



## Review

### Quality of Life in Children and Adolescents With Primary Headache Disorders

Semih AYTA<sup>1</sup>, Derya ULUDÜZ<sup>2</sup>, Onur Tuğçe POYRAZ FINDIK<sup>3</sup>, Aynur ÖZGE<sup>4</sup>

<sup>1</sup>Ministry of Health, Haseki Training and Research Hospital, Child Neurology Unit, İstanbul, Turkey <sup>2</sup>İstanbul University, Cerrahpaşa Medical Faculty, Department of Neurology, İstanbul, Turkey <sup>3</sup>Marmara University, Medical Faculty, Department of Child and Adolescent Psychiatry, İstanbul, Turkey <sup>4</sup>Mersin University, Medical Faculty, Department of Neurology, Mersin, Turkey

## Abstract

The frequency and significance of headache in children and adolescent has been drawing more attention nowadays. Similarly, growing body of data is being collected on the quality of life of headache in children and adolescent to which increased attention is paid. Compared with other chronic disorders, headache in children has more negative effect on school performance, as well as emotional status. As for school children, it is reported that these children could not go to school on a regular basis, they do less performance and their careers are negatively affected on the long-term. Accompanying symptoms such as depression, somatization, anxiety also impairs the quality of life. Early identification and treatment of headache will not only improve a health condition, but also will provide advancement in academic and social area as well as psychological development for children with headache.

**Keywords:** Children, headache, migraine, tension type headache, quality of life

### Primer Başağrısı Olan Çocuk ve Ergenlerde Yaşam Kalitesi

## Özet

Günümüzde çocuk ve ergenlerde başağrısı sıklığı ve önemi giderek daha fazla dikkati çekmektedir. Benzer biçimde, başağrısı olan çocuk ve ergenlerin yaşam kaliteleriyle ilgili bilgilerin de giderek arttığı gözlenmektedir. Çocuklardaki diğer kronik hastalıklarla karşılaştırıldığında, başağrısının emosyonel durum ve okul başarısı üzerine daha fazla negatif etkisi vardır. Bu çocukların okula düzenli gidemedikleri, performanslarının düşük olduğu ve uzun dönemde kariyerlerinin olumsuz etkilendiği bildirilmiştir. Eşlik eden depresyon, somatizasyon ve anksiyete gibi semptomlar da yaşam kalitesini bozmaktadır. Başağrısı olan çocuklarda erken tanı ve tedavi sadece bir sağlık sorununu düzeltmekle kalmayacak, aynı zamanda akademik, sosyal ve psikolojik gelişimlerine de olanak sağlayacaktır.

**Anahtar Kelimeler:** Çocukluk çağı, başağrısı, migren, gerilim tipi başağrısı, yaşam kalitesi

## INTRODUCTION

In children and adolescents, recurrent headache is one of the most common and disturbing pain conditions often causing significant impairments in academic, physical, and social functioning both

between and during headache attacks<sup>(26)</sup>. School absences, poor academic performance, social stigma, deteriorated family interactions and impaired interpersonal relationship are some consequences of recurrent headaches<sup>(8)</sup>.

Evidence from the last decade indicate that recurrent headache can result in more pain and have much more effect on functioning than many chronic diseases in children such as idiopathic arthritis and sickle cell disease<sup>(51)</sup>. Despite this, experimental interest to the impact on life of this prevalent condition lags behind that other chronic diseases in children. Lack of knowledge in this area has recently stimulated the World Health Organization to announce a global campaign (“Lifting the Burden”) aimed to facilitate efforts regarding measurement and reducing the negative impact of recurrent headache on the lives of individuals affected by this condition<sup>(59)</sup>.

Children with headache are likely to live through psychosocial adversity and this reveals a significant health care issue for their future life. In children and adolescents, evaluation of headache is important to make the appropriate diagnosis and initiate treatment<sup>(48)</sup>. Because headaches is often underdiagnosed and untreated among children, to recognize this problem, particularly in early life, approaches to relieve pain and increase quality of life (QoL) among these children is substantial aspect of treatment process.

Further research, aimed the probable relationships between headaches, emotional and behavioural difficulties, impairments in daily life functioning, and QoL, is still required<sup>(60)</sup>.

At this paper mainly aimed to create awareness about the importance of headache disorders on the quality of life of children and adolescents as our future generations.

### **THE REASONS OF HEADACHE ON THE QUALITY OF LIFE**

There are very much interest in QoL issues related to headache, as well as many adolescents (48%) is affected by headache<sup>(39)</sup>. The measure of QoL in children is challenging, because

assessment tools must consider children's changing cognitive and social development depending on age. Besides, there is the issue of who should provide the better information, the parent or the child. The Pediatric Quality of Life Inventory, version (PedsQL 4.0) is a valid, developmentally appropriate measure of QoL for children between the ages of 2 and 18 years and it has two form for both parent and child<sup>(16,54,63)</sup>.

A data-based analysis indicates that children with frequent or severe headaches are more prone than children without frequent or severe headaches to present high levels of emotional, conduct, inattention-hyperactivity, and peer problems. Moreover, they are more likely than children without severe headache to be frustrated and to have adversities with family life, friendships, education and leisure activities by their difficulties<sup>(60)</sup>. A research that participants all assessed with the same instrument (KINDL-R) indicated that though the impact of headache on QoL seemed to be little, the effect size was higher than that revealed for other chronic conditions in children such as spina bifida, myelomeningocele, type 1 diabetes, hemophilia or asthma and similar to the effect size observed for obesity and attention deficit hyperactivity disorder<sup>(41,43,65)</sup>. A reliable measurement of childhood migraine disability, Paediatric Migraine Disability Assessment (PedMIDAS), showed that because of their headaches, quite a number of children and adolescents suffered from moderate to severe impairment in school, home, and play activities<sup>(23)</sup>.

#### **Key feature:**

Headache has an important effect on QOL using different methodologies on different age groups and specified for some headache subtypes.

#### **Effect on General Health**

Current health condition substantially affects QoL of children with headaches<sup>(54)</sup>.

Engstrom et al researched on 20 headache patients' ages 9 to 18 years, children with headache experienced more somatic symptoms and more anxiety, lower overall well-being and were less talkative than healthy controls<sup>(17)</sup>. In a study, adolescents with headaches stated a poorer functioning status, worse psychological functioning, more physical complaints, and less satisfaction with health and life than healthy adolescents<sup>(31)</sup>. Smitherman et al showed that the university students with episodic migraine had lower levels of QoL in various domains, above all, worse and clinically marked levels of psychological well-being, poor or decreased general health perceptions, and more physical pain than students without episodic migraine<sup>(58)</sup>. A research indicated that according to parents reports, adolescents were more affected by migraine, especially physical functioning and overall QoL domain than children aged 8-12, whereas these differences were not exist based upon self-report<sup>(54)</sup>.

Most of studies point out that individuals who often suffer from headache live through more stress, fatigue, depression, and somatic symptoms, also they perceive weaker themselves, a less joyful mood and minor satisfaction with life than the individuals who never had headaches<sup>(28)</sup>.

### **Key feature:**

Children and adolescent with headache attacks shows worse physical health than non-headache subjects.

### **Effect on Psychological Development**

Childhood headache is related with certain psychopathological factors. Studies show that an association between paediatric headache and some of psychosocial factors, such as childhood depression, maternal depression, social disadvantage and to have a family with a history of "painful situations"<sup>(69)</sup>.

Some of predictors for childhood headache are abnormal tiredness, travel sickness, bedwetting, sleep difficulties,

concentration difficulties and to have a mother who having history of headache<sup>(7)</sup>. Especially for tension-type headaches (TTH), stress within the family or at school is another important predictor of headaches in paediatric population<sup>(1,14,32,45,62)</sup>. Also, adverse family environment have been linked to childhood headache such as marital problems, low socioeconomic status, losing of a family member, any disease in home, and conflict with parents<sup>(28,35,57)</sup>. In addition to environmental risk factors, research suggested certain related personality characteristics and psychological features. Some of common personality features are anxiety, depression, somatisation, pessimism, emotional rigidity, deliberative, propensity for internalizing feelings, sensitivity, hyperactivity, and to be ambitious<sup>(4,5,10,11,14,27,52,55)</sup>. On the other hand, it is thought that vulnerability to social stressors is another important factor. Wang et al suggested that the prevalence of migraine could be rising associated with individual vulnerability to communal or environmental changes in Asian adolescents<sup>(66)</sup>.

A study was performed including 2490 children aged 11 to 18 years in Turkey and results were similar to Wang's research<sup>(68)</sup>.

There were proven relationship between stress and psychosomatic symptoms. As an independent risk factor, beginning of school period was suggested associated stressor to increase frequency of headache in children<sup>(3)</sup>. In a Sweden study, children who had high stress level at school times complained about more psychosomatic symptoms. According to results of Swedish school based study, 21% of boys and 30% of girls suffered from headache, and 28% of girls and 17% of boys had abdominal pain once or more times per week<sup>(25)</sup>. Furthermore, a current meta-analysis of research revealed that bullying have an important psychological effect on psychosomatic symptoms. Particularly, there were significant association between

abdominal pain, headache, and both bullying and being bullied<sup>(20)</sup>. Studies suggested that another considerable stressor was sense of unfairness in school environment. In a representative sample of Italian students, Santinello et al showed that high perceived teacher unfairness was strong association with frequent headaches<sup>(56)</sup>. These outcomes confirmed the hypothesis that in adolescence ages, stress caused by sense of unfairness may have an impact severity of somatic complaints<sup>(61)</sup>.

Children with TTH experienced more psychological and temperamental difficulties than migraine group<sup>(29)</sup>. Milde-Busch et al investigated that whether among individuals with migraine and with TTH showed differences in terms of stress and headache. The research results were statistically significant. Biological features may reveal these differences. Finally, psychosocial intervention including stress management and coping strategies may be more appropriate and efficient treatment and prevention method for person with migraine than TTH patients<sup>(38)</sup>.

In a study that performed by Strine et al, children with frequent and severe headache were 3.2 times more probable than children without headache to have a serious degree of impairment in mental health issues<sup>(60)</sup>. In a prospective study, children who often had headache were found to have an increased risk of headache, numerous physical symptoms and psychiatric disease in adulthood<sup>(6,18)</sup>. Individuals with migraine have been found to experience more psychopathological symptoms comparing to healthy controls<sup>(9)</sup>. Visudtibhan et al observed that 8.5% of students with migraine reported anxiety in their study sample<sup>(64)</sup>. In Smitherman's study, individual with episodic migraine stated markedly numerous complaints of both depression and anxiety comparing to controls, with about 25% of them reporting moderate or severe degree of psychiatric symptoms. Nevertheless, there is quite less

study that examining the effects of treating psychiatric symptoms on migraine. For future research, treatment representations of these and associated findings will be important and necessary area<sup>(58)</sup>.

### **Key feature:**

Children and adolescents with headache attacks shows worse psychological health including some specific psychiatric disturbances like depression, anxiety disorders, ADHD, tic disorders etc and merits more attention and multidisciplinary approach.

### **Effect on Academic Performance**

In childhood headache is the third most common reason among illness-related causes of school absenteeism<sup>(44)</sup>. Unpredictable headache, especially migraine, captures the children and their families without preparation. Caused by nature of migraine, episodes reveal suddenly and it is hard to plan for homework, exams, and lessons absences. When children get back to school after 2-3 days, they may devote great time to close the gap that coming into existence during their absenteeism. Children with migraine and their families relive this episodes so many times. Both their academic achievement and school adjustment will be devastating by attacks and this will also contribute to impairment in emotional functioning. This burden may increase, if migraine is severe or if children with migraine and their parents perceived as unpredictable and severe<sup>(36,53)</sup>.

Comparing to other chronic illness, Power's study, based on children self-report, revealed that children with migraine had more impairment in school functioning and socio-emotional functioning. Cross-sectional research showed that there were differences in daily life functioning between age groups in children with migraine. The adolescents reported having more difficulties in school than young children. Parents-reports confirmed this difference in the aspect of functioning<sup>(54)</sup>.

Hesketh et al suggested that the majority of the children with headache in their study had sense of pressure to success at school, were afraid of exams, saw excessive amount of homework and concerned for thoughts of their teachers about themselves<sup>(24)</sup>.

### **Key feature:**

Children with headache attacks, especially migraine, have generally worse academics performance correlating with frequency of attacks and comorbidities when compared to non-headache subjects.

### **Effect on Social Life**

In contrast to school functioning area, Power's study showed that younger children with migraine had more impairment in social functioning comparing to adolescents<sup>(54)</sup>. As a cause of interruption and deterioration of school functioning and social relationship, migraine has a negative effect on life of children with migraine and their families<sup>(22)</sup>.

Not only school absenteeism, but also headaches disrupt compliance at leisure times that are spent with peers in children. Social interaction can impair by headache attacks. Therefore, it is possible to say that headache attacks diminish all aspect of QoL<sup>(19,34)</sup>. As support to this, Metsahonkala et al exhibited that being bullied in classroom and poor relationship with peers were related to headaches in children<sup>(37)</sup>.

Headaches are associated with decreased social life activity. Social activities and hobbies can reduce frequency of headaches and their negative effect on QoL. In this context, there is a negative correlation between QoL, social activities and headaches. In case of this cycle continue on adulthood, it is probable to suffer from chronic headache later years for children with headache<sup>(8)</sup>.

### **Key feature:**

Headache attacks have negative impact on hobbies and social life events on children and adolescents not only because of attack characteristics (i.e photophobia is triggered by cinema) but also co-morbid life events (i.e. comorbid atopic disorders negatively effects on outdoor events).

### **QUALITY OF LIFE IN DIFFERENT HEADACHE SUBTYPES**

In recent years, as well as other health-related areas, impact of headache on QoL has become one of remarkable topic. Milde-Busch et al showed that 48% of adolescent population experienced headache at least once per month. This pain corresponded to small but significant decline on QoL measurement scale<sup>(40)</sup>.

According to Turkey population-based research, in spite of frequently referring to health care service, diagnosis and treatment of chronic migraine was often unrecognized<sup>(47)</sup>. Chronic migraine influences people's life during their generating ages. Therefore, these headaches also make significant reduction in their QoL and important economic burden to community<sup>(50,67)</sup>.

Headaches in children and adolescents can lead to negative consequences in terms of both physical and mental health. Psychiatric disorders are often comorbid with chronic headaches, particularly mood and anxiety problems. Mental health problems can occur before or after headache attacks. Other common comorbid conditions are nonspecific somatic complaints, such as back pain, neck pain, abdominal pain, and diffuse muscle pain. Patients may have dizziness, accompanying with headache episode. Blurred vision, syncope or near syncope can reveal during dizziness. Generally, vertigo is not observed, but during severe headache<sup>(36)</sup>.

Among children with different type of headache, migraine group seemed to be most impaired QoL, particularly physical

and emotional wellbeing, in school and family environment. Starting from this point, migraine headache could be thought as an indicator of a more pervasive issue characterized by worse psychosocial wellbeing. However, migraine headache represents not only a primary headache, but also responses to the difficulties of adolescence<sup>(40)</sup>. Brna et al designed a study including 994 adolescents with migraine and measured the Short Form-36 survey for health-related quality of life. In the study group, subjects stating a mood disorder had significantly lower QoL, most significant for general mental health, social functioning, and emotional role. Consequently, the study showed that adolescents with migraine damaged health related QoL in terms of both clinic and statistic than their peers<sup>(12)</sup>.

In a study including 70 children, among primary headache groups were performed comparison. Groups were TTH, migraine, chronic TTH, and migraine plus TTH. QoL scores of all groups were lower than healthy controls, excepting self-esteem subscale. Especially, family cohesion, mental health, and parental impact time were most damaged aspect of QoL. As one of the results from this study, Bruijn et al indicated that there were no significant differences between migraine and TTH groups in terms of QoL subscales<sup>(13)</sup>.

There is a continued discussion on whether TTH and migraine may be together phenomenon or whether TTH may be thought as mild migraine attack in subjects with migraine<sup>(21)</sup>. Milde-Busch et al emphasized that both people with only migraine and people with combined type headaches (migraine plus TTH) had similar decline and scores on QoL measures<sup>(40)</sup>.

#### **Key feature:**

Migraine, especially CM has a specific importance on the QoL of children and adolescents followed by TTH and other headache subtypes.

## **EFFECTS OF CO-MORBIDITIES AND ENVIRONMENTAL FACTORS ON QOL IN CHILDREN WITH HEADACHE**

Research revealed that adults with migraine or frequent headache have increased risk at medical issues including atopic disease, motion sickness, cardiovascular disease, epistaxis, and in women, menorrhagia<sup>(15,30,42,46,49)</sup>. In accordance with studies in adults, research on children showed that childhood headache increased risk for different medical conditions, from 40% to 300% for certain problems. Also, anemia, being overweight, and stomach or intestinal illnesses were observed more frequent than children without headache attacks<sup>(68)</sup>.

Children growing in lower socioeconomic environment are at risk for headache. For these children, awareness and early treatment are important to minimize adverse long term effects<sup>(33)</sup>. Majority of studies on childhood headaches underlines the importance of psychological factors within comorbid conditions. Psychological factors can be the result of headache or they can lead to headaches. In either case, the management of them is essential step. In addition to this, in children who suffer from frequent headaches, symptoms of the different systems are quite common such as asthma, ear infections. Taking into account biological pathways will be provided appropriate treatment to children with headache. Further clinic and genetic research can determine homogeneous subgroups<sup>(2)</sup>.

#### **Key feature:**

Each type of comorbid medical events increase the negative effect of headache on QoL of children and adolescents, sometimes become more important than headache attacks.

## **CONCLUSION**

Headache is an important health problem particularly for children who are in

developmental ages and will be guaranteed for future of their society.

Early identification and treatment of headache will not only improve a health condition, but also will provide advancement in academic and social area as well as psychological development for children with headache. At this point, there are needed for informative studies targeting families, physicians and all sections of the community.

Researchers who are interested in this topic are needed, especially in area of secondary headache that lack of academic knowledge and this effect on QoL. Results of the studies in this area should share urgently to shed light on appropriate managing of headache in childhood.

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**Correspondence to:**

Semih Ayta

E-mail: [semayta@gmail.com](mailto:semayta@gmail.com)

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**REFERENCES**

1. Abu-Arafeh I. Chronic tension-type headache in children and adolescents. *Cephalalgia* 2001;21:830-836.
2. Anttila V, Kallela M, Oswell G, Kaunisto MA, Nyholt DR, Hamalainen E, Havanka H, i. Ilmavirta M, Terwilliger J, Sobel E, Peltonen L, Kaprio J, Farkkila M, Wessman M, Palotie A. Trait components provide tools to dissect the genetic susceptibility of migraine. *Am J Hum Genet* 2006;79:85-99
3. Anttila P, Metsähonkala L, Helenius H, Sillanpää M. Predisposing and provoking factors in childhood headache. *Headache* 2000;40:351-356
4. Anttila P, Metsähonkala L, Aromaa M, Sourander A, Salminen J, Helenius H, Alanen P, Sillanpää i. M. Determinants of tension-type headache in children. *Cephalalgia* 2002;22:401-408
5. Anttila P, Sourander A, Metsähonkala L, Aromaa M, Helenius H, Sillanpää M. Psychiatric symptoms in children with primary headache. *J Am Acad Child Adolesc Psychiatry* 2004;43:412-419
6. Antonaci F, Voiticovschi-Iosob C, Di Stefano AL, Galli F, Özge A, Balottin U. The evolution of headache from childhood to adulthood: a review of the literature. *J Headache Pain* 2014;15:15
7. Aromaa M, Rautava P, Helenius H, Sillanpää ML. Factors of early life as predictors of headache in children at school entry. *Headache* 1998;38:23-30
8. Aytacıoğlu H, Özge A, Köstekçi İ, Taşdelen B, Öksüz N, Toros, F. The Effects of Daily Variables i. on Primary Headache Disorders in High-School Children; A Proposal For A Cut-off Value For Study/Leisure Time Regarding Headache Types. *Journal of Neurological Sciences [Turkish]* 2011;28:453-464
9. Balottin U, Fusar Poli P, Termine C, Molteni S, Galli F. Psychopathological symptoms in child and adolescent migraine and tension-type headache: a meta-analysis. *Cephalalgia* 2013;33:112-122
10. Bandell-Hoekstra I, Abu-Saad HH, Passchier J, Knipschild P. Recurrent headache, coping, and quality of life in children: a review. *Headache* 2000;40:357-370
11. Borge AI, Nordhagen R. Development of stomach-ache and headache during middle childhood: co-occurrence and psychosocial risk factors. *Acta Paediatr* 1995;84:795-802
12. Brna P, Gordon K, Dooley J. Canadian adolescents with migraine: impaired health-related quality of life. *J Child Neurol* 2008;23:39-43
13. Bruijn J, Arts WF, Duivenvoorden H, Dijkstra N, Raat H, Passchier J. Quality of life in children with primary headache in a general hospital. *Cephalalgia* 2009;29:624-630
14. Carlsson J, Larsson B, Mark A. Psychosocial functioning in schoolchildren with recurrent headaches. *Headache* 1996;36:77-82





- immunological screening. *Cephalalgia* 2006;26:172-179
47. Ozge A, Saşmaz T, Buğdaycı R, Cakmak SE, Kurt AÖ, Kaleağası SH, Siva A. The prevalence of chronic and episodic migraine in children and adolescents. *Eur J Neurol* 2013;20:95-101
  48. Ozge A, Termine C, Antonaci F, Natriashvili S, Guidetti V, Wöber-Bingöl C. Overview of diagnosis and management of paediatric headache. Part I: diagnosis. *J Headache Pain* 2011;12:13-23
  49. Özge A, Öksüz N, Ayta S, Uluduz D, Yıldırım V, Toros F, Taşdelen B. Atopic disorders are more common in childhood migraine and correlated headache phenotype. *Pediatr Int* 2014;56:868-872
  50. Pascual J, Colás R, Castillo J. Epidemiology of chronic daily headache. *Curr Pain Headache Rep* 2001;5:529-536
  51. Peterson CC, Palermo TM. Parental reinforcement of recurrent pain: the moderating impact of child depression and anxiety on functional disability. *J Pediatr Psychol* 2004;29:331-341
  52. Pine DS, Cohen P, Brook J. The association between major depression and headache: results of a longitudinal epidemiologic study in youth. *J Child Adolesc Psychopharmacol* 1996;6:153-164
  53. Powers SW, Patton SR, Hommel KA, Hershey AD. Quality of life in childhood migraines: clinical impact and comparison to other chronic illnesses. *Pediatrics* 2003;112:e1-5
  54. Powers SW, Patton SR, Hommel KA, Hershey AD. Quality of life in paediatric migraine: characterization of age-related effects using PedsQL 4.0. *Cephalalgia* 2004;24(2):120-127
  55. Rhee H. Risk factors for and sequelae of headaches in schoolchildren with clinical implications from a psychosocial perspective. *J Pediatr Nurs* 2001;16:392-401
  56. Santinello M, Vieno A, De Vogli R. Primary headache in Italian early adolescents: the role of perceived teacher unfairness. *Headache* 2009;49:366-374
  57. Sillanpää M, Piekkala P, Kero P. Prevalence of headache at preschool age in an unselected child population. *Cephalalgia* 1991;11:239-242
  58. Smitherman TA, McDermott MJ, Buchanan EM. Negative impact of episodic migraine on a university population: quality of life, functional impairment, and comorbid psychiatric symptoms. *Headache* 2011;51:581-589
  59. Steiner TJ; World Headache Alliance. Lifting the burden: The global campaign against headache. *Lancet Neurol* 2004;3:204-205
  60. Strine TW, Okoro CA, McGuire LC, Balluz LS. The associations among childhood headaches, emotional and behavioral difficulties, and health care use. *Pediatrics* 2006;117:1728-1735
  61. Torsheim T, Wold B. School-related stress, support, and subjective health complaints among early adolescents: a multilevel approach. *J Adolesc* 2001;24:701-713
  62. van der Wouden JC, van der Pas P, Bruijnzeels MA, Brienen JA, van Suijlekom-Smit LW. Headache in children in Dutch general practice. *Cephalalgia* 1999;19:147-150
  63. Varni JW, Seid M, Kurtin PS. PedsQL 4.0: reliability and validity of the Pediatric Quality of Life Inventory version 4.0 generic core scales in healthy and patient populations. *Med Care* 2001;39:800-812
  64. Visudtibhan A, Siripornpanich V, Khongkhatithum C, Chiemchanya S, Sirijunpen S, Ruangkanha nasetr S, Visudhiphan P. Migraine in Thai children: prevalence in junior high school students. *J Chil Neurol* 2007;22:1117-1120
  65. Wagner VM, Müller-Godeffroy E, von Sengbusch S, Häger S, Thyen U. Age, metabolic control and type of insulin regime influences health-related quality of life in children and adolescents with type 1 diabetes mellitus. *Eur J Pediatr* 2005;164:491-496
  66. Wang SJ, Fuh JL, Juang KD, Lu SR. Rising prevalence of migraine in Taiwanese adolescents aged 13-15 years. *Cephalalgia* 2005;25:433-438
  67. Wang SJ, Fuh JL, Lu SR. Chronic daily headache in adolescents: an 8-year follow-up study. *Neurology* 2009;73:416-422
  68. Zencir M, Ergin H, Sahiner T, Kiliç I, Alkiş E, Özdel L, Gürses D, Ergin A. Epidemiology and symptomatology of migraine among school children: Denizli urban area in Turkey. *Headache* 2004;44:780-785
  69. Zuckerman B, Stevenson J, Bailey V. Stomachaches and headaches in a community sample of preschool children. *Pediatrics* 1987;79:677-682