>2.03 (1.49–2.78)</b>	<b>1.97 (1.43–2.73)</b>
Low SES	1.32 (0.82–2.12)	0.99 (0.58–1.69)	<b>1.71 (1.13–2.60)</b>	<b>1.70 (1.09–2.64)</b>
Mother’s symptom load				
High SES	<b>1.54 (1.15–2.07)</b>	1.34 (0.98–1.83)	<b>2.20 (1.67–2.91)</b>	<b>1.96 (1.46–2.62)</b>
Low SES	<b>1.52 (1.06–2.17)</b>	1.22 (0.82–1.80)	<b>1.48 (1.06–2.08)</b>	1.25 (0.87–1.79)
Father’s symptom load				
High SES	1.13 (0.76–1.67)	1.14 (0.76–1.71)	<b>1.70 (1.21–2.40)</b>	<b>1.50 (1.04–2.17)</b>
Low SES	1.20 (0.78–1.86)	1.07 (0.67–1.72)	1.20 (0.77–1.85)	1.28 (0.81–2.01)

Estimates in *bold* are statistically significant, *P* < 0.05

Model 1: adjusted for respondent, country and child’s age group

Model 2: adjusted for respondent, country, child’s age group and child’s headache

related to adverse living conditions. The socialization pathway underlines the importance of transmission of parents’ perceptions, knowledge and habits to their children. This transmission can be direct such as the supply of medicines (Holstein et al. 2008a, b), indirect through verbal and non-verbal learning (Hansen et al. 2008) or

communication of norms, attitudes and habits (Maiman et al. 1986; Hatchette et al. 2006) and may even reflect a general pattern of strategies for managing pain (Vuckovic 1999). The whole idea that school-age children are socialized into using medicines was proposed by Bush and Davidson in 1982 (referenced by Bush and Iannotti 1992).

These early studies also perceived children as reflecting and acting individuals, not entirely passive with parents and professionals making all decisions regarding their medicine use. We do not have data to support the above interpretations, but our finding of a significant association between parent's symptom load and children's medicine use is in accordance with this general idea of socialization within the family.

The living conditions pathway underlines the importance of adverse living conditions. The study by Allotey et al. (2004) suggests that family life is under so much pressure that some parents do not have the time or personal resources to manage their children's headache without resorting to medicine, and the study by Vuckovic (1999) found that time demands may force the mothers to use medicines as time-saving commodities. We have not investigated the adverse living conditions pathway, but the association between parent's symptoms and children's medicine use was present in both higher and lower SES groups.

Bush and Iannotti (1992) proposed a children's health belief model for the study of children's medicine use, a model that includes both of the above pathways. This model describes demographic (age, sex) and socio-economic factors as the basic determinants of medicine use and suggests that the pathway between the determinants and medicine use includes different aspects of socialization or readiness of the family to use medicines. They propose three important socialization issues: (1) cognitive/affective issues such as perceptions of control, risk taking, worries about illness and autonomy, (2) enabling factors such as MD visits and (3) family circumstances such as caretaker's motivation and perceived benefits of medicines. Our findings do not directly support the model but are in concordance with the idea of a cognitive/affective pathway and a caretaker perception pathway. We propose the use of such a model for further studies on medicine use among children and adolescents.

Only a few published studies involve data on both parents and their children. Therefore, this study was appropriate for answering the research questions. It included large random samples in five Nordic countries. The slightly skewed non-participation may induce selection bias. Unfortunately, the data does not provide any opportunity to investigate whether this selection bias influence our findings. The study may suffer from information bias, especially because the data on children's medicine use are parent-reported. A recent study showed that until the age of 13, parents seem to be the major source of medicine supply for their children (Holstein et al. 2008a, b). It is a potential limitation of the study that the parents answered the questionnaire on behalf of their teenage children. Children in the teens are fully capable of answering questionnaires

and they may even know more about own health and health behaviour than their parents. An important challenge in studies like this is residual confounding, i.e. variation in the outcome measure caused by unmeasured variables. In this study, we especially suspect that peer influences may be important explanatory factors among teenagers, but the study does not include data about peer influences. Furthermore, the question about the child's headache may be insufficient for confounder control because it does not have a specific time reference but only asks about headache at present.

The study only includes data on OTC medicines, and the conditions associated with use of prescription medicines may be different. The data were collected in 1996. Since we use the data for analytical purposes, and since the basic characteristics under study (parents' health status, children's medicine use) have not undergone substantial qualitative changes since then, we do not see any substantial problem attached to the time lag between data collection and analysis.

Our study included a wide age range. The above-proposed processes may not be equally relevant for pre-school children who are very dependent on their caretakers' perceptions and supply and young people for whom medicine use is a way to demonstrate autonomy from parents (Hansen et al. 2009). Therefore, it is necessary to focus the research on children's medicine use according to age group. Further, we need a range of methods to increase our insights into children's medicine use: qualitative studies to explore communication and decision processes within families, longitudinal studies to detect how decisions regarding medicine change through childhood and adulthood and quantitative survey studies to increase our insight into the socio-economic circumstances that influence medicine use.

**Conflict of interest** The authors declare that they have no competing interests.

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