SciForschen
Open HUB for Scientific Research

ISSN 2471-4925

Journal of Clinical Case Studies

Research Article | Volume: 2.2 | Open Access

Risks and Comorbid Factors of Frequent Headaches during Childhood and Adolescence

Teresa Paiva[1,2]*, Tania Gaspar[2,3] and Margarida Gaspar de Matos[2,4]

[1]*CENC- Sleep Medicine Center, Lisbon, Portugal*
[2]*ISAMB/ University of Lisbon, Portugal*
[3]*University Lusiada, Portugal*
[4]*FMH/ University of Lisbon, Portugal*

***Corresponding author:** Teresa Paiva, CENC, Rua Conde das Antas, 5, Lisbon, Portugal, Tel: +351968011648; Fax: +351213715459; **E-mail:** teresapaiva0@gmail.com

Received date: 12 Mar 2017; **Accepted date:** 17 Apr 2017; **Published date:** 21 Apr 2017.

Citation: Paiva T, Gaspar T, Matos MG (2017) Risks and Comorbid Factors of Frequent Headaches during Childhood and Adolescence. J Clin Case Stu 2(2): doi http://dx.doi.org/10.16966/2471-4925.141

Abstract

Background: The prevalence of headache during adolescence is very high. In most studies, the prevalence of headache is higher in females.

The objective of the present study was to evaluate statistically significant associations between high headache frequency and multiple variables obtained in a National Survey.

Methods: The included variables were demographic and socioeconomic; other health complaints; sleep characteristics and complaints; current adolescents´ habits concerning multimedia/electronic tools and nutrition variables; risk behaviors; social support and school satisfaction with the final purpose of building a risk association model for adolescents´ frequent headaches by means of a logistic regression.

This survey is a component of the Health Behavior in School-Aged Children (HBSC) study. The Portuguese HBSC survey included 3476 pupils (53.8 % girls) in the 8th (45.9%) and 10th grades (54.1%) with a mean age was 14.9 years (*SD*=1.26).

Results: The prevalence of high-frequency headaches was 22.2% and their major comorbidities were other health complaints with special reference to abdominal pain and dizziness and psychopathological symptoms, namely sadness, irritability, nervousness and low energy. Furthermore, they had lower family support, lower academic success, unfair treatment, loneliness and nobody to share or to worry about their problems and lower quality of life; e-media and excessive mobile phone use, tobacco and alcohol use, and some violent behaviors were also associated with the presence of frequent headaches.

Conclusion: In spite of these significant associations, the logistic regression model explaining 38% of the variance included mostly other health complaints.

Keywords: Headache; Adolescence; Health; Sleep; Screen time; Risk behaviors; Social support; Nutrition

Abbreviations: HBSC: Health Behavior in School-Aged Children; BMI: Body Mass Index; USA: United States of America; OD: Odds Ratios; CDC: Center for Disease Control.

Introduction

The prevalence of headache during adolescence is very high. In a prospective study using headache diaries. 85% of the students between the 6 and 9th grade reported headaches during a 3 week period [1]. In another study, the overall 3-month prevalence of headache was 69.4% with 4.4% of the adolescents suffering from frequent and severe headaches [2]. Frequent headaches including a migraine have a prevalence of 24.8% to 32% [3-7].

Their impact on quality of life and school attendance is negative [8]. At this age headaches are associated with other pain complaints [9,10] namely abdominal pain [11] with psychologic and behavioral problems [12,13,15,16] and with psychiatric symptoms (depression. anxiety. etc) [8,10,16-18] and also suicidal ideation especially in migraine patients [19,20]; with sleep deprivation [21,22]; with sleep habits and sleep disorders [23-25] and epilepsy [26,27].

In most studies, the prevalence of headache is higher in females [1,2,4,28] and increases with early menarche [29]. Several health or life factors increase the risk of migraine and or tension headache namely: higher blood pressure [30]; anxiety and depression for migraine [31] while anxiety alone increases the risk of both a migraine and tension headache [32]; loneliness and victimization [33]; physical and sexual abuse [34].

The high prevalence of headache depression and atopic conditions in adolescents not getting enough sleep the week before the study was proven in a large epidemiological study in the USA [35]. Irregular intake of meals (especially irregular breakfast) and sleep disturbances [36] or sleep disturbances alone [37-40] are also associated with higher headache prevalence. Among sleep disturbances, Periodic Limb Movements of Sleep [25] are particularly relevant for A migraine while sleep apnea is more likely to induce chronic morning headaches both in adults and children [40].

Taking these data into consideration the objective of the present work was to evaluate the associations between high headache frequency and multiple sets of variables obtained in the HBSC National Survey. The included variables were demographic and socioeconomic; other health complaints; sleep characteristics and complaints; current adolescents´ habits concerning multimedia/electronic tools and nutrition variables; risk behaviors as defined by the Center for Disease Control (CDC) [41]; social support and school satisfaction with the final purpose of building a risk association model for adolescents´ frequent headaches.

The hypothesis was beside the conventional parameters associated with:

Methods

Procedures

This survey is a component of the Health Behavior in School-Aged Children (HBSC) study [42-45].

The Portuguese HBSC survey included 3476 pupils (53.8% girls). In the 8th (45.9%) and 10th grades (54.1%) with a mean age was 14.9 years (*SD*=1.26. min 12.5. max 19.0); they were randomly chosen from 139 schools. in a national sample geographically stratified by Education Regional Divisions. The school response rate was 89.9%.

The overall procedure concerning has been described elsewhere together with validation work and detailed methods [42,44,46]; briefly this study has the approval of a scientific committee an ethical national committee and the national commission for data protection and followed strictly all the guidelines for protection of human rights; adolescents' participation in the survey and completion of the questionnaires was voluntary and anonymity was assured.

Instrument

This study used a Health Behavior in School-Aged Children (HBSC 2010) [45] questionnaire and was included in the present work questions that inquired about: 1) gender and grade. parents education and profession; 2) sociodemographics and self-reported weight and height, for BMI computation; 3) Headache frequency; 4) Other health complaints frequency (backaches. fatigue. sadness. irritability. anxiety and difficulty to fall asleep); 5) Sleep deprivation (defined as a difference in sleep duration higher than 3hours between weekdays and weekends) [22] and weekdays sleep duration; 6) Habits concerning TV, computer, the internet and mobile phone use; 7) Risk behaviors (alcoholic beverages; drunkenness. tobacco and. physical inactivity); 8) Nutrition variables (breakfast during week and weekends. fasting. low consumption of fruit and vegetables. high consumption of sweets and colas); 9) Social support, school satisfaction, life satisfaction and quality of life (Kids-10) [47]. Most answers were obtained by Likert scales of 4 to 8 cells.

The analysis included descriptive analysis of the Likert scales, after which they were recorded into a Yes/No.Frequent/Rare. Low/High parameterization, as follows:

Headache and health complaints frequencies were coded as almost daily, several times per week, almost weekly, almost monthly, rarely or never; the frequent (Headache Yes) included those that occurred: daily, several times per week, and almost weekly and the infrequent "Headache No" category those that were almost monthly, rare or absent.

TV and computer time were evaluated in terms of usage hours during the week and during the weekends and recorded according to usage: higher or equal to 3h per day, or lower than that value. Mobile phone use was considered "yes" whenever the frequency of communications or messaging with friends occurred daily and several times a day.

Alcoholic beverages in the last 30 days, drunkenness, tobacco and drugs consumption, fights, bullying and carrying weapons to school were coded into "No" equivalent to "never" or "Yes" equivalent to the behavior ever been practiced; physical inactivity was coded as "No" when never or infrequently practiced and "Yes" as otherwise. Nutrition variables coding was as follows: None or infrequent consumption of vegetables, fruits, and sweets was considered as "No" and "Yes" for the remaining; idem for taking the breakfast during weekdays and weekends, having or not fasting periods along the day going hungry to bed at night.

Statistical analysis

The averages of the continuous variables, namely life satisfaction quality of life and social support were compared with ANOVA for independent samples. Pearson chi-square with z-transformation of the occurrence frequencies and Bonferroni correction and Odds ratio computation were used in the dichotomic variables in order to evaluate the association between the presence/absence of headache and the remaining variables also subdivided into 2 categories.

During logistic regression using as dependent variable Headache (Yes/No)and as covariates the variables with high Odds Ratios, the following parameters were computed: pseudo R-square model, fitting information, cell probabilities, classification table, goodness-of-fit, parameter estimates and likelihood ratio tests at 95% confidence intervals; the model assumed having headaches as reference, SPSS (IBM corporation, Armonk NY. USA) version 21 for windows was used in the statistical computations.

Results

Headaches had a high prevalence when considering all types of frequency; 4.2% of the students had "daily headaches" (more than 15/month); 18% had Several times per week or weekly complaints and for 17.3% headaches occurred on a monthly basis; this means that headaches occurred on a regular basis in 39.5% of the students. Headaches were more prevalent in females (F=159.513; p<.001) and the prevalence of all frequency types increased with grade (F=18.427; p<.001).

In what concerns the parents educational and professional levels and the fact of having either the father or the mother unemployed were not associated with higher headache prevalence with odds ratios close to 1; mothers were, however, more often unemployed and had a lower academic education (Table1).

Table 2 shows the association with other health complaints and with sleep characteristics; the Odds ratios are high for all the complaints but are especially high for abdominal pain (OR=12.1) and dizziness (OR=11.3); the OR for back and shoulder and neck pain were 4.8 and 3.5 respectively. The association between headaches and psychic complaints is also high with OR of 4.4. 3.9 And 4.6 for sadness, irritability and nervousness respectively. Sleep initiation difficulties and sleep deprivation are also significantly associated with headache (OR equal to 3.9 and 1.3. respectively), but for sleep duration in weekdays in spite of a higher prevalence of headache the OR is not significant). Fatigue is also strongly associated with headaches with OR=3.1.

Psychological variables showed important influences in headache prevalence and significant associations namely: "not feeling in good shape" OR=4.8, feeling "low energy" OR=5.1. "sadness the week before" OR=4.5, "loneliness" OR=2.6, "no time for him/herself" OR=2.7,"no time for activities" OR=3.1, "feeling pressure at school" OR=2.4, "having poor family relations" OR=6.1, feeling no justice OR=1.8, marks at school OR=1.9 (Table3).

Only some of the different dimensions of social support show significant associations with frequent headaches; among which the inability of having fun with friends, having nobody to share, to support or to worry; not receiving help from friends or considering it as not good.

Both life satisfaction (6.67 *vs* 7.35; F=29.781. p<.001) and quality of life (35.29 *vs* 39.58; F=13.110. p<.001) are significantly lower in those suffering from frequent headaches while the social support quotation is higher in the headache group (13.4 *vs* 12.55; F=4.046. p<.01).

Headaches are more prevalent in those using computers for more than 2 hours during weekdays and mostly at weekends but the corresponding odds ratios are low. Adolescents with frequent use of mobile phone have significantly more headaches (p<.001; OR=1.6); the same occurs for those with frequent use of alcoholic beverages (OR=2.2) and frequent episodes of drunkenness (OR=1.5) and tobacco (OR=1.6). However carrying

Table 1: Headache and socio demographic variables

Health complaints		% within HA	% without HA	Chi2	p	OR
Family SES						
Father unemployment	8.9	8.9	.002	.517	.994	.740 – 1.334
Mother unemployment	23.9	21.4	2.143	.079	1.155	.952 – 1.402
Father profession level	41.3	42.6	.085	.423	.947	.656 – 1.367
Mother profession level	50.7	52.6	.267	.330	.925	.688 – 1.243

Table 2: Headache health complaints and sleep features

Health complaints	% within HA	% without HA	Chi2	p	OR	Confidence intervals
Pain complaints						
Abdominal pain	26.9	2.9	449.19	.000***	12.100	9.189 – 15.933
Back pain	49.2	16.6	345.66	.000***	4.839	4.065 – 5.762
Shoulder and neck pain	37.3	14.7	185.57	.000***	3.464	2.879 – 4.168
Psychic complaints						
Sadness	46.4	16.4	300.425	.000***	4.398	3.692 – 5.239
Irritability	48.0	19.0	262.412	.000***	3.929	3.309 – 4.666
Nervousness	59.7	24.2	343.629	.000***	4.621	3.902 – 5.474
Sleep complaints						
Sleep initiation	47.7	19.0	259.119	.000***	3.895	3.280 – 4.624
Sleep deprivation	22.8	17.9	8.712	.003**	1.357	1.107 – 1.663
Sleep duration<7h	24.7	20.3	9.489	.001***	.773	0.656 – .911
Sleep duration<6h	28.0	21.0	12.578	.000***	.689	0.561 – .847
Other						
Fatigue	60.5	32.2	184.055	.000***	3.121	2.637 – 3.691
Dizziness	28.8	3.5	462.299	.000***	11.270	8.695 -14.609

Table 3: Headache, Psychological aspects and Social support (family and friends)

Psychological aspects	% within HA	% without HA	Chi2	p	OR	Confidence intervals
Not in good shape	19.7	3.9	144.954	.000***	4.794	3.643 – 6.307
Low energy	27.2	6.8	164.629	.000***	5.116	3.911 – 6.692
Sadness last week	41.5	13.6	175.927	.000***	4.505	3.565 – 5.694
Loneliness	19.2	8.5	53.206	.000***	2.573	1.982 – 3.340
No time for himself	30.4	14.0	74.799	.000***	2.674	2.218 – 3.360
No time for activities	37.9	16.2	122.499	.000***	3.153	2.557 – 3.887
Pressure at school	73.7	53.9	94.732	.000***	2.394	2.202 – 2.863
Family relations	19.7	3.9	10.847	.000***	6.061	1.858 – 9.770
Justice	15.1	9.0	18.522	.000***	1.805	1.375 – 2.369
Marks at school	19.9	11.7	18.561	.000***	1.874	1.404 – 2.502
Family and Friends						
No fun with friends	8.3	3.5	25.915	.000***	2.493	1.735 – 3.581
Nobody present	25.0	18.7	2.604	.070	1.450	.922 – 2.282
Nobody to share	31.7	22.4	3.858	.035*	1.605	.998 – 2.579
No family support	17.9	12.4	3.839	.035*	1.542	.998 – 2.385
No family emotional support	22.7	18.4	1.999	.095	1.307	.901 – 1.894
No family comfort	24.6	23.3	.110	.409	1.076	.697 – 1.661
No friends to help	19.2	13.1	4.457	.025*	1.575	1.030 – 2.407
Bad help from friends	20.7	14.3	4.230	.028*	0.641	.418 - .982
No talks with family	24.2	22.2	.467	.272	1.114	.817 – 1.519
No friends to share	25.4	19.2	2.473	.075	1.433	.914 – 2.248
Nobody worries	28.5	19.3	4.845	.021*	1.665	1.054 – 2.629
No decision family support	24.1	18.5	3.005	.053	1.395	.956 – 2.035
No friends to share problems	26.4	21.0	2.280	.081	1.348	.914 – 1.987

weapons to school has a higher headache prevalence (OR=1.4); physical inactivity is more prevalent in the headache group but the association is not significant (Table 4).

Missing breakfast during the week and at weekends fasting/missing meals or not eating fruit routinely have higher headache prevalence but with no significant OR; eating no vegetables or too many sweets and colas had no influence (Table 4).

The significant covariates in binominal logistic regression using as dependent variable Headache dichotomized (with a referent value YES) and as independent variables Kidscreen 10 (Quality of Life) gender, abdominal pain, back pain, sadness, nervousness, sleep initiation difficulties, dizziness and fatigue.

With this model the final likelihood ratio tests have a chi-square equal to 12.76, with 8 degrees of freedom and p=.125; and Nagelkerke R-square

Table 4: Headache, habits and risk behaviors, nutrition habits

Behaviors	N	% within HA	% without HA	Chi2	p	OR	Confidence intervals
Screen times							
TV>3h	3383	45.1	43.8	.352	.290	1.051	.892 – 1.237
TV WE>3h	3341	74.8	75.6	.225	.334	0.950	.792 – 1.153
PC play>3h	3378	17.8	20.7	3.212	.040*	0.826	.669 – 1.018
PC play WE>3h	3327	36.4	43.6	12.174	.000***	0.741	.625 – .877
PC use>3h	3382	33.1	31.2	1.011	.168	1.093	.919 – 1.299
PC use WE>3h	3324	53.5	53.6	.000	.512	0.999	.848 – 1.177
Mobile phone	3422	80.6	72.1	21.932	.000***	1.604	1.315 – 1.957
Toxics							
Alcoholic beverages	3383	5.5	2.6	16.097	.000***	2.213	1.487 – 3.294
Drunkenness	3439	22.7	16.1	18.019	.000***	1.532	1.257 – 1.868
Tobacco	3432	24.3	16.8	22.07	.000***	1.589	1.308 - 1.920
Violence							
Fights	3417	28.6	25.9	2.239	.069	1.151	0.962 – 1.377
Weapons to school	3280	7.4	5.3	4.382	.025*	1.415	1.021 – 1.962
Physical inactivity							
Activity <3days/week	2439	21	14.4	13.433	.000***	.632	.494 - .809
Nutrition habits							
Breakfast/fasting							
Week-days	670	56.5	48.5	3.538	.035*	.725	.520 – 1.012
Weekend	3419	10.9	7.6	8.543	.003**	.671	.512 – .878
Fasting/Hungry	3296	3.7	0.6	44.450	.000***	.151	.080 – .266
Nutrients							
No fruit	1794	18.3	14.0	4.573	.021*	.726	.541 – .975
No vegetables	2154	18.5	18.2	.024	.462	.979	.753 – 1.274
Sweets	2130	23.0	22.8	.013	.477	.986	.772 – 1.259
Colas	2092	36.0	34.0	.593	.237	.918	.737 – 1.142

Table 5: Independent variables gender: wellbeing and the variables with higher association values in previous analysis: physical and psychological symptoms.

HEADACHE - YES	B	S.E.	Wald	df	Sig.	OR	95% C.I. for OR	
							Inferior	Superior
Abdominal	-1.548	0.172	80.534	1	0	0.213	0.152	0.298
Backache	-0.704	0.114	38.25	1	0	0.494	0.396	0.618
Sadness	-0.315	0.127	6.216	1	0.013	0.729	0.569	0.935
Slinitiation	-0.393	0.116	11.427	1	0.001	0.675	0.537	0.848
Dizziness	-1.432	0.164	76.051	1	0	0.239	0.173	0.33
Fatigue	-0.377	0.108	12.121	1	0	0.686	0.555	0.848
Nervousness	-0.577	0.115	24.977	1	0	0.561	0.448	0.704
kIDS_10	-0.047	0.01	20.395	1	0	0.954	0.935	0.974
Gender	-0.664	0.11	36.21	1	0	0.515	0.415	0.639
Constant	4.924	0.391	158.332	1	0	137.544		

Variable dependent: headache
R^2=38.3%

was 0.383 explaining 38.3% of the variance. The parameters estimates are shown if table 5. The remaining variables even if more prevalent in the headache population, and presenting significant OR association with high headache frequency did not show significant parameter estimate either allowed significant regression models.

Discussion

CDH had a prevalence of 4.2% and monthly headaches a prevalence of 17.3% the percentage of teenagers that ever had a headache was 39.5%. These data are in line with others referred in the literature [1-7] confirming once more those headaches are the commonest neurological complaint during adolescence. Since the epidemiological study did not evaluate headache characteristics we excluded from our analysis the monthly occurrence important in a migraine but less relevant in tension-type or other types of headaches. Therefore the prevalence of frequent headaches in our study was 22.2%. ie. Similar to what has been obtained in other studies [3]. We also observed the female gender preference [1,2,4,28] and the significant prevalence increase with age [6].

Furthermore, the study showed that the major comorbidities of frequent headaches were other health complaints and psychiatric and psychological factors. For health complaints there was a higher relevance for abdominal pain and dizziness although the OR for back shoulder and neck pain and fatigue were also quite high; the association with abdominal pain has been shown in other studies [11]. Frequent sadness irritability and nervousness are also strongly associated with frequent headaches; this in line with several other observations [8,10,16-18]; the same holds for the psychological variables investigated with special relevance for "low energy" and "low family support" and lower values for obtained marks

being mistreated in terms of fairness pressure at school no time for himself and for other activities sadness and loneliness and poor family relations.

Concerning family and friends, frequent headache sufferers had less often fun with friends complained more often of having nobody to share and no family support neither friends to help and nobody to worry about them. Life satisfaction and quality of life were significantly lower in the headache group.

Concerning daily behaviors with e-media, the only significant association is excessive mobile phone use. No significant association was found between headaches and computer use. In line with our previous results another study of the WHO cross-national Health Behavior in School-aged Children investigating adolescents in Finland. Denmark and France found a relation between computer use for more than 2 hours in weekdays and increased health complaints but not with headaches [48]. Among risks behaviors only carrying weapons to school, wine consumption and frequent drunkenness episodes were significantly associated with frequent headaches. Bullying is usually considered as a cause for a headache but in agreement with others [49], this was not found in our study. Mobile phone and weekdays, computer use and all risks behaviors are however associated with sleep deprivation [50]. The nutrition patterns investigated showed no significant association in spite of the fact that some of them are more prevalent among headache sufferers (namely fasting/missing meals and missing breakfast during weekdays and weekends).

In spite of the significant associations only gender, quality of life and several health complaints were significant in a binominal regression model; the model achieved showed significant likelihood ratio and pseudo R-square, explaining between 25 to 38% of the variance; there is a lack of significant values in model parameters estimates relating headaches with psychological factors, electronic media utilization, risk behaviors and nutrition suggesting an organic/intrinsic pathogenesis of frequent headaches in adolescents.

In synthesis, the prevalence of a frequent headache is high and there is a cluster of high Odds Ratio associated factors namely: other health complaints, with special reference to abdominal pain and dizziness; psychopathological symptoms: sadness. Irritability, nervousness and low energy; social and family support: lower family support, lower academic success, higher school pressure, unfair treatment, loneliness and nobody to share or to worry about their problems; lower quality of life; e-media and excessive mobile phone use; tobacco and alcohol use and violent behaviors.

This multivariable cluster enhances the negative impact of frequent headaches upon adolescents` daily life. The clinical implications are obvious namely in what concerns the need of prophylactic measures, early detection, and efficient treatment. Furthermore, it is clear that clinical evaluation must take into account other health complaints and implies a proper evaluation of a large scope of behavioral, school and family issues.

Conflict of Interest

No conflict of interests to be mentioned.

Key Messages

The prevalence of frequent headaches among adolescent is high and impacts upon their quality of life and life satisfaction.

- Headaches are statistically associated with a large cluster of health complaints, family and school issues and behaviors concerning excessive mobile phone use and some risk behaviors among which consumption of alcohol and tobacco, and violent behaviors.
- The logistic model used explained 38% of the variance integrated only gender, quality of life and health complaints.
- Clinical evaluation of headache adolescents´ sufferers implies a proper evaluation of a large scope of clinical, Behavioral, school and family issues.

References

1. Larsson B, Fichtel Å (2012) Headache prevalence and characteristics among school children as assessed by prospective paper diary recordings. J Headache Pain 13: 129-136.
2. Fendrich K, Vennemann M, Pfaffenrath V, Evers S, May A, et al. (2007) Headache prevalence among adolescents-the German DMKG headache study. Cephalalgia 27: 347-354.
3. Braz M, Barros Filho AA, Barros MB (2013) [Adolescent health: a population based study in Campinas. São Paulo State. Brazil]. Cad Saude Publica 29: 1877-1888.
4. Zwart JA, Dyb G, Holmen TL, Stovner LJ, Sand T (2004) The prevalence of migraine and tension-type headaches among adolescents in Norway. The Nord-Trøndelag HealthStudy (Head-HUNT-Youth). a large population-based epidemiological study. Cephalalgia 24: 373-379.
5. Perquin CW, Hazebroek-Kampschreur AA, Hunfeld JA, Bohnen AM, van Suijlekom-Smith LW, et al. (2000) Pain in children and adolescents: a common experience. Pain 87: 51-58.
6. Dooley JM, Gordon KE, Wood EP (2005) Self-reported headache frequency in Canadian adolescents: validation and follow-up. Headache 45: 127-131.
7. Bellini B, Panunzi S, Bruni O, Guidetti V (2013) Headache and sleep in children. Curr Pain Headache Rep 17: 335.
8. Slater SK, Kashikar-Zuck SM, Allen JR, LeCates SL, Kabbouche MA, et al. (2012) Psychiatric comorbidity in pediatric chronic daily headache. Cephalalgia 32: 1116-1122.
9. Laurell K, Larsson B, Eeg-Olofsson O (2005) Headache in schoolchildren: association with other pain family history and psychosocial factors. Pain 15119: 150-158.
10. Lewandowski AS, Palermo TM, Peterson CC (2006) Age dependent relationships among pain. depressive symptoms. and functional disability in youth with recurrent headaches. Headache 46: 656-662.
11. Galli F, D'Antuono G, Tarantino S, Viviano F, Borrelli O, et al. (2007) Headache and recurrent abdominal pain: a controlled study by the means of the child behavior checklist (CBCL). Cephalalgia 27: 211-219.
12. Masi G, Favilla L, Millepiedi S, Mucci M (2000) Somatic symptoms in children and adolescents referred for emotional and behavioral disorders. Psychiatry 63: 140-149.
13. Virtanen R, Aromaa M, Koskenvuo M, Sillanpää M, Pulkkinen L, et al. (2004) Externalizing problem behaviors and headache: a follow up study of adolescent Finnish twins. Pediatrics 114: 981-987.
14. Bruijn J, Locher H, Passchier J, Dijkstra N, Arts WF (2010) Psychopathology in children and adolescents with migraine in clinical studies: a systematic review. Pediatrics 126: 323-332.
15. Arruda MA, Bigal ME (2012) Behavioral and emotional symptoms and primary headaches in children: a population-based study. Cephalalgia 32: 1093-1100.
16. Balottin U, Poli PF, Termine C, Molteni S, Galli F (2013) Psychopathological symptoms in child and adolescent migraine and tension-type headache: a meta-analysis. Cephalalgia. 33: 112-122.
17. Pavone P, Rizzo R, Conti I, Verrotti A, Mistretta A, et al. (2012) Primary headaches in children: clinical findings on the association with other conditions. Int J Immunopathol Pharmacol 25: 1083-1091.
18. Ligthart L, Gerrits MMJG, Boomsma DI, Penninx BWJH (2013) Anxiety and depression are associated with migraine and pain in general: an investigation of the interrelationships. J Pain 14: 363-370.

19. Wang SJ, Fuh JL, Juang KD, Lu SR (2009) Migraine and suicidal ideation in adolescents aged 13 to 15 years. Neurol 72: 1146-1152.

20. Parisi P (2009) Migraine and suicidal ideation in adolescents aged 13 to 15 years. Neurology 73: 1713.

21. Heyer GL, Rose SC, Merison K, Perkins SQ, Lee JE (2014) Specific headache factors predict sleep disturbances among youth with migraine. Pediatr Neurol 51: 489-493.

22. Paiva T, Gaspar T, Matos MG (2015) Sleep deprivation in adolescents: Correlations with health complaints and health related quality of life. Sleep Med 16: 521-527.

23. Bruni O, Novelli L, Guidetti V, Ferri R (2010) Sleep and headaches during adolescence. Adolesc Med State Art Rev 21: 446-456.

24. Paiva T (2011) Sleep and Headaches. In: S Chokroverty, P Montagna (eds) The volume of Sleep Disorders of the Handbook of Clinical Neurology 99: 1073-86.

25. Esposito M, Parisi P, Miano S, Carotenuto M (2013) Migraine and periodic limb movement disorders in sleep in children: a preliminary case-control study. J Headache Pain 14: 57.

26. Ottman R, Lipton RB (1994) Comorbidity of migraine and epilepsy. Neurol 44: 2105-2110.

27. Bellini B, Arruda M, Cescut A, Saulle C, Persico A, et al. (2013) Headache and comorbidity in children and adolescents. J Headache Pain 14: 79.

28. Karli N, Akiş N, Zarifoğlu M, Akgöz S, Irgil E, et al. (2006) Headache prevalence in adolescents aged 12 to 17: a student-based epidemiological study in Bursa. Headache 46: 649-655.

29. Aegidius KL, Zwart JA, Hagen K, Dyb G, Holmen TL, et al. (2011) Increased headache prevalence in female adolescents and adult women with early menarche. The Head-HUNT Studies. Eur J Neurol 18: 321-328.

30. Tronvik E, Zwart JA, Hagen K, Dyb G, Holmen TL, et al. (2011) Association between blood pressure measures and recurrent headache in adolescents: cross-sectional data from the HUNT-Youth study. J Headache Pain 12: 347-353.

31. Merikangas KR, Angst J, Isler H (1990) Migraine and psychopathology. Results of the Zurich cohort study of young adults. Arch Gen Psychiatry 47: 849-853.

32. Guidetti V, Galli F, Fabrizi P, Giannantoni AS, Napoli L, et al. (1998) Headache and psychiatric comorbidity: clinical aspects and outcome in a 8-year follow-up study. Cephalalgia 18: 455-462.

33. Løhre A (2012) The impact of loneliness on self-rated health symptoms among victimized school children. Child Adolesc Psychiatry Ment Health 6: 20.

34. Genizi J, Srugo I, Kerem NC (2014) Headache and Physical and Sexual Abuse Among Jewish and Arab Adolescents in Israel. J Child Neurol 29: 505-508.

35. Smaldone A, Honig JC, Byrne MW (2007) Sleepless in America: inadequate sleep and relationships to health and well-being of our nation's children. Pediatrics 1: S29-S37.

36. Moschiano F, Messina P, D'Amico D, Grazzi L, Frediani F, et al. (2012) Headache, eating and sleeping behaviors and lifestyle factors in preadolescents and adolescents: preliminary results from an Italian population study. Neurol Sci 33: S87-S90.

37. Gilman DK, Palermo TM, Kabbouche MA, Hershey AD, Powers SW (2007) Primary headache and sleep disturbances in adolescents. Headache 47: 1189-1194.

38. Gupta R, Bhatia MS, Dahiya D, Sharma S, Sapra R, et al. (2008) Impact of primary headaches on subjective sleep parameters among adolescents. Ann Indian Acad Neurol 11: 164-169.

39. Bruni O, Russo PM, Ferri R, Novelli L, Galli F, et al. (2008) Relationships between headache and sleep in a non-clinical population of children and adolescents. Sleep Med 9: 542-548.

40. Paiva T, Attarian H (2014) Obstructive sleep apnea and other sleep-related syndromes. Handb Clin Neurol 119: 251-271.

41. Center of Disease Control (2013).

42. Currie C, Roberts C, Morgan A, Smith R, Settertbulte W, et al. (2004) HBSC and WHO cross national study: research protocol for the 2001/2002 survey. Copenhagen: WHO.

43. Matos MG, Simões C, Tomé G, Gaspar T, Camacho I, et al. (2006) Portuguese adolescents' health today and in eight years: HBSC. FMH & CMDT: Lisbon.

44. Matos MG, Simões C, Tomé G, Camacho I, Ferreira M, et al. (2012) Social adventure & Health. The health of Portuguese adolescents. Report of the 2010 HBSC study. CMDT & FMH: Lisbon.

45. Currie C, Zanotti C, Morgan A, Currie D, de Looze M, et al. (2012) Social determinants of health and well-being among young people. Health Behaviour in School-aged Children (HBSC) study: International Report From the 2009/2010 survey. Copenhagen: WHO Regional Office for Europe. (Health Policy for Children and Adolescents. No. 6).

46. Roberts C, Freeman J, Samdal O, Schnohr CW, de Looze ME, et al. (2009) The Health Behaviour in School-aged Children (HBSC) study: methodological developments and current tensions. Int J Public Health 54: S140-150.

47. Gaspar T, Ribeiro JP, de Matos MG, Leal I, Ferreira A. (2012) Health-related quality of life in children and adolescents: subjective well-being. Span J Psychol 15: 177-186.

48. Nuutinen T, Roos E, Ray C, Villberg J, Välimaa R, et al. (2014) Computer use, sleep duration and health symptoms: a cross-sectional study of 15-year olds in three countries. Int J Public Health. 59: 619-628.

49. Politis S, Bellou V, Belbasis L, Skapinakis P (2014) The association between bullying-related behaviors and subjective health complaints in late adolescence: cross-sectional study in Greece. BMC Res Notes 7: 523.

50. Paiva T, Gaspar T, Matos MG (2015) Sleep deprivation, sleep stealers and risk behaviors in Portuguese adolescents – A cross-cultural comparison. MOJ Public Health.