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Observational study

The association between adolescent and parental use of non-prescription analgesics for headache and other somatic pain – A cross-sectional study

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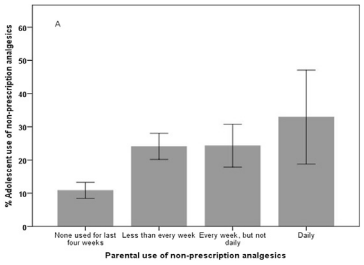
HIGHLIGHTS

- Headache was the main pain driving non-prescription analgesics use among adolescents.
- 34% of adolescents with headache used non-prescription analgesics versus 19% with other pain.
- Adjusting for pain, parental use of non-prescription analgesics predicted adolescent use.
- This parent–adolescent association was strongest for those least afflicted by pain.
- Parental prescription analgesics use did not predict adolescent use of non-prescriptives.

GRAPHICAL ABSTRACT



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ABSTRACT

Background and purpose: Over the last years, concern has been expressed about adolescents' possible liberal attitude towards – and use of – non-prescription analgesics. A high consumption of analgesics is unfortunate as it may lead to various harmful effects and worsening of headache. In order to address this challenge, it is necessary to achieve a more extensive knowledge about adolescent consumption. The main aim of this study was to examine the association between adolescent and parental use of non-prescription analgesics, taking into account headache as well as other somatic pain. The effects of parental prescription analgesics use was a secondary aim.

Methods: The study is based on data from two cross-sectional health studies conducted in 2005 and 2012 in Norway, including 646 adolescents and an accompanying parent. By using sample weights, the final weighted sample used in the analysis was 1326. Data was collected through postal questionnaires to parents and adolescents as well as parental telephone interviews.

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Questionnaires included questions on different pain locations and the pain for each location was graded according to how troubling the pain was. Medication data on prescription and non-prescription analgesics was from telephone interviews and was quantified based on the pattern over the past 4 weeks. Multivariate logistic regression models and complex samples analyses were used.

Results: 20% of adolescents were reported as using non-prescription analgesics during the previous 4 weeks. Girls were more often reported to use non-prescription analgesics than boys. Headache and all other somatic pain locations except back pain were reported more frequently among girls while boys more frequently reported back pain. There was a clear association between the use of non-prescription analgesics and headache with 34% of adolescents with headache using non-prescription analgesics versus 19% of adolescents with other somatic pain and 14% of adolescents not reporting pain. Among adolescents reporting headache, 9% were reported to use non-prescription analgesics daily or almost daily versus 3% and 2% among those reporting other somatic pain and reporting no pain respectively. In addition, parental use of non-prescription analgesics was a strong independent predictor of adolescent use (adjusted OR 1.69 for boys, 1.54 for girls). This relationship increased when the adolescents were less bothered by headache themselves.

Conclusion: Headache is the dominant medication-driving pain for non-prescription analgesics among adolescents but parental medication use of non-prescription analgesics also strongly influences adolescent use.

Implications: There is a need for health services to improve information to parents and adolescents about risks associated with use of analgesics and also to work on prophylactic strategies focusing on adolescents. Parents should be made aware that their medicine use strongly influences that of their children.

1. Introduction

Pain is common among adolescents [1,2], the most prevalent types of pain in these groups being headache, abdominal pain, leg pain, back pain [2,3], and menstrual pain [3]. An international survey of pain among adolescents showed monthly prevalence to be 54% for headache, 50% for stomach ache and 37% for backache [1]. Headache is also the third most important cause of disability worldwide [4], and Krogh and colleagues [5] found that headache reduces daily activity among adolescents by nine days per year on average.

Several studies show that adolescents have a high consumption of non-prescription analgesics, such as paracetamol and non-steroid anti-inflammatory drugs (NSAIDs) [6,7]. Non-prescription analgesics are suitable for reducing light to moderate pain, and are considered relatively safe. However, the use of these medicines is not without risk and excessive use may lead to adverse effects, toxicity and in some cases even death [8–10].

Analgesics are used by adolescents most commonly to reduce headache [6,11,12], and in many countries there seems to have been an increasing trend of using medicine for headache among adolescents from 1986 to 2010 [7]. However, it is also seen that some adolescents use non-prescription analgesics for other purposes, such as reducing nervousness or improving sleep [13,14]. Studies indicate that liberal attitudes towards use of non-prescription analgesics among adolescents are quite common [13,15], and that adolescents lack knowledge about potential risks and side-effects [16]. A systematic review of self-medication among adolescents showed that the prevalence for use of non-prescription analgesics in general ranged from about 40–95% with differences depending on condition addressed, gender and recall times [6]. Norwegian youth were among those with the highest prevalence of non-prescription analgesics use in this review [17].

Medicine use in adolescents has been associated with availability and accessibility to medicine at home, and with parental influence [13,16,18]. Adolescents report receiving information about non-prescription analgesics mainly through their parents and state that parents influence their consumption [13,16]. However, information about the relationship between adolescent and parental analgesics use is sparse, and there is a need for greater insight. This is important in a public health context as use of analgesics for headache in early life predicts use of analgesics for headache in adulthood [19], and using non-prescription analgesics may prevent the adolescents from learning other, more beneficial ways of coping with challenges in life [20].

It has previously, in studies of mother–child dyads, been suggested that pain-related behaviour, including medication use patterns, of mothers may influence medication use of children and adolesecents [21,22]. Furthermore, a large Scandinavian study shows that parental headache and general symptom load may influence the analgesics use pattern of their children regardless of the childrens' own pain [23]. However, this study did not examine, or control for, the association between parental medication use and that of their children.

The purpose of this study was, in a large, representative population, to examine whether there exists an association between adolescent and parental use of non-prescription analgesics, while controlling for other possible factors which may affect the adolescent use such as reported pain, gender, and education level of the parents. A secondary objective was to examine whether parental use also of prescribed analgesics affected adolescent use of non-prescription analgesics.

2. Material and methods

2.1. Design, participants and procedure

This study is based on data from a cross-sectional health survey; "Norway Living Conditions Survey" conducted by Statistics Norway (SSB) in 2005 and 2012. For both years, a sample of 10 000 adults was randomly drawn from the SSB demographic/population register. Data from the adolescents (age 13–15) were collected by contacting children of the adult participants [24,25]. In 2005, SSBs two-stage selection scheme was used when drawing the sample. This year, the whole country was divided into 109 geographical strata from which the participants were drawn [24]. In 2012, the selection was drawn from the whole country with a representative distribution of gender, age (16 years or older), and region [25]. Direct data as answered by the adolescents themselves, were collected through a postal questionnaire. Additional information concerning the adolescents was collected from the parents through the interview. Only the adolescents with a parent who had answered

the interview were included in the study [24,25]. Our sample therefore consisted of adolescents each with one accompanying parent. 674 adolescents were invited to answer the postal questionnaire in 2005, 428 responded. 466 were invited in 2012, and 229 responded. Thus, 657 parent child dyads were studied.

The interviews with the adults were performed by a combination of computer-assisted personal interviews and telephone interviews. Postal questionnaires to both the adults and the adolescents were sent by surface mail. They also had the opportunity to answer through web. In addition to interviews and postal questionnaires, information about age and education were collected from central registers [24,25].

2.2. Measures

2.2.1. Pain assessment

In order to assess headache as an independent variable, we used the question from the postal questionnaire to adolescents asking: "To what extent have you been troubled with the following problems?", with reply options on a scale of 1–4 where 1 = not bothered, 2 = little bothered, 3 = quite troubled and 4 = very troubled.

The question used to assess other somatic pain was also found in the postal questionnaire given to adolescents. The subjects answered the following question: "Have you over the past fourteen days been troubled by any of the following: neck pain, back pain upper part, back pain lower part, arm pain, shoulder pain, knee pain or foot pain?" Each type of pain had the same four reply options as the headache question.

Our preliminary results showed that headache was the quantitatively dominating pain with a prevalence of 60% of cases reporting "little bothered" or more for headache vs. 20% reporting "little bothered" or more for other somatic pains. In addition, headache was the main driver of analgesics consumption (34% of headache patients vs. 19% of other somatic pain patients used analgesics) and many headache patients also had other somatic pains (48%) whereas patients with other somatic pains less frequently had headache (32%). We therefore made three categorical groups as follows:

i) Headache with or without other somatic pains – all cases reporting that they were quite or very troubled by headache,
ii) Somatic pain without headache – all cases responding that they were little, quite or very troubled by any of the somatic pain locations given but reported no or little headache,
iii) No headache or pain – all remaining cases responding that they were not bothered by somatic pains and not or little bothered by headache.

2.2.2. Use of analgesics

Adolescent use of non-prescription analgesics (dependent variable) was assessed with two questions from the parental interview. The first question was "Has he/she taken non-prescription analgesics during the past four weeks?". The response options were "yes" or "no". The next question was "Did he/she take these medications daily or almost daily during the past four weeks?", also with the response options "yes" or "no". In the case of the parents' use of analgesics (independent variable), we used the question from the postal questionnaire to the adults; "How often have you taken the following medications over the past four weeks: Non-prescription analgesics? Prescription analgesics?" Responses were: "none used for the past four weeks", "less than every week", "every week, but not daily", and "daily".

2.2.3. Demographics/socioeconomic status among parents

The demographic variables included (as independent/explanatory variables) were the gender of the adolescent, as well as the gender and education level of the parent who had answered the questions about the adolescent. The education levels of the parents were used as a proxy of their socioeconomic status. The variable was categorized into three categories; low level of education (up to twelve years of education), medium level of education (13–14 years of education), and higher level of education (completed a college or university degree). The information about the education levels of the parents was collected through central registers [25]. Information about education level was missing for 23 of the participants, most of them immigrants, with associated lack of information in the public registers due to immigrant background. The educational variable was further dichotomized into "low and average education" and "higher education"; the cut-off set between medium and high level of education. Year of investigation was controlled for.

2.3. Statistical analyses

The analyses were conducted using the Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, version 22.0. Armonk, NY). For descriptive results two-sided column proportions tests were used with p-values set to <0.05 (Bonferroni corrections were done when appropriate). Multivariate logistic regression models were used to examine the association between the adolescent use of non-prescription analgesics (dependent variable) and the parental use of analgesics. Other known influencing factors such as headache, somatic pain, gender of the adolescents, gender and education levels of the parents, were also included in the analyses. Except for data presented in the descriptive table we have chosen to use a pooled dataset from 2005 and 2012 in our analyses since development over time was not the main focus of this study.

In order to compensate and adjust for the dropout and reduce possible bias, a unique system of weights were developed for the "Norway Living Condition Survey" for both years, that accounted for non-respondents among the adults by adjusting for gender, age, education and, family size [25]. Since weights were applied, the analyses were performed with the Complex Sample module in SPSS that adjusts the standard errors for the modified sample size [26]. Due to 11 responses missing in the variable of parental use of analgesics, we ended up with a study sample of 646 participants. With weighting, the total weighted sample was 1326.

Calculation of the Tolerance and Variance inflation factors (VIF) were used to check for high inter-correlation between the explanatory variables [27]. Tolerance and VIF showed no violation of multicollinearity assumptions. The relationship between the different types of pain was investigated using Pearson product-moment correlation coefficient. The results showed a positive correlation between somatic pain categories. Values ranged from 0.11 to 0.47 (weighted). Seeing that the majority of the different types of somatic, non-headache pain were strongly correlated, we chose to combine them and treat them as a whole.

3. Results

3.1. Prevalence and descriptive data

Table 1 shows the weighted prevalence of the dependent and explanatory variables included in the analyses for each year. The weighted sample size was 1326, consisting of 54% boys and 46% girls.

For pooled data, almost 20% of the adolescents had used non-prescription analgesics during the past four weeks according to the reporting parent. A higher prevalence of use of non-prescription

Table 1
Weighted prevalence (%) for each year for demographic, dependent and independent variables. Weighted $N = 1326$.

		2005		2012		Total	
		W-N	%	W-N	%	W-N	%
Adolescent gender	Boys	426_a	53.3	293_a	55.7	718	54.2
	Girls	373_a	46.7	233_a	44.3	606	45.8
Reporting parent gender	Men	390_a	48.8	215_b	40.9	605	45.7
	Women	409_a	51.2	311_b	59.1	719	54.3
Reporting parent level of education	Low	293_a	36.8	124_b	23.6	417	31.5
	Medium	286_a	35.8	183_a	34.8	469	35.4
	High	219_a	27.5	219_b	41.7	438	33.1
Adolescents used non-prescription analgesics (P)	No	639_a	80.1	447_b	85.0	1086	82.1
	Yes	159_a	19.9	79_b	15.0	238	17.9
Adolescents used non-prescription analgesics almost daily (P)	No	776_a	97.2	507_a	96.4	1283	96.9
	Yes	22_a	2.8	19_a	3.6	41	3.1
Parents used non-prescription analgesics past four weeks (P)	Not used	414_a	51.9	232_b	44.2	647	48.9
	< Weekly	250_a	31.3	209_b	39.7	459	34.7
	Weekly, <daily	103_a	12.9	69_a	13.2	172	13.0
	Daily	30_a	3.8	15_a	2.9	46	3.5
Parents used prescription analgesics past four weeks (P)	Not used	681_a	85.5	458_a	87.0	1139	86.1
	<Weekly	37_a	4.7	20_a	3.8	57	4.3
	Weekly,<daily	43_a	5.4	29_a	5.5	72	5.4
	Daily	35_a	4.4	19_a	3.7	55	4.1
Headache (A)	Not bothered	267_a	33.5	263_b	50.1	530	40.1
	Little bothered	398_a	49.9	202_b	38.3	599	45.3
	Quite troubled	97_a	12.2	51_a	9.6	148	11.2
	Very troubled	35_a	4.4	10_b	2.0	45	3.4
Neck pain (A)	Yes	39_a	4.9	47_b	9.1	86	6.6
Back pain, upper part (A)	Yes	21_a	2.6	23_a	4.4	44	3.3
Back pain, lower part (A)	Yes	58_a	7.3	28_a	5.3	86	6.5
Arm pain (A)	Yes	12_a	1.5	13_a	2.5	25	1.9
Shoulder pain (A)	Yes	30_a	3.8	19_a	3.5	49	3.7
Knee pain (A)	Yes	43_a	5.4	62_b	11.9	105	8.0
Foot pain (A)	Yes	36_a	4.6	29_a	5.7	66	5.0
Any somatic pain, dichotomous (A)	Yes	140_a	17.8	121_b	24.0	261	20.2

Note: Values in the same row and subtable not sharing the same subscript are significantly different at $p < .05$ in the two-sided test of equality for column proportions. Cells with no subscript are not included in the test. Tests assume equal variances.[1,2] Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction. W-N = weighted number; P = parental report; A = adolescent report.

analgesics was seen among girls (65%). Further, 69% of the adolescents using non-prescription analgesics had parents in the low/medium educational category. 60% of the adolescents reported having experienced headache. One fifth of the adolescents reported having some kind of other pain the same time period. Girls reported more frequent headache in all categories. All other somatic pain was also more prevalent in girls, except back pain, which was more common in boys. 50% of the parents reported using non-prescription analgesics, whereas about 15% used prescription analgesics. There was a significant difference in use of analgesics, both with and without prescription, between the reporting fathers and mothers, with mothers reporting a higher use. 2.6% of the adolescents had used analgesics requiring prescription. Because this proportion was so small, no further analyses was done on use of prescription analgesics by these adolescents.

A significant decrease in adolescent use of non-prescription analgesics was reported between 2005 and 2012. There was also a significant difference in the two years in the adolescent report of pain (Table 1). However, time trend was not a major focus of this study, and since the sample was of limited size it was decided to merge the data from the 2 years in the further analyses.

3.2. Use of analgesics and influence of parental analgesics use

Of adolescents reporting headache, about one third used non-prescription analgesics (Table 2). For those with other somatic pain but no headache, one fifth used non-prescription analgesics. There was a significantly higher proportion using non-prescription analgesics for headache than for other somatic pain. Other differences between pain categories were not significant (Table 2). The proportion using non-prescription analgesics almost daily was more than four times higher among those with headache than among those with neither headache nor somatic pain (Table 2).

The use of non-prescription analgesics among adolescents was significantly higher when their parents used non-prescription analgesics (Table 3). Fig. 1 shows a clearly increasing trend of adolescent use of non-prescription analgesics when parental use increased (Fig. 1a). A different pattern is seen in parental use of prescription analgesics, where the trend of adolescent use of non-prescription analgesics first increased but then decreased (Fig. 1b). Overall, there was no significant effect of parental use of prescription analgesics on non-prescription analgesics use of the adolescents (not shown). There was a significant relationship between adolescent use of non-prescriptive analgesics and being troubled by headache (Table 3). However, the relationship with their parent's use of non-prescriptive analgesics increased when the adolescents reported being little or not at all bothered by headache (Fig. 2). Among adolescents reporting being quite or very bothered by headache, the use of non-prescription analgesics first increased drastically compared to parents not using analgesics. However, when parental use of non-prescription analgesics became more frequent, these

Table 2
Weighted prevalence (%) for each headache/somatic pain category, dependent and independent variables. Weighted *N* = 1301.

		Adolescents' headache or somatic pain							
		Headache (A)		Somatic pain without headache (A)		No headache or pain (A)		Total	
		W-N	%	W-N	%	W-N	%	W-N	%
Adolescents used non-prescription analgesics (P)	No	127_a	65.7	143_b	81.1	798_b	85.6	1067	82.0
	Yes	66_a	34.3	33_b	18.9	134_b	14.4	234	18.0
Adolescents used non-prescription analgesics almost daily (P)	No	176_a	91.3	$170_{a,b}$	96.6	913_b	98.0	1260	96.8
	Yes	17_a	8.7	$6_{a,b}$	3.4	18_b	2.0	41	3.2

Note: Values in the same row and subtable not sharing the same subscript are significantly different at $p < .05$ in the two-sided test of equality for column proportions. Cells with no subscript are not included in the test. Tests assume equal variances.[1,2]. Tests are adjusted for all pairwise comparisons within a row of each innermost subtable using the Bonferroni correction. W-N = weighted number; P = parental report; A = adolescence report.

Table 3
Odds ratios of adolescent use of non-prescription analgesics with different explanatory variables. (Multivariate logistic regression) Stratified by gender.

	Boys OR (95% CI) W-N = 718	Girls OR (95% CI) W-N = 604
Year	0.93 (0.83–1.03)	0.98 (0.89–1.07)
Parent gender (ref = male)	1.23 (0.62–2.43)	2.19 (1.15–4.14) *
Level of education	0.47 (0.22–1.03)*1	1.38 (0.76–2.50)
Adolescent headache	2.7 (1.00–7.27)*	2.84 (1.49–5.43)**
Parent used non-prescription analgesics	1.69 (1.16–2.46)**	1.54 (1.09–2.18)*

W-N = Weighted number; OR = Odds ratio; CI = confidence intervals; * $p < 0.05$; ** $p < 0.01$; ***$p < 0.001$; *1 borderline significant ($p = 0.058$).

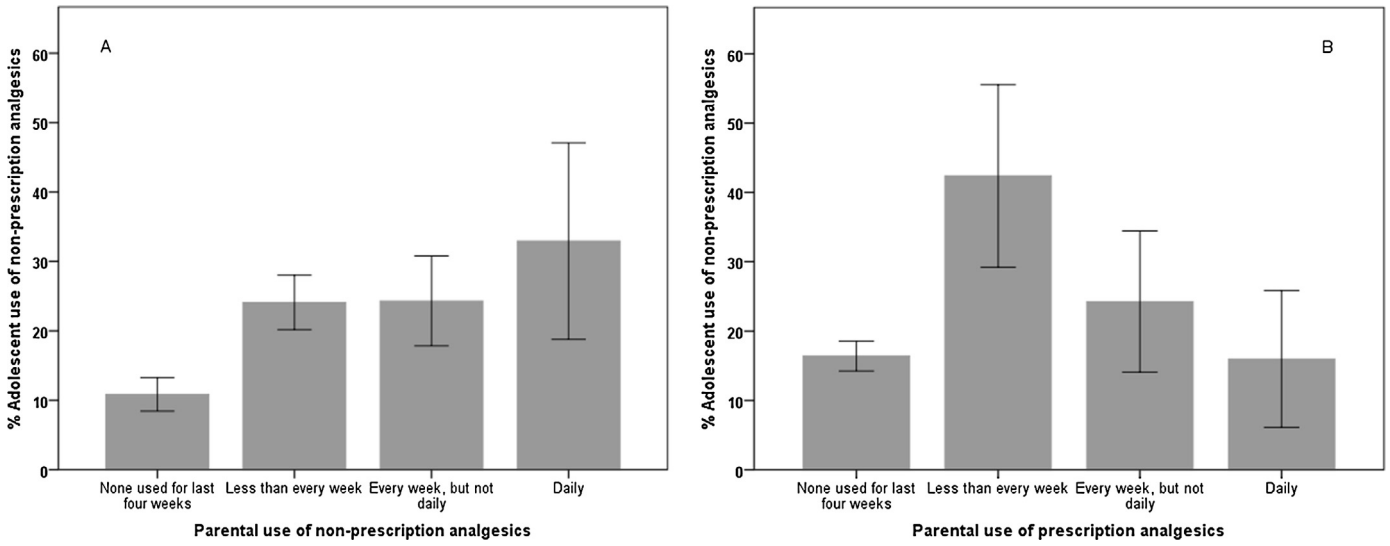

Fig. 1. Percentage with 95% confidence interval of adolescents who used non-prescription analgesics when parents used non-prescription analgesics (A) and prescription analgesics (B).

adolescents' use decreased despite reporting headache (Fig. 2). The association between the adolescent and parental use of non-prescription analgesics was only significant when the adolescents reported no or little headache (Table 4).

There was also a significant difference in what mothers and fathers reported regarding their daughters' use of non-prescription analgesics, with mothers reporting higher use (Table 3). This was not the case for boys. For boys, a borderline significant difference

Table 4
Odds ratios of adolescents' use of non-prescription analgesics with different explanatory variables. (Multivariate logistic regression) Stratified by adolescents having headache or not (ref.group for gender = male).

	HeadacheOR (95% CI) W-N = 193	No headacheOR (95% CI) W-N = 1129
Year	0.96 (0.89–1.03)	0.94 (0.80–1.10)
Adolescent gender	1.39 (0.85–2.26)	1.44 (0.51–4.08)
Parent gender	1.52 (0.90–2.55)	1.87 (0.71–4.93)
Level of education	0.80 (0.48–1.35)	1.13 (0.44–2.91)
Parent used non-prescription analgesics	1.45 (0.88–2.37)	1.63 (1.22–2.18)***

W-N = Weighted number; OR = Odds ratio; CI = confidence intervals; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

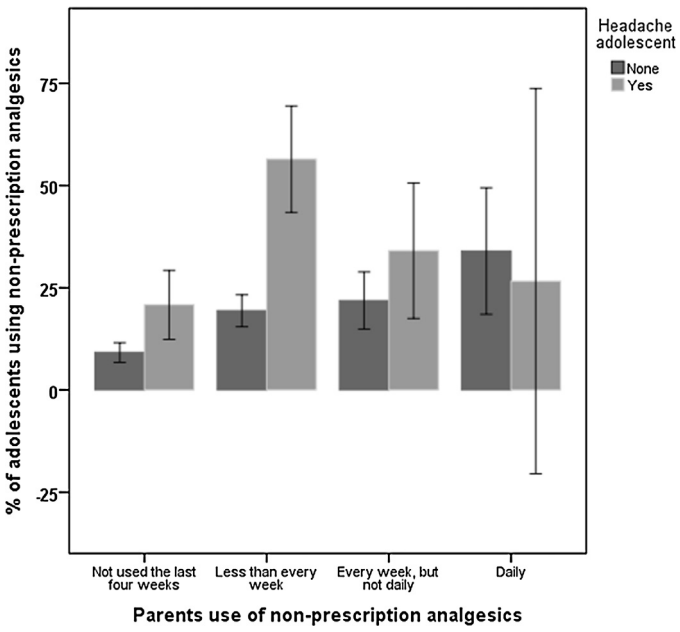

Fig. 2. Percentage with 95% confidence interval of adolescents who used non-prescription analgesics when parents used non-prescription analgesics, split by adolescents' headache.

was found in the education levels of the parents, where parents in the low/medium level reported a higher use of non-prescriptive analgesics (Table 3).

Somatic pain had no significant impact on the use of non-prescription analgesics (data not shown).

4. Discussion

Our most prominent finding was the significant association between adolescents' use of non-prescription analgesics and the reporting parents' use of non-prescription analgesics. This association was present even when adolescent headache was controlled for but was seen especially when the adolescents reported not being bothered or being little bothered by headache. The association was not significant for prescription analgesics.

4.1. Associations between parents and adolescents

Use of prescription analgesics presupposes that one has received a medical evaluation. Adults who are afflicted with severe pain and need prescription analgesics may be more reluctant and restrictive regarding the use of analgesics by their children. Hatchette et al. [21] found that mothers were aware that how they coped with pain would influence how their children coped. Parents who are in need of strong prescription analgesics may discourage their children from doing the same. On the other hand, those who use non-prescription analgesics may not be as aware. Use of non-prescription analgesics relies to a larger degree on one's own evaluation and attitude towards this kind of medication. It is therefore likely that the observed connection between adolescent and parental use of non-prescription analgesics can be explained by influence of parental attitudes to this medication. Previous studies have shown that parents influence adolescent consumption and that it is mostly through their parents that adolescents receive information about non-prescription analgesics [13,16,21]. A qualitative study of mothers impact on adolescents' perception of pain and use of analgesics has shown that mothers' attitudes, knowledge and practices largely transfer to their children [21]. Another Danish study showed a correlation between mothers' self-medication and their children's (6–11 years) use of non-prescription analgesics even when controlling for pain [22]. Additionally, other studies have pointed out that adults' knowledge of the potential harmful effects of non-prescription analgesics is deficient [28–30]. This may mean that the knowledge transmitted to adolescents is inadequate and could lead to a risky consumption.

Our study shows that the use of non-prescription analgesics has a stronger association with headache than other somatic pain. Several other studies have also found headache to be the most prevalent reason for use of analgesics [11,12,31]. Here, the association between adolescent and parental use of non-prescription analgesics was strongest when the adolescents reported not being particularly bothered by headache. This could imply that parental attitudes influence mainly the threshold for taking analgesics and that if the headache is more troublesome or frequent, it may override parental attitudes. The results show that some adolescents who did not report headache or pain still used non-prescription analgesics. This strengthens the interpretation that it is the parents' own assessment and attitudes towards non-prescription analgesics that are transferred to adolescents and affect their use.

We have no clear explanation for the gender differences of parental reporting found in this study. It has been demonstrated that mothers' use of non-prescription analgesics is significantly associated with their children's self-medication of non-prescription analgesics [22]. This could mean that mothers have better insight into their children's medication use than fathers do, which may lead to a gap between mothers and fathers reporting. The specifics around this need further investigation.

Non-prescription analgesics, if used correctly, may reduce suffering due to pain, but also carry risks of side effects and, not least, risks of worsening of headache with improper use – so-called medication-overuse headache. Our results, which suggest a direct association between parental analgesics use and that of their adolescent children, thus emphasize the need for further studies on this association as a risk factor for medication-overuse headache and analgesic medication overuse in general.

4.2. Prevalence

The present study shows a significantly lower prevalence (20%) in the use of non-prescription analgesics compared to previous studies. A study from 2010 showed that approximately 50% of 15-year-olds had used non-prescription analgesics against headaches in the past month [14], while about 30% had used it for abdominal pain. In another study, 60% had used such medicine in the past month [20]. In these studies, the use of medicines was self-reported. The discrepancy could thus stem from the fact that the use of analgesics in our study was reported by the adolescents' parents, and not by the adolescents themselves, as in other studies. That parents have reported their adolescents' consumption in our study, may suggest that parents are not fully aware of the adolescents' consumption. The real consumption may be higher. As our results show a correlation between adolescent and parental use, the real association may thus be even stronger.

We saw a clear gender difference in the use of analgesics. The prevalence was higher for both girls and reporting mothers. This is consistent with several previous studies [1,7]. In a study of gender differences in the use of analgesics, the authors discovered that some of the gender differences are explained by a higher frequency of pain conditions in women, but that there is still a significant difference in use that remains to be explained [31]. Higher consumption of prescription analgesics among those with lower education, as we found in our study, was also found in Holstein and colleagues' study of social class variation in medicine use among adolescents [32]. On the other hand, other studies have found the

converse, i.e. that those with low education use analgesics to a lesser extent [31,33].

The reduction in use of non-prescription analgesics from 2005 to 2012 seen in our study must be interpreted with caution as this was not a main focus here, we pooled the two data collection years for the main analyses, and other studies generally indicate an increase [7,13,15,17,34–36]. However, we have previously found a decline in the use of non-prescription analgesics among adults in Norway from 1998 to 2012 [37].

4.3. Strengths and limitations

A strength of this study was that the survey is representative for the Norwegian population by covering a large and diverse demographic area [24,25]. Using the weighting system may also be considered a strength as it reduces the risk of having an unrepresentative sample due to low or skewed recruitment [26,38]. Further, the uniqueness of this dataset is that we have information from both adolescent and parental medicine consumption, providing us the opportunity to study this correlation.

Using a cross-sectional study design has the limitations that it is not possible to say anything about causality [39]. Using cross-sectional questionnaires as opposed to prospective diaries also involves a risk of information bias [40]. Another limitation is that the information on the adolescent's use of analgesics is reported by one of the adolescent's parents and not by the adolescent themselves. Studies [15,21] show that some adolescents use analgesics without informing their parents, which may in this study lead to an underestimation of medicine use. However, there are also several studies suggesting that adolescents primarily obtain non-prescription analgesics at home [13,18], which makes it likely that parents have a certain insight into the consumption. The adolescents here were 13–15 years old – younger children may be even more influenced by their parents' behaviour and attitudes towards analgesics, older adolescents perhaps less so.

There was a slight difference in wording in the headache question between the two data collection years, however, comparison of the association between pain and analgesics use should be valid. Regarding other somatic pain, the study is also limited by the fact that there are no questions about stomach pain which is one of the main reasons why especially girls with menstrual pain use non-prescription analgesics [14]. Such pain may therefore be underreported here.

There was a significant difference in levels of education with an increase in participants with higher education from 2005 to 2012. SSB has reported that there has been an overrepresentation of highly educated participants in the living conditions surveys in recent years [25]. This may be related to the level of education generally rising in Norway [41], or a tendency that more resourced people respond to such surveys to a larger degree. The weighting system is designed to adjust for this skewness [38].

5. Conclusion

We have demonstrated that headache is the main driver of non-prescription analgesics use by adolescents but also that there is a significant association between parental use of non-prescription analgesics and that of their adolescent children. Adolescents use more non-prescription analgesics if their parents use them, even when adjusting for the presence of child or parental pain.

6. Implications

These findings imply that it is important that parents are aware that their medicine use strongly influences that of their children. Furthermore, the findings underline the importance of health services improving information about this association to parents and adolescents and also working on prophylactic strategies focusing on adolescents with pain in general and headache in particular. Schools and school health services may also have a role in this.

Ethical issues

The "Norway Living Condition Survey" of 2005 and 2012 was approved by the Data Protection Officer of Statistics Norway. Participation was by written informed consent and all analyses were done on anonymized data. For adolescents, parental consent was required [24,25]. Permission to withdraw data from Statistics Norway living conditions surveys 2005 and 2012 for this study was given by Norwegian Social Science Data Service (NSD).

Conflict of interests

The authors report no conflict of interests.

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