

# Medicine use and recurrent complaints among 15-years-old adolescents in Tuscany

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## Abstract

**Background.** The use of medicines to treat common complaints, such as headache, stomachache, difficulty in getting to sleep and nervousness, is widespread among adolescents, and is increasing. The aim of this survey was to estimate the prevalence of recurrent specific complaints among 15-year-old adolescents in Tuscany over three years (2006, 2010 and 2014) and that of medicine use to treat these complaints among boys and girls.

**Methods.** The present study is based on data from the Tuscan HBSC studies at three time points (2006, 2010 and 2014), which involved 2830 adolescents, aged 15 years old (1395 boys and 1435 girls).

**Results.** Overall, the data confirm that adolescents who suffer from recurrent complaints are more likely to use medicines. The prevalence rates of all complaints were higher in girls than in boys in the three years considered. Over the whole period, headache, stomachache and difficulty in getting to sleep increased in girls, while boys displayed significant decrease in nervousness and stomachache.

**Conclusion.** Our findings underline the fact that the use of medicines in adolescence is a public health concern and constitutes an emerging issue that needs greater attention and investigation on the part of scientific research.

## Key words

- medicine use
- adolescents
- recurrent complaints

## INTRODUCTION

The use of medicines to treat common complaints, such as headache, stomachache, difficulties in getting to sleep and nervousness, is widespread among adolescents. Several studies have found that medicine use is increasing, and have noted differences regarding age, gender and the types of medicines taken [1-5].

Overall, the use of medicine and the prevalence of frequent complaints are much higher among girls than boys [6-8]. Studies have shown an increasing use of medicine for headache and stomachache in girls [1, 2, 5, 8] and a decreasing use of medicines for nervousness and getting to sleep among boys [2, 5].

This behavior is supported by the greater accessibility and availability of medicines, changes in pharmaceutical regulations and the attitude of parents, who are the primary source of medicines [1, 5, 6]. Moreover, Andersen *et al.* [9] suggest that the use of medicines in adolescence continues into adulthood, underlining the need for proper use among adolescents. Adolescence has been identified by the World Health Organization

(WHO) as the age from 10 to 19 years, and is a key period of human growth [10].

As adolescents have poor knowledge of medicines, it seems important, from a public health point of view, to instruct them in proper medicine use and to study trends in medicine use in target groups [1, 7, 9].

Although in-country studies have evaluated such trends, the results are difficult to compare, owing to differences in study populations, data collection and measurements [1]. The international Health Behaviour in School-aged Children (HBSC) study, which is based on a unified methodology and covers European and North American countries, is a unique tool for collecting data on medicine use among adolescents [6].

The aim of the present survey was to estimate the prevalence of recurrent specific complaints, headache, stomachache, difficulties in getting to sleep and nervousness, among 15-year-old adolescents in Tuscany over three years (2006, 2010 and 2014) and that of medicine use to treat these specific symptoms among boys and girls.

## METHODS

### Study design and population

The data presented in this study were taken from HBSC surveys conducted in Tuscany over three years (2006, 2010 and 2014). The aims and theoretical framework of the international and Italian studies are described in detail [11-13].

The methods used to gather these data are described in detail elsewhere [11, 12].

Parental consent to participation in the survey was required. The Ethics Committee of the National Institute of Health (Comitato Etico dell'Istituto Superiore di Sanità), which approved the protocol, agreed to the use of an opt-out consent form, which implied that a child would be included by default unless his or her parents chose to "opt-out" by explicitly refusing consent. Data collection was anonymous and the demographic information collected (gender, year and month of birth, nationality, nationality of parents) does not permit identification of the individual adolescent. HBSC data are collected every fourth year on children aged 11, 13 and 15 out of a random sample of schools (also known as cluster sampling).

The HBSC study uses an anonymous self-administered questionnaire, which complies with international standards and is distributed in schools [13]. All member countries are involved in a continuous process of development and validation of the questionnaire. Several studies on many topics have demonstrated the validity of the questionnaire.

### Sample

Identical protocols, in terms of target groups, sampling and data collection, were used in all surveys. Systematic cluster sampling (schools), stratified by administrative district, was applied in each of the three waves from which the sample was drawn. Only 15-year-old adolescents (1175 in 2006, 901 in 2010, 754 in 2014) were included in this study, as adolescents of this age are more independent in their use of medicines. The distribution of participants, in terms of age and sex, was similar in all 3 surveys; additional details of the Italian HBSC study can be found elsewhere [12, 13].

### Instrument and variables

An anonymous, structured questionnaire was administered in classrooms by trained personnel.

### Symptoms

The frequency of the symptoms considered (headache, stomachache, difficulties in getting to sleep and nervousness) was measured on a scale that ranged from almost "every day" to "rarely or never". Each symptom was dichotomized as "recurrent", if occurring at least weekly, and "not recurrent" otherwise.

### Medicine use

We considered only medications used to treat specific symptoms (e.g. headache and medicines for headache). The scale used to measure these value was: "yes, once", "yes, more than once" and "no". This scale was dichotomized into "yes" and "no". We have considered as cat-

egory "Yes" the cumulative responses "Yes, once" and "Yes, more than once", as category "No", otherwise.

### Statistical analysis

To compare proportions between two or more groups, we used the chi-square test. In case of more than two groups, subsequently, in the case of a significant difference, we applied Bonferroni's correction to calculate the p-value for multiple comparisons. A chi-square test for trend was implemented in order to estimate time trend analysis for the prevalence of recurrent complaints. To estimate the OR (IC 95%), we used two different Logistic Regression's models: one for each time period (2006, 2010, 2014) and "All year" and one for Trend (2006-2010, 2010-2014, 2006-2014). In both cases we stratified the analysis for gender and we used the values "no recurrent" for symptom variables, "no" for medicine variables and the lowest level for time period (2006 and 2010) as the reference category.

In the first model, we used "use of medicine" (yes or not) as dependent variable and "status of complaints" (no recurrent or recurrent) as independent variable. In the second model we have the same dependent variable and as independent variable the year of survey, selecting only the subjects with recurrent complaints. The odds represents the constant effect of a predictor X, on the likelihood that one outcome will occur.

SPSS software, version 20.0, was used to carry out all statistical analyses. For all analyses, a statistical significance level of 5% was used.

## RESULTS

The survey evaluated four specific complaints – headache, stomachache, difficulty in getting to sleep and nervousness – among Tuscan boys and girls over three time-periods (2006, 2010, 2014). Overall, the number of respondents was almost equivalent between girls and boys, with a slight prevalence of girls in 2006 (602 females vs 571 males) and 2014 (398 females vs 356 males).

A progressive reduction in the numbers of respondents over the whole period 2006-2014 was observed for both genders (Table 1), the causes of which will be investigated in the next HBSC Italian survey.

Differences by gender are shown in Table 1 as prevalence rates of each recurrent complaint considered. In each survey, girls systematically displayed higher prevalence rates of all complaints than boys, with statistically significant differences between the genders.

For example, in 2006, only 29.3% of boys reported suffering from headache, as opposed to 54.6% of girls (a statistically significant difference of about 25 percentage points;  $p < 0.01$ ). In the same year, 32.6% of girls stated that they suffered from stomachache, as against 21.6% of males (a difference of about 25 percentage points;  $p < 0.01$ ), and again, about 27% of girls reported having difficulty in getting to sleep, versus 20% of males (a difference of about 7 percentage points;  $p < 0.01$ ), the smallest difference between the genders. Finally, the prevalence of nervousness in the same year was higher among females than males (a difference of about 16 percentage points,  $p < 0.01$ ).

**Table 1**  
Number of study subjects and prevalence of recurrent complaints among 15-year-old adolescents by gender and survey: 2006, 2010 and 2014 in Tuscany

2006							
Gender	Boys		Girls		Total		p
	N	%	N	%	N	%	
Total subjects	571	48.7	602	51.3	1173	100	>0.05
Headache	167	29.3	328	54.6	495	42.2	<0.01
Stomachache	123	21.6 <sup>a</sup>	195	32.6 <sup>b</sup>	318	27.2	<0.01
Difficult in get. sleep	115	20.1	160	26.6 <sup>c</sup>	275	23.5 <sup>d</sup>	<0.01
Nervousness	338	59.5	455	75.8	794	67.9	<0.01
2010							
Gender	Boys		Girls		Total		p
	N	%	N	%	N	%	
Total subjects	468	51.9	433	48.1	901	100	>0.05
Headache	140	30.1	244	56.5	384	42.8	<0.01
Stomachache	95	20.6	179	41.5	274	30.7	<0.01
Difficult in get. sleep	95	20.4	144	33.3	239	26.6	<0.01
Nervousness	262	56.5	321	74.3	583	65.1	<0.01
2014							
Gender	Boys		Girls		Total		p
	N	%	N	%	N	%	
Total subjects	356	47.2	398	52.8	754	100	>0.05
Headache	97	27.5	244	61.9	341	45.6	<0.01
Stomachache	52	14.7 <sup>a</sup>	153	38.8 <sup>b</sup>	205	27.4	<0.01
Difficult in get. sleep	84	23.8	138	35.0 <sup>c</sup>	222	29.7 <sup>d</sup>	<0.01
Nervousness	185	52.4	298	75.6	483	64.7	<0.01

<sup>a, b, c, d</sup> Bonferroni's correction. In each complaint, where we see the same index, this means that there is a significant difference between those groups in multiple comparisons =  $p < 0.05$ .  
Chi-square:  $p < 0.05$ .

From 2006 to 2014, the time trend analysis showed a progressive, albeit moderate, increase in headache in girls (from 54.6% in 2006 to 56.5% in 2010 to 61.9% in 2014 [ $p = 0.025$ ]), but not in boys (29.3% in 2006, 30.1% in 2010, 27.5 % in 2014) (analysis was performed, but the p-values are not showed).

Concerning stomachache, the data reveal a marked decrease in boys, especially between 2006 and 2014 (from 21.6% to 14.7%,  $p = 0.015$ ) and a considerable increase in girls: from 32.6% in 2006 to 41.5% in 2010 to 38.8% in 2014,  $p = 0.024$  (Table 1).

In each of the three years, girls systematically displayed higher prevalence rates of recurrent complaints than boys. Over the whole period, the prevalence of nervousness remained fairly constant among girls (2006 = 75.8%; 2010 = 74.3%; 2014 = 75.6%), while significant decrease was observed in boys (2006 = 59.5%; 2010 = 56.5%; 2014 = 52.4%, [ $p = 0.035$ ]).

Finally, the complaint "stomachache" showed a statistically significant trend over the whole study period

among both girls ( $p = 0.01$ ) and boys ( $p = 0.01$ ). The trend is characterized by an increase for girls and decrease for boys.

Difficulty in getting to sleep displayed a significant increase among girls between 2006 and 2014 ( $p = 0.004$ ).

The prevalence and odds ratio (95% CI) of medicine use for the symptoms analyzed among 15-year-old adolescents with recurrent complaints, by gender, in 2006, 2010 and 2014 are shown in Table 2.

In both boys and girls, and in all years, the risk (OR) of medicine use was about four/five times greater among those who suffered from headache than those who did not. Similarly, the probability of taking medicine to treat stomachache was about three times greater among both boys and girls who suffered from stomachache than among those who did not.

With regard to difficulty in getting to sleep and nervousness, unlike the other symptoms, the use of medicine differed markedly between boys and girls. In all years, the risk of medicine use was about four times greater among boys with difficulty in getting to sleep than among boys who did not have this problem. Among girls, however, the risk of taking medicine in order to get to sleep was about nine times greater among those with this problem than among those who did not have difficulty getting to sleep. Similarly, in all years, boys who complained of nervousness were about four times more likely to take medicine to treat this complaint than boys who did not suffer from this complaint. Among girls, however, the probability was about ten higher.

Analysis of the trend in medicine use in the periods 2006-2010, 2010-2014 and 2006-2014 did not reveal a major increase among boys, except for the period 2006-2010, in which a 4.44-fold increase in the odds of medicine use for difficulties in getting to sleep was recorded. Among girls, however, the probability of medicine use for headache and nervousness increased by 1.45 times and 1.73 times, respectively, in 2010-2014 and 2006-2014.

The complaint for which most respondents used pharmaceutical drugs was headache (60.5%), with an increase, albeit not statistically significant, of five percentage points from 2010 to 2014. Nevertheless, the highest ORs were observed with regard to difficulty in getting to sleep; those who suffered from this complaint were about six times more likely to treat the problem with drugs than those who did not have this difficulty. From 2006 to 2010, this value rose, but subsequently declined in 2014 (3.87). This trend was more marked in girls than in boys. Moreover, a significant rising trend was seen in the number of girls suffering from insomnia between 2006 and 2010 (4.44), with the probability of taking pharmaceutical drugs to treat this complaint being four times higher in 2010 than in 2006.

**DISCUSSION**

The use of medicines to treat common complaints, such as headache, stomachache, difficulty in getting to sleep and nervousness, is widespread among adolescents and is increasing [1-4, 14]. Adolescence is a key period in human growth and health habits acquired in this period may be carried over into adulthood. Consequently, adolescents constitute a strategic target group

from a public point of view [10, 15].

The aim of our survey was to estimate the prevalence of recurrent specific complaints – headache, stomachache, difficulty in getting to sleep and nervousness ± among 15-year-old adolescents and of medicine use to treat these complaints among boys and girls in Tuscany over three years (2006, 2010 and 2014).

Overall, the data revealed that girls displayed higher prevalence rates of all these complaints than boys over the three years (2006, 2010 and 2014), in accordance with other studies showing that gender differences increased with age [6, 7, 16-18]. Girls showed an increase in headache, stomachache and difficulty in getting to sleep, while boys displayed a significant decrease in nervousness and stomachache over the whole period.

As reported by other studies [1, 2, 7-9, 17, 18], the most common complaint for which adolescents use pharmaceutical remedies is headache. In our study, adolescents who suffered from headache were four/five times more likely to use medicines than those without headache, with no substantial differences between boys and girls. However, our data did not completely agree with those of other studies. Indeed, a study conducted in 20 countries [1] found higher prevalence of

the use of headache remedies among girls than boys, while another study reported a decline among girls between 1998 and 2010 [5]. Moreover, Andersen *et al.* [2] found an increase among girls aged 11- 15 years. The probability of using medicine to treat stomachache was three times higher among boys and girls who suffered from this complaint than among those who did not. Other studies have reported a greater use of stomachache remedies among girls than among boys, increasing with age [2, 5, 6, 8]. This difference could be due to menstruation, though no specific information on the type of stomachache is available [2, 5]. Only one study has reported a more likely use of medicine for stomachache among boys than girls [7]. Additionally, the higher probability of using medicines to treat pain in adolescents with recurrent pain than those without has been reported in other previous studies [6, 7, 19, 20]

In our survey, significant gender differences were seen in the use of medicines to treat sleep difficulties and nervousness. The data revealed that, in all years, girls with difficulty in getting to sleep were nine times more likely to use medicines than girls without this problem, while among boys the use of medicines was only four times greater. The same pattern emerged with regard

**Table 2**

The prevalence and odds ratio (95% CI) of medicine use for specific symptoms among 15-years-old adolescents, with recurrent complaints (in case of Trend), by gender and survey: 2006, 2010 and 2014

	2006			2010			2014			Trend 2006- 2010	Trend 2010- 2014	Trend 2006- 2014
	%	N	OR (95% CI)	%	N	OR (95% CI)	%	N	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
<b>Boys</b>												
Headache	53.6	89	<b>3.45</b> (2.36-5.03)	55.1	76	<b>4.79</b> (3.12-7.37)	50.5	48	<b>4.54</b> (2.72-7.57)	1.06 (0.67-1.67)	0.83 (0.49-1.41)	0.84 (0.53-1.46)
Stomachache	28.5	35	<b>2.21</b> (1.38-3.53)	31.2	29	<b>3.24</b> (1.89-5.56)	26.9	14	<b>2.86</b> (1.41-5.81)	1.14 (0.63-2.05)	0.81 (0.38-1.73)	0.93 (0.45-1.92)
Difficult in get. sleep	2.6	3	2.40 (0.56-10.17)	10.6	10	<b>5.36</b> (2.05-13.99)	8.3	7	<b>3.36</b> (1.14-9.89)	<b>4.44</b> (1.19-16.65)	0.76 (0.28-2.11)	3.39 (0.85-13.54)
Nervousness	4.1	14	<b>9.81</b> (1.28-75.12)	5.4	14	1.86 (0.70-4.93)	3.8	7	2.16 (0.55-8.50)	1.32 (0.62-2.81)	0.70 (0.28-1.76)	0.92 (0.36-2.31)
<b>Girls</b>												
Headache	64.9	213	<b>4.03</b> (2.86-5.67)	59.0	144	<b>2.97</b> (2.00-4.43)	67.6	163	<b>4.68</b> (3.01-7.27)	0.78 (0.55-1.09)	<b>1.45</b> (1.01-2.10)	1.13 (0.79-1.61)
Stomachache	50.5	98	<b>2.47</b> (1.74-3.53)	42.5	76	<b>2.11</b> (1.40-3.18)	51.7	78	<b>3.26</b> (2.11-5.03)	0.76 (0.48-1.09)	1.45 (0.94-2.24)	1.05 (0.68-1.60)
Difficult in get. sleep	9.4	15	<b>11.20</b> (3.66-34.28)	9.8	14	<b>15.47</b> (3.46-69.04)	9.5	13	<b>4.30</b> (1.60-11.58)	1.05 (0.49-2.26)	0.97 (0.44-2.14)	1.01 (0.46-2.21)
Nervousness	6.0	27	<b>9.13</b> (1.23-67.77)	7.2	23	<b>8.52</b> (1.14-63.83)	9.9	29	<b>10.40</b> (1.40-77.37)	1.22 (0.69-2.17)	1.41 (0.80-2.50)	<b>1.73</b> (1.03-2.98)
<b>Total</b>												
Headache	61.1	302	<b>4.09</b> (3.20-5.24)	57.6	220	<b>4.11</b> (3.09-5.46)	62.8	211	<b>5.66</b> (4.11-7.80)	0.86 (0.66-1.13)	1.24 (0.92-1.68)	1.07 (0.81-1.43)
Stomachache	42.0	133	<b>2.58</b> (1.96-3.41)	38.6	105	<b>2.90</b> (2.11-4.00)	45.3	92	<b>3.96</b> (2.77-5.65)	0.87 (0.63-1.21)	1.32 (0.91-1.91)	1.15 (0.80-1.64)
Difficult in get. sleep	6.5	18	<b>6.86</b> (3.05-15.46)	10.1	24	<b>7.27</b> (3.42-15.44)	9.0	20	<b>3.87</b> (1.89-7.92)	1.61 (0.85-3.04)	0.88 (0.47-1.65)	1.49 (0.94-2.37)
Nervousness	5.2	41	<b>10.15</b> (2.44-42.21)	6.4	37	<b>2.98</b> (1.31-6.76)	7.5	36	<b>5.27</b> (1.86-14.99)	1.25 (0.79-1.97)	1.20 (0.74-1.92)	1.42 (0.73-2.76)



to nervousness; the probability of taking medicine to treat this complaint was ten times greater among girls and four times greater among boys than among their respective counterparts who did not suffer from this problem. These data disagree with those of a previous study, which found only small gender differences in the use of medicine to treat both complaints [8]. Other studies have reported a decreased use of medicine for both complaints among boys and girls aged 11-15 years [8], particularly among boys [2, 5].

The limitation of this survey was the lack of specific information as proper drugs, types of stomachache in girls and the respondents' parents' social class. Previous studies found a positive correlation between the use of medicine and low parental social class, adolescents with low sense of coherence, poor self-rated health and being a victim of bullying [14, 15, 21, 22].

Overall, our data showed that adolescents with recurrent headache, stomachache, difficulty in getting to sleep and nervousness were more likely to use medicines highlighting significant gender differences to treat the last two complaints. In addition, girls used medicines for pain more than boys [6, 8, 18]. This behavior

could be linked to many factors, such as easy access to medicines (provided in part by parents), the availability of new medicines, changes in pharmaceutical regulations and more aggressive marketing [1, 5]. The use of medicines in adolescence is a public health concern and constitutes an emerging issue that needs more attention and investigation on the part of scientific research [7, 9, 23]. Adolescence is a key period in human growth, and health habits acquired in this period may be carried over into adulthood. Consequently, adolescents should have adequate knowledge and awareness of medicine use.

#### Authors' contributions statement

GL conceived of the presented data; CMT wrote the manuscript with support from IM, AP, SR, GL; AP and SR analysed the data; TP and EM revised the paper.

#### Conflict of interest statement

The authors declare no conflict of interest.

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