USE OF MEDICINES AMONG STUDENTS OF HIGH SCHOOLS IN THE CZECH REPUBLIC

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Abstract: The aim of the study was to examine the prevalence and type of medicines used by high school students in the Czech Republic and to analyze association between use of medicines during last 6 months and self medication with different socio-demographic and lifestyle aspects. A cross-sectional study was conducted in high schools from two regions and three towns in the Czech Republic. The study sample was a student population of nine selected high schools. The study was approved by the local Ethics Committees and school board and was conducted in compliance with the ethical principles of the Declaration of Helsinki. Questionnaires respecting anonymity were distributed to the students during the regular class period. Students answered closed and open questions divided into six sections focussing on their experience with chronic and irregular use of medicines, medicines use during last six months, conditions treated, type and source of used medicines. A modified log-linear Poisson regression model with a robust variance estimator (sandwich) was used for statistical analysis. In total, 979 students, aged 14–21 years (mean age 17 years) participated in the study: 32% were male and 68% female; 19% of students reported regular use of medicines for chronic disease. The use of medicines during the last 6 months was reported by 83% of students; 42% of them reported the use of both prescription and over the counter (OTC) medicines; 22% the use only of OTC, and 31% only prescription medicines. Allergy, asthma, disorders of the thyroid gland, atopic dermatitis, and hypertensive diseases were among the most frequent long-term diseases. The most frequent groups of medicines used for the treatment of long-term diseases were systemic antihistamines, thyroid preparations, and respiratory drugs. Nonsteroidal anti-inflammatory medicines, ibuprofen and paracetamol were the most frequently used medicines during last six months. The study results showed quite extensive use of both prescription and OTC medicines in students of high schools between 14-21 years of age in the Czech Republic. Statistically significant associations were found between use of medicines during last 6 months and type of school, sex and chronic diseases, and between self-medication and sex.

Keywords: high school students; medicine-taking behavior; non-prescription drugs; nonsteroidal anti-inflammatory drugs

In the 1950s and 1960s consumption of medications was influenced by doctors and health care centres. Patients were used to receiving advice and prescriptions from doctors and took a passive role with respect to selection of medication and management of their disease. During the last 40 years the situation has changed dramatically not only due to economic reasons but also due to a change of attitude of patients, who are willing to take responsibility in health related matters. Since the 1990s, a growing number of products have been granted non-prescription status and self medication has become a standard part of life (1-3).

Most studies focussed on adolescents medicine-taking behavior that have been carried out in the last two decades, in Western European and Arabian countries, suggest that a significant increase in the use of prescription and use and abuse of non-prescription medicines has emerged among adolescents (4-15). Limited data is available from Central and Eastern European countries.

The aim of this study was to examine the prevalence of medication use and medicine taking behavior in students of high schools in the Czech Republic, compare the data with the data from similar studies conducted in other countries and to find out if socio-demographic characteristics of subjects and lifestyles have any influence on medicines use.

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METHODS

A cross-sectional study was conducted in nine high schools from two regions and three towns in the Czech Republic (CZ).

Participants

The planned number of high schools students to be included in the research was about one thousand. High school in CZ is defined as a school with 4 years of education which ends with a graduation examination (equivalent to A-level examination in the United Kingdom). To enter high school, students have to complete 9 years of elementary school and pass entry exam to high school. Usual student ages range from 14-19 years. In order to cover standard stratification of high schools in the district towns in CZ, three different types of secondary educational schools were included in the study: general high school (called a gymnasium in CZ), nursing school and avocational high school. As the average number of students in a classroom in secondary schools in CZ is about 30, at least 36 classes (1st-4th) were to be involved to meet expectation of the planned 1000 students. Based on this calculation, nine schools, from three different district towns (Hradec Kralove, Opava, and Krnov) in two different regions (Kralovehradecky, Moravskoslezsky) were selected for the research. The researchers selected towns where they could conduct the research in person in the schools. Selected schools were invited to participate by personal visit of researchers to the schools. After mutual oral informal consent, formal written consent from the chairman of the school board was obtained to conduct the study. The dates and time were agreed in advance with the class teachers. In each of the school one classroom of each of grade (1st-4th) was randomly chosen for research. The research was conducted during a regular class period and all students that were present at school were invited to participate in the research. The study was approved in advance by the local Ethics Committees. The students were informed in advance by the class teacher about the planned study, that the data were to be collected during a regular class period and that participation in the research was voluntary. None of students who were present on that day at school refused to attend the study. At the beginning of the data collection, the researcher made a brief presentation to the students related to the aim of the study, how the data would be analyzed and used in the future. It was also emphasized that the survey was anonymous and for the purpose of the study it was desirable to collect real life data thus students were encouraged to enter true responses or not to respond at all, or in case of doubt or an unclear question to ask the researcher for further clarification. Then, the anonymous questionnaire was distributed to the students to be completed. At all times, one of the researchers and a class teacher were present in the classroom. After collection of completed questionnaires, the researcher distributed to the students a prepared brochure with basic information focussing on the risks and benefits of using medicines, adverse drug reactions, guidance for proper use of medicines and information about where students can find additional useful information regarding medicines use. Then, the researcher gave short presentation on this topic followed by a discussion with students.

Study questionnaire and validation procedure

A structured questionnaire was developed through a series of focus group discussions with subject experts and following a review of literature in PubMed and Web of Science [4-15]. The questionnaire was content-validated by the subject experts and after pilot testing with 30 questionnaires some questions were excluded or modified to enable better understanding by the students. The questionnaire had multiple choice and open questions, 48 questions for male students and 51 questions for female students and was divided in the following sections:

1. Socio-demographic details;
2. Lifestyle habits;
3. Prevalence of chronic diseases and chronic medication;
4. Use of prescription and non-prescription medication in last 6 months and health conditions treated;
5. Source of medication procurement and medication recommendation;
6. Prevalence and frequency of OTC use.

A list of options was included for sections 3 to 4, following an initial review of literature, which indicated the commonly reported issues among self-medicating students. The listed drugs were further classified according to anatomical-therapeutic-chemical (ATC) classification in the results.

Statistical analyses

Descriptive statistics were used to summarize the data collected from the questionnaire. To estimate prevalence ratios a modified log-linear Poisson regression model with a robust variance estimator (sandwich) was used (16). The package Sandwich (17) implemented in the R system for statistical

computing was used for the data analysis (18). Type of school, age, sex, smoking habits, time spent on sport, TV and internet, use of illicit drugs, mother's and father's education were included in the model as main socio-demographic and lifestyle characteristics of subjects and their influence on medicines use and self medication use has been assessed. Several questions had multiple responses and therefore the percentages did not add up to a total of 100%. Since the participants did not respond to every statement in the questionnaire, there were differences in the value of n (the total population of respondents) for individual questions.

RESULTS

In total, 979 students, aged 14–21 years (mean age 17 years) from 9 schools participated in the study.

Out of 979 students 32% were males and 68% females. Not all students responded to all of the questions thus demographic data and further statistical analysis included only the full answers to each of the questions. The main socio-demographic characteristics are summarized in Table 1.

Out of 964 students who responded, 177 (19%) reported regular use of medicines for chronic disease. Allergy, asthma, disorders of the thyroid gland, and atopic dermatitis were among the most frequent long-term diseases reported. The groups of medi-

cines most frequently used for the treatment of long-term diseases were systemic antihistamines, thyroid preparations, and respiratory medicines (Table 2).

The use of medicines during last 6 months was reported by 796 (83%) of the students, 342 (43%) of whom reported the use of both prescription and OTC medicines, 249 (31%) only the use of OTC

Table 1. Demographic characteristics.

Age	*n (mean)*
14 - 21 years	979 (17)
Type of school	*n (%)*
High school	470 (48.0)
Nursing school	302 (30.9)
Vocational school	207 (21.1)
Sex	*n (%)*
Female	669 (68.3)
Male	310 (31.7)
Do you suffer any chronic disease?	*n (%)*
Yes	188 (19.3)
No	787 (80.7)
Do you use regularly medicines for chronic disease?	*n (%)*
Yes	177 (19.4)
No	737 (80.6)

Table 2. Prevalence of chronic disease and regular use of medicines.

Prevalence of long-term disease	*Total n (%)*
Allergy	79 (8.1)
Asthma	26 (2.6)
Disorders of the thyroid gland	20 (2.1)
Atopic dermatitis	8 (0.8)
Others (less than 7)	55 (5.7)
Students without chronic disease	787 (80.7)
Total	*975 (100)*
Most frequent groups of medicines used for treatment of chronic diseases	*Total n (%)*
Antihistamines for systemic use/Anti-allergic drugs	83 (8.5)
Thyroid preparations	16 (1.6)
Respiratory/Anti-asthmatics	14 (1.4)
Mineral supplements 7 (0.7)	
Others (less than 7)	57 (5.8)
Students without chronic medication	787 (80.7)
Total	*964 (100)*

Table 3. Health conditions for using medicines by students during last 6 months*.

Health conditions	Number (%)
Headache	406 (41.5)
Cold and sore throat	373 (38.1)
Dysmenorrhoea	276 (28.2)
Fever	248 (25.3)
Vomiting/Diarrhoea	81 (8.3)
Migraine	79 (8.1)
Toothache	53 (5.4)
Muscle/Joint aches	50 (5.1)
Stomach aches	35 (3.6)
Contraception	3 (3.4)
Others	115 (11.7)

* Students indicated all health problems they suffered during last 6 months. In total 796 students responded.

medicines, and 205 (26%) took only prescription medicines. For subsequent question related health conditions for which students used medication during last 6 months, the students could enter all health conditions and medicine used. Thus, the data collected for this section represented prevalence of each of health condition during last 6 months and medicines taken to treat this condition. Among the most frequent health conditions for using medicines during last 6 months reported by students were headache 406 (41.5%), cold and sore throat 373 (38.1%), dysmenorrhoea 276 (28.2%), fever 248 (25.3%), vomiting/diarrhoea 81 (8.3%), migraine 79 (8.1%), toothache 53 (5.4%), muscle/joint aches 50 (5.1%), stomach aches 35 (3.6%), contraception 33 (3.4%) and the others 115 (11.7%) (Table 3).

Out of 796 students 685 (86%) remembered the exact names of the medicines they used. Where the students indicated a brand name of a medicine, the generic names were used for statistical purposes. Nonsteroidal anti-inflammatory medicines, ibuprofen and paracetamol, were the most frequently used medicines in general (Table 4).

About 10% of students (99) noted that they never used OTC medicines, 3% (29) used OTC medicines every day and a high majority of students use OTC medicines occasionally or sometimes. Absolute results and results per different categories (sex, type of school and students with and without chronic disease) are summarized in Table 5.

Out of 979 students, 737 (75.3%) admitted self-administration of medicines during their life-

time. The most frequent medicines that students used were ibuprofen (n = 470) and paracetamol (n = 263). The three most common reasons for self medication reported were immediate help and relief (n = 381), the simplest solution in that situation (n = 189), and familiarity with the safe use of medicines (n = 140). The student's mother was the most frequent person who recommended and dispensed the medicines to students (n = 412), followed be physician (n = 275), and pharmacist (n = 173). The main source of medication was the home pharmacy cabinet (n = 681) and pharmacy (n = 162). Of the female students, 446 admitted use of medicines for menstrual discomfort, with ibuprofen (n = 389), paracetamol (n = 53), and metamizole (n = 47) the most frequently chosen.

The data showed statistically significant association between the medicines used during last six months and type of school, sex and chronic diseases. Students who attended nursing schools tended to use fewer medicines than the students from other types of schools; females and students with chronic disease used more medicines. Students from nursing schools and students with chronic disease used less OTC medicines than other students during last six months. As regards students' self-medication during their lifetime, a statistically significant association was found for female students (Table 6).

DISCUSSION

Statistical analyses

The most common method of modelling binomial health data in cross-sectional studies today is logistical analysis, which works very well if one wants to model the ratio of odds instead of the ratio of probabilities. It also yields a good approximate analysis if one is interested in the ratio of probabilities of a rare event. However, if the event is not rare, and one is interested in the ratio of probabilities (i.e., prevalence ratio), then the logistic approximation will be poor because the odds ratio is a poor estimator of the probability ratio. Several authors recommended using the log-binomial model (i.e., binomial model with log link function), which directly models the prevalence ratio. However, this model is not widely used as it often fails to converge. Instead, Poisson regression may be a different natural choice for fitting a log-linear model, since it estimates prevalence ratio and since most medical applications of the Poisson distribution arise *via* the Poisson approximation to the binomial distribution (19). The estimating equations for Poisson regression are unbiased when the response variable is binary rather than

Table 4. Medicines taken during last 6 months.

Health condition	Generic name	Number	ATC code
Headache	Ibuprofen	321	M01AE01
(n = 406)	Paracetamol	100	N02BE01
	Naproxen	5	M01AE02
	Nimesulide	5	M01AX17
Cold and sore throat	Dichlorobenzyl alcohol + Amylmetacresol	68	R02AA20
(n = 373)	Benzalkonium chloride + Menthol + Essential oils	40	R02AA20
	Antibiotics	35	J01
	Benzydamine	30	A01AD02
	Butamirate + Guaifenesin	28	R05FB02
	Benzoxonium chloride + Lidocaine hydrochloride	26	R02AA20
	Paracetamol	23	N02BE01
	Paracetamol + Phenylephrine	22	N02BE51
Fever	Paracetamol	186	N02BE01
(n = 248)	Ibuprofen	51	M01AE01
	Aspirin	14	N02BA01
	Antibiotics	9	J01
Dysmenorhoea	Ibuprofen	214	M01AE01
(n = 276)	Paracetamol	26	N02BE01
	Metamizol + Pitofenone	25	A03DA02
	Nimesulide	8	M01AX17
Vomiting/ Diarrhoea	Carbo medicinalis	29	A07BA5
(n = 81)	Other intestinal adsorbents	27	A07BC05
	Intestinal anti-infectives	22	A07AX
	Antidiarrheal microorganisms	4	A07FA01
	Loperamide	3	A07DA03
Migraine	Ibuprofen	55	M01AE01
(n = 79)	Paracetamol	9	N02BE01
	Metamizole	4	N02BB02
	Sumatriptan	3	N02CC01
	Nimesulide	3	M01AX17
Muscle/Joint ache	Ibuprofen	19	M01AE01
(n = 50)	Magnesium sulfate	5	A12CC30
	Ketoprofen	4	M01AE03
	Paracetamol	3	N02BE01
Toothache	Ibuprofen	45	M01AE01
(n = 53)	Paracetamol	3	N02BE01
	Nimesulide	2	M01AX17
	Paracetamol + Propyfenazon	2	N02BE51
Stomach ache	Other intestinal adsorbents	7	A07BC05
(n = 35)	Ibuprofen	5	M01AE01
	Calcium carbonate	4	A02AD01
	Metamizole	4	N02BB02
Others	Contraceptives	33	G03
(n = 148)	Cetirizine	21	R06AE07
	Antibiotics	16	J01
	Loratadine	7	R06AX13
	Desloratadine	6	R06AX27
	Levocetirizine	5	R06AE09

Poisson, and thus lead to consistent estimation of the prevalence ratio. However, when used to estimate prevalence ratio from binary data, Poisson regression gives standard errors that are too large, because the variance of a Poisson random variable is always larger than that of a binary variable with the same mean. Thus this bias was minimized by using the model-robust sandwich estimator used by Zeileis (17).

Bias of the study

The authors are aware of several limitations of this study. Survey questions on medicines use do have methodological limitations affecting their validity as health status indicators, specifically recall period and motivation of the respondents to provide correct answers. To try to reduce bias some cross-check questions were included in the ques-

Table 5. Frequency of use of OTC medicines (%).

Frequency of use of OTC medicines	Number of students	Female	Male	High school general	School for nurses	Other schools	Students with chronic disease	Students without chronic disease
	(n = 958)	(n = 652)	(n = 299)	(n = 456)	(n = 298)	(n = 199)	(n = 180)	(n = 768)
Never	99 (10.3)	46 (7.1)	53 (17.7)	51 (11.2)	28 (9.4)	20 (10.0)	12 (6.7)	87 (11.3)
Occasionally (less than 1× a month)	574 (59.9)	428 (65.6)	144 (48.2)	269 (59.0)	187 (62.7)	118 (59.3)	93 (51.7)	477 (62.2)
Sometimes (1× a month)	112 (11.7)	90 (13.8)	22 (7.4)	42 (9.2)	41 (13.8)	29 (14.6)	35 (19.4)	77 (10.0)
Often (1× a week)	22 (2.4)	15 (2.3)	3 (1.0)	7 (1.5)	6 (2.0)	5 (2.5)	7 (3.9)	11 (1.4)
Every day	29 (3.0)	15 (2.3)	13 (4.3)	17 (3.7)	6 (2.0)	5 (2.5)	11 (6.1)	16 (2.1)
Others	122 (12.7)	58 (8.9)	64 (21.4)	70 (15.4)	30 (10.1)	22 (11.1)	22 (12.2)	100 (13.0)

Table 6. Influence of socio-demographic characteristics of subjects and lifestyles on the use of medicines.

All medicines use during last 6 months			
Terms	Level	p-value	PR (95% Cl)
School	0 – school for nurses		
	1 – other schools	0.014	1.09 (1.02-1.17)
Sex	0 – female 1 – male	< 0.001 0.85	(0.79-0.92)
Chronic disease	0 – yes, 1 – no	< 0.001 0.84	(0.80-0.88)
OTC use during last 6 months			
Terms	Level	p-value	PR (95% Cl)
School	0 – school for nurses		
	1 – other schools	< 0.001	1.34 (1.18-1.52)
Chronic disease	0 – yes, 1 - no	0.002	1.23 (1.08-1.41)
Students self-medication in their lifetime			
Terms	Level	p-value	PR (95% Cl)
Sex	0 – female 1 – male	0.023	0.92 (0.86-0.99)

* To estimate prevalence ratios a modified log-linear Poisson regression model with a robust variance estimator (sandwich) was used. Type of school, age, sex, smoking habits, time spent on sport, TV and internet, use of illicit drugs, mother's and father's education were included in the model as main socio-demographic and lifestyle characteristics of subjects (in Table as terms). Statistically non significant terms not included in the Table.

tionnaire to show consistency of the responses. The results of some questions were also compared with general population statistics (e.g., prevalence of some chronic diseases). It is acknowledged that the data collected from 3 types of schools, 979 students, 3 different districts and 2 different regions might not be a sufficient sample to represent the whole population of Czech high school students. In our study 68% of female students participated in the study and this number was caused by selection of the schools (a majority of students in nursing schools are female students). However, further research in the field is needed to get more proportional data related to both genders. Questionnaires were completed under presence of researchers and a teacher, which might imply that the students provided social desirable answers (social acquiescence). To minimize this bias, neither teacher nor researcher have been checking the answers during the survey and the questionnaires were collected by students and provided directly to the researcher. Students were also encouraged to complete true data or not to respond rather than complete desirable or fabricated data. Only 33 female students reported use of contraceptive pills but quite high use of medication for menstrual discomfort. The seemingly low number of contraceptive users might be caused by an information bias, as use of contraception might not have been perceived as chronic treatment.

Comparison with other studies

The data from some other studies including children, high school and university students proved that a large proportion of students are exposed to medicines, often since childhood, and self administer the medicines without parents' supervision (15, 20–23). Comparable with other studies the main conditions for medicines use were headache, cold and sore throat and pain (7, 21). In concordance with other studies carried out in Sweden, England, Brazil, Denmark, and UAE, analgesics and antipyretics (ibuprofen and paracetamol) were most commonly used non-prescription medicines (7, 10, 15, 21, 27). The data regarding prevalence of allergy and asthma is comparable with world statistics related to these diseases (24, 25).

Although other studies have used different recall periods, which limits comparison, the prevalence of self-medication in our sample is comparable to that reported in Canada (58.3 to 75.9%), lower than Maltese (90.3%) and UAE (89.2%) students and higher than that observed in German (57%) or Brazilian students (55.8%; 56.6%) (13–15, 26–28).

We have not found an increase in self-medication with age as reported by authors among Danish and Kuwait students (10, 29) but we have found significant difference between gender (female) similar to other literature sources (7, 14, 30).

As regards the frequency of OTC use, our data were similar to those reported by Swedish authors (7). The home medicine cabinet was the most common source of medicines and the mother was the most frequent person who dispensed medicines to these populations in general (7, 12, 15, 26, 31). Similar to some other authors, we have not found any relation between use of OTC medicines in students and their lifestyle habits or socio-economic differences or between use of medicine and age and between the use of OTC medicines and by the presence of chronic illnesses (30–33). No literature data were found regarding comparison of the data from different types of high schools.

CONCLUSION

This is the first research study to explore the self-medication practices among students in the Czech Republic and provides baseline data critical in creating awareness about the risks and benefits of self-medication. The prevalence of self-medication among the high school students in CZ is high but comparable with the data presented by other countries. The use of medicines in students in CZ was not associated with personal and lifestyle characteristics and age, but was associated with sex, chronic disease and the type of school the students attended. Additional studies are needed to include all types of schools and proportionate gender participation. It is extremely important that students are aware of the risk and benefits of medicines as well as of proper use of medicines and self-diagnosis to avoid potential abuse, misuse or improper use of medicines. Health care providers, parents, pharmacists and teachers in CZ should be actively involved in early health education strategies for establishing responsible use of medicines in this age group.

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