Introduction

Somatic pain is very common among adolescents [1]. Headaches are along with stomach and back pain the most common health issue and the most common type of pain in this age group and they are becoming more and more frequent [1-7]. They are the most often recurring symptom and are connected to pain in adult age [1,8,9].

According to studies conducted thus far, headache frequency varies considerably [3,10,11]. The frequency according to individual studies depends on the formulation of questions related to headaches in the questionnaires and on the age of the respondents (in literature 4 to 18 years of age) and literature data are not easily comparable. Thus, according to some, 10-30% of school children suffer from headaches once a week or once a day and 9-33% at least once a month (7-17 years) [4]. It is also shown that the frequency of headaches from once a month to ever in life amounts to 54,4-58,4%, weekly from 6-44%, and daily from 1-9% (12-18 years) [7]. Other authors state that 33-40% of school children suffer from headaches at least once a week (12-15 years) [5]. In Croatia, the prevalence of recurrent headaches among population of high school students in Zagreb amounts to 30.1% (16-18 years) [12] and 54.1% among students in 18 high schools in 10 cities of Republic of Croatia (15-18 years) [13]. Headaches occur more often in girls than in boys and become more frequent with child’s age and the level of education [1,3,5,11,14,15]. Iranian researcher claim that there is no difference among genders stratified according to individual age groups [11].

Headaches decrease the quality of life [3,7,8,10,16], have a negative influence on school success [3,8] and cause school absenteeism [11,16]. They are linked to emotional and physical difficulties [4,5,7,8]. Available research results prove the relation with symptoms of depression and anxiety [4,8,16], musculoskeletal pain [1,6,8], obesity and asthma [8]. Headaches represent a multi factorial disorder [8,15,17]. They are linked to stress, primarily in school (due to tests and questioning), school environment, psychological and physical abuse, peer violence, inadequate spending of leisure time and high parents’ expectations [1,3,5,6,10]. Authors also state that there is a connection to alcohol consumption, smoking cigarettes, use of electronic media and...
physical inactivity [1,2,5,6,9]. The aim of this article is to determine the epidemiological data on headaches among Croatian school children and their connection to risk factors and other health complaints.

**Methods**

We have used the Croatian database from HBSC for 2013/2014, a cross-sectional study supported by the World Health Organization. The principal investigator in Croatia is the Croatian Institute of Public Health. Research methodology is described in detail elsewhere [18]. The advantages of this research among other researches in this field is the large multinational sample and the application of standardized methods to create the database [1]. It is conducted across Europe, North America and in Israel every four years and the respondents are children aged 11-16. Croatia is one of 44 countries participating in this study. The basic research principle is to monitor, in defined time intervals, the health and behavior among school-aged children and investigate how school, family and other social factors influence the way of life and behavior of youth [19].

**Participants**

The study was conducted in april 2014 among students in our elementary and high schools among 11-, 13- and 15-year-olds. The students were interviewed using an anonymous standardized questionnaire. School selection that is, class selection was conducted by CIPH using a random sample. Student interviews were conducted anonymously; voluntariness of student participation was secured by providing the students' parents/caretakers with the option of being able to decline to take part in the study without having to provide any explanation. The study has obtained the approval of the Ministry of science, education and sports and the Ethics committee of the Croatian Institute of Public Health.

**Variables**

The questionnaire consists of 74 questions. One pertains to health complaints whereby the type of investigation that is being used is common and represents a reliable measure of psychosomatic difficulties with students [20]. Health complaints were researched using a standard list of health complaints by using the following questions: "How often in the past 6 months have you had one of the following: a headache, stomach pain, back pain, irritability or bad mood, feeling of nervousness, difficulty falling asleep and dizziness?" The multiple choice answers were: 1=about every day, 2=more than once a week, 3=about every week, 4=about every month, and 5=rarely or never.

For the purpose of the analysis, the variable health complaints frequency was dichotomised so that the answers 1, 2 and 3 (often) were compared to answers 4 and 5 (rarely). Smoking cigarettes was researched by using question: "How often do you smoke cigarettes?" Response options were: 1=every day, 2=At least once a week, not every day, 3=Rarely than once a week, 4=I don't smoke at all. For the purpose of the analysis, the variable was dichotomized: 1 and 2 vs 3, 4 and 5. Drunkenness was researched by using question: "Have you ever had so much alcohol that you were really drunk?" and answers: 1=No, never, 2=Yes, once, 3=Yes, 2-3 times, 4=Yes, 4-10 times, 5=Yes, more than 10 times. Answers were dichotomized: 1 and 2 vs 3, 4 and 5.

We also analyzed distribution and association by gender and age. In this research there is a possibility of bias due to the subjective assessment of the respondent that is used as a measure for headaches and also due to the understanding the term headache in school children (does every 11 year child know what the word headache means). Statistical analysis of the questionnaires was conducted using IBM SPSS Statistics 23.0 (Base). We used descriptive statistics to determine the frequency and distribution and binary logistic regression in order to analyze the association between headaches and smoking cigarettes, drunkenness, other health complaints, gender and age.

**Results**

**Sample description (Participants)**

The Croatian sample comprised of 5741 students of which 49.8% were girls (2857) and 50.2% were boys (2884). There were 1792 students at the age of 11 (mean age 11.6), 2003 students ages 13 (mean age 13.6) and 1946 students aged 15 (mean age 14.6). The response rate was 85.9%. 15.8% (431) boys and 66.7% (862) girls had frequent headaches (Table 1).

| Headaches Frequency | Gender | Total |
|---------------------|--------|-------|
|                     | Male   | Female |       |
| About every day     | 93 (3.4%) | 234 (8.4%) | 327 (5.9%) |
| More than once/week | 126 (4.6%) | 283 (10.2%) | 409 (7.4%) |
| About every week    | 212 (7.8%) | 345 (12.4%) | 557 (10.1%) |
| SUM= OFTEN          | 431 (15.8%) | 862 (31.1%) | 1293 (23.5%) |
| About every month   | 514 (18.9%) | 581 (20.9%) | 1095 (19.9%) |
| Rarely or never     | 1776 (65.2%) | 1333 (48.0%) | 3109 (56.6%) |
| SUM= RARELY         | 2290 (84.2%) | 1914 (68.9%) | 4204 (76.5%) |
| Total               | 2721 (94.5%) | 2776 (50.5%) | 5497 (100%) |

At the age of 11, 21.3% girls had frequent headaches, 36% at the age of 13, and 42, 7% at the age of 15. At the age of 11, 30, 9% boys had frequent headaches, 36, 9% at the age of 13, and 32, 3% at the age of 15 (Table 2).

| Age | Headaches |
|-----|-----------|
|     | Often     | Rarely    |
|     | Male | Female | Male | Female |
| 11  | 36.9 | 36.0 | 29.8 | 37.9 |
| 13  | 29.8 | 36.0 | 34.1 | 35.0 |
| 15  | 36.1 | 42.7 | 36.1 | 27.2 |
Table 3: Multivariate, adjusted binary logistic regression for associations between headache, age, gender, smoking, drunkenness and other health complaints; whole sample.

|                          | OR, 95% CI, p |
|--------------------------|--------------|
| Age                      | 1.34, 1.23-1.46, p=0.000 |
| Gender                   | 2.45, 2.15-2.58, p=0.000 |
| Smoking                  | 1.94, 1.45-2.59, p=0.000 |
| Drunkenness              | 1.18, 0.81-1.72, p=0.390 |
| Stomachache              | 3.31, 2.66-4.13, p=0.000 |
| Backache                 | 2.08, 1.71-2.54, p=0.000 |
| Bad mood                 | 2.06, 1.68-2.53, p=0.000 |
| Irritability             | 1.39, 1.14-1.70, p=0.001 |
| Nervousness              | 1.57, 1.32-1.87, p=0.000 |
| Difficulty falling asleep| 1.56, 1.27-1.90, p=0.000 |
| Dizziness                | 4.82, 3.72-6.24, p=0.000 |

(Table 3) Frequent headaches were connected with gender (OR 2.45, CI 2.15-2.58) and age (OR 1.34, CI 1.23-1.46). They were also connected with cigarette smoking, that is, students who were smoking cigarettes had more frequent headaches than those who were not smoking (OR 1.94, CI 1.45-2.59). Students with other health problems had more frequent headaches - students with stomachache (OR 3.31, CI 2.66-4.13), backache (OR 2.08, CI 1.71-2.54). Students in the bad mood had more frequent headaches than those in the good mood (OR 2.06, CI 1.68-2.53). Students with irritability had more frequent headaches than those without (OR 1.39, CI 1.14-1.70). There is also a positive connection of frequent headaches with nervousness (OR 1.57, CI 1.32-1.87), difficulty falling asleep (OR 1.56, CI 1.27-1.90), and with dizziness (OR 4.82, CI 3.72-6.24).

Discussion

According to the results of our study, almost every fourth student (23.5%) had headaches often headaches were more frequent in girls and associated with age. This paper indicates the connection of headaches and cigarette smoking. Headaches were associated with other somatic symptoms at the same time (back pain, stomach pain and dizziness) and psychological difficulties (bad mood, nervousness, irritability, sleeping difficulties).

Headaches are a subjective experience for which there is no objective measurement instrument. This research cannot determine the prevalence of headaches in school children in Croatia due to the way the questions related to headaches is formulated. There is no answer that would separate those students who have never had a headache. For this reason we can only speak of a higher or smaller frequency that is, as we have decided to define them, of often or rare occurring headaches in school children. The possibility of bias is reduced by a large multinational, representative sample and the application of standardized methods by the HBSC researchers [6]. There is research claiming that children already after 5 years of age are able to understand and use the scales for assessment of the duration and intensity of physical symptoms [21].

Available literature shows a large difference in numeric indicators due to a small number of researches conducted and mainly on smaller samples, investigated and measured using various methods with large age differences. The age of respondents in our study is 11-15 years while in searched and cited literature the respondents’ age was 4-17 years which needs to be taken into account when comparing frequency. In our research each fourth student (23.5%) has reported having a headache from almost every day to every week which corresponds to literature data (10-30%). Swedish authors report 6-44% of students having a headache once a week while this is reported by 7.4% of our students [2]. Furthermore, 5.9% of students have reported having headaches daily, and according to the same authors the frequency amounts to 1-9%. Having a headache once a month to ever in life, according to their research was found in 55.4-58.4% of students while in our research the percentage of children with the same frequency of headaches was significantly higher (76.5%).

Research conducted thus far shows that headaches are more frequent in girls and that frequency increases with age [8,10]. In Croatia, headaches are more frequent in girls (about 2.5 times more frequent) with a statistically significant difference with respect to gender. They increase with age. Adolescents suffering from headaches are prone to risk behavior such as addictive substance use and in Croatia they are more frequent in students who smoke cigarettes [2,3].

The researched health complaints showed an association of headaches with irritability or bad mood, nervousness, difficulties falling asleep and dizziness. The strongest association was with dizziness (students with dizziness had headaches 4 times more often). Students suffering from frequent headaches also had stomach and back pain more often (3 and 2 times). Literature data state that isolated headaches are more an exception than a rule, often coexisting with other pain [8].

Pain in children’s age is an excellent predictor of future pain in adult age. Since there is an association between pain in adult age and adolescence it is important to know how to act preventively in adolescence [6]. Even though it is not possible to influence some risk factors, a large number of them is preventable and by changing habits and behaviors we can influence the frequency of headaches. In conclusion, headaches are common among Croatian students, more common among female students and at older age groups. They are associated with many other health complaints. Their coexistence could cause serious problems in students functioning. Also, our study pointed at association of headaches with cigarette smoking and importance to improve smoking prevention programs.

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