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Asthma in Adolescent's Ages

Astma u adolescenciji

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Summary

Introduction: With global prevalence of 6.9% asthma represents one of the most frequent chronic diseases in adolescence. Owing to unique psychophysical changes, it is exceptionally significant to prevent and treat asthma in adolescents adequately and on time.
Aim: The purpose of this review is to specifically evaluate the clinical data about adolescents with asthma, focusing on physiological changes in adolescents and their impact on asthma development and severity. Further aim of this review is to identify the determinants of adherence.
Objective: A complete search of the Cochrane Central Register of Controlled Trials (CENTRAL) in the Cochrane Library, MEDLINE and Pub Med up to January 2020 was carried out. The key words used were "Adolescent, asthma, risk factors, adherence". English language restriction was applied.
Results: Adolescents with asthma are under the increased risk of developing psychic disorders such as depression and anxiety, diabetes mellitus, obesity, cardiovascular and endocrinologic diseases. Comorbidities, single or associated with risk factors, additionally increase the prevalence, morbidity and mortality of adolescence with asthma. The support of a physician, parents and identically aged individuals is exceptionally important to adolescents with asthma. This is the right moment when they should take control over their life, and thus also over asthma. It is highly significant to adopt a healthy lifestyle; performing moderate physical activity, having healthy eating habits as well as developing good and stable social and emotional connections. With the aim of achieving good control over asthma it is necessary for the adolescents to obtain knowledge about their disease and strictly follow the treatment plan and to avoid all risk factors that could contribute to the worsening of their condition.
Conclusion: A particular phenotype of asthma in adolescents requires a special approach. A strategy for treatment must always imply the prospect of adolescence

Key words: Adolescent, asthma, adherence

Sažetak

Uvod: Sa globalnom prevalencijom od 6,9% astma predstavlja jedno od najčešćih hroničnih oboljenja u adolescenciji. Zbog jedinstvenih psihofizičkih promena, izuzetno je važno sprečiti i lečiti astmu kod adolescenata na adekvatan i na vreme.
Cilj: Svrha ovog pregleda je da posebno proceni kliničke podatke o adolescentima sa astmom, fokusirajući se na fiziološke promene kod adolescenata i njihov uticaj na razvoj i ozbiljnost astme. Daljnji cilj ovog pregleda je identifikovanje determinanti pridržavanja.Cilj: Obavljena je kompletna pretraga Centralnog registra kontrolisanih suđenja u Cochrane-u u Cochrane biblioteci, MEDLINE i Pub Med-u do januara 2020. godine. Ključne reči koje su korišćene bile su „adolescencija, astma, faktori rizika, adherenca". Primenjeno je ograničenje engleskog jezika.
Rezultati: Adolescenti sa astmom su pod povećanim rizikom za razvoj psihičkih poremećaja kao što su depresija i anksioznost, dijabetes melitus, gojaznost, kardiovaskularne i endokrinološke bolesti. Komorbidnosti, pojedinačne ili povezane sa faktorima rizika, dodatno povećavaju prevalenciju, morbiditet i smrtnost adolescencije sa astmom. Podrška lekara, roditelja i starosno sposobnih pojedinaca izuzetno je važna za adolescente sa astmom. Ovo je pravi trenutak kada bi trebali preuzeti kontrolu nad svojim životom, a samim tim i nad astmom. Od velike je važnosti usvajanje zdravog načina života; izvođenje umjerene fizičke aktivnosti, zdravih prehrambenih navika, kao i razvijanje dobrih i stabilnih socijalnih i emocionalnih veza. U cilju postizanja dobre kontrole nad astmom potrebno je da adolescenti steknu saznanja o svojoj bolesti i strogo slede plan lečenja i izbegnu sve faktore rizika koji mogu doprineti pogoršanju njihovog stanja.
Zaključak: Poseban fenotip astme kod adolescenata zahteva poseban pristup. Strategija lečenja uvek mora da podrazumeva perspektivu adolescencije.

Ključne reči: *adolescencija, astma, adherencija*

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Background

With a global prevalence of 6.9% (ranging from 3.8% in Asia-Pacific and Northern and Eastern Europe to 11.3% in North America), asthma is one of the most common chronic diseases in adolescent age. (1) The growing worldwide burden of allergic diseases is properly defined as the "allergy epidemic". Allergy is common in children, adolescents and adults.

The German epidemiological Multicenter Allergy Study (MAS) suggested an age-related evolution of atopic and allergic diseases, usually named "atopic march". In fact, on epidemiological bases, infantile eczema and food allergy usually precede the onset of allergic airway disease (rhinitis and asthma). (2) The incidence of asthma is higher in preschool and early school age with an improvement in symptoms and a decrease in prevalence afterwards. However, there is a second asthma peak during puberty, especially among females. The overall prevalence of the adolescent-onset asthma is 9% within subjects without asthma at the age of ten. Adolescent-asthma represents up to 25% of asthma at 18-years, when it shows phenotypic characteristics, disease severity and morbidity similar to asthma with onset in the first decade of life. Atopic constitution, rhinitis and presence of bronchial hyper reactivity (BHR) at the age of ten predict the subsequent development of adolescent-onset asthma. (3)

Among environmental factors, only paracetamol use at age of 18 shows an independent significant association with adolescent-onset asthma. (4) According to the definition by the World Health Organization (WHO) adolescents are young people between 10 and 19 years of age. Adolescence is a period of accelerated growth and of tremendous physiological and psychological changes.

Although adolescents are considered a typical healthy group, many of them may suffer from chronic diseases like asthma, diabetes mellitus, obesity, cardiovascular diseases or physical and mental disabilities. Adolescents are also at a higher risk of sexually transmitted diseases, mental disorders and of risk-taking behaviors like tobacco, alcohol or drug abuse.

Both chronic diseases and risk factors, independently or synergistically, can have an impact on development and future well being of teenagers. (5) Considering the fact that adolescents with asthma differ from other age groups with asthma, health care providers (HCP) are responsible for the best care, effective asthma treatment, and optimal asthma control. This is the period when patients have to learn to cope with their asthma management on their own and when it is essential to have support from both parents and peers. (6)

Objective

The purpose of this review is to specifically evaluate the clinical data about adolescents with asthma, focusing on physiological changes in adolescents and their impact on asthma development and severity. Further aim of this review is to identify the determinants of adherence.

Methods

A complete search of the Cochrane Central Register of Controlled Trials (CENTRAL) in the Cochrane Library, MEDLINE and Pub Med up to January 2016 was carried out.
The key words used were "Adolescent, asthma, risk factors, adherence". English language restriction was applied.

Physiological changes - Hormones and adolescent asthma

The changes in sex hormones, influencing physiological and psychological evolutions during puberty can affect both asthma development and its severity. Due to the impact of the sex hormones during adolescence, females are probably at higher risk for asthma compared with males. (7) Severe asthma is also more prevalent in adult women and the prevalence and severity of asthma decrease after menopause. (8) The two main hormone-related events during the adolescence of females are menarche and hormonal contraceptive use. Both events are associated with increased levels of estrogens, which double the risk of developing asthma. According to this some authors pointed out that early menarche is one of the most important risk factors for asthma development in adolescence and later in adulthood. (9,10) In parallel, recent data suggested that a delayed menarche could be a strong protective factor for both asthma and allergic rhinitis (11). On the other side atopic conditions during childhood represent an independent risk factor for early puberty. (12)

The existing data about the role of oral contraceptive pill (OCP) on respiratory diseases are scarce and conflicting, especially in the adolescent age. While Salam et al. showed a positive effect of OCP on current wheezing in women with asthma, and Forbes et al. observed no increase in asthma severity in OCP users, North-Baltic population surveys suggested that the use of OCP can increase risk of asthma in both normal-weight and over-weight women. (13,14,15)

In agreement with the North-Baltic study, the results from Erkoçoğlu study pointed out that young women taking oral contraceptives had a higher rate of concomitant wheezing, which implies that sex steroids may have a negative impact on female respiratory health. (16)

It is also well known that respiratory symptoms may change significantly during the menstrual cycle being more pronounced between the mid-luteal and the mid-follicular stages, and less common near ovulation. (17) Contrary to the other published data a recent Swedish study found no consistent association between asthma and pubertal staging.

According to their results there is only connection between asthma and height. They showed that children with asthma were shorter than those without asthma, and those with ICS-treated asthma were shorter than those with non-ICS-treated asthma. (18)

Life style – Physical activity

Physical activity is crucial to improve individual physical and mental health especially during adolescence. The relationship between asthma and physical activity may seem a paradox. Long-term exercise, like long distance running and competitive swimming can induce airway inflammation and increase BHR. This kind of physical activity can be a powerful trigger of asthma symptoms and can severely affect the quality of life. The prevalence of asthma, atopic constitution, exercise-induced bronchoconstriction (EIB), and BHR is higher in high-level athletes compared to the general population. It is very important to point out that EIB and BHR is also more frequent in patients with "poorly" or uncontrolled asthma. (19) Asthma is reported in 2.7 to 22.8% of summer sports athletes and in 2.8 to 54.8% of winter's sport athletes. These variations may be partly explained by the different athletes' populations and by the diagnostic tests used. The prevalence of BHR is even higher, ranging from 25 to 79% in athletes performing endurance sports, while it is around 20% in power and speed sport athletes. Exposure to allergens, pollutants, chlorine derivatives or cold air during training may promote the development of asthma and BHR.

Although the exact mechanism of EIB and BHR are still unexplained, frequent and/or intense airway dehydration and mechanical airway stress from intense exercise may contribute to these changes. (20) On the contrary, both a reduced physical activity and a sedentary life style are associated with obesity and asthma. (21,22,) The misdiagnosis of asthma is common in adolescence with exercise induced symptoms of cough, wheezing or dyspnea especially in those subjects without a history of allergy in childhood. (23,24,25)

Life style – Nutrition and asthma

The nutritional intake does not seem significantly different in adolescents with or without asthma. In general, adolescents have a lower intake of fruits and vegetables, fibers, vitamin D and polyunsaturated fatty acids than recommended (i.e. polyunsaturated fat is in the lower level of the recommended range). The intake of calcium, folate, iron and magnesium results to be lower than recommended in girls, especially in the asthma group. The percentage of saturated fatty acids and sugars is above the recommended level for all adolescents. (26) Due to "bad eating" habits, obesity and overweight have reached epidemic proportions in western countries. Obesity, usually associated to a sedentary lifestyle particularly among female teens, represents an independent risk factor for asthma and asthma severity. (27)

Both asthma and obesity are independently or synergistically associated with systemic inflammation. (28,29)

Recent meta-analyses showed that overweight and obesity increase the odds of incident asthma, in a dose-dependent manner, and that weight gain almost doubles the odds of asthma incidence. (30)

Taken together, these observations support the recommendation of weight control and tackling obesity as part of an asthma management plan. It is also very interesting to point out that Mediterranean diet, a well-recognized cultural model for healthy eating, has been associated with a lower mortality and morbidity for chronic diseases including asthma. That was apparent in Mediterranean populations, as compared to USA and Northern Europe.

Adopting healthy eating habits is of great importance for asthma control and prevention. It is well known that Mediterranean diet and fresh fruit intake increases the likelihood for asthma to be under control (defined by symptoms, lung function and airway inflammation), while high intake of ethanol increases the risk of uncontrolled asthma. Literature data reported that a higher intake of nutrients such as vitamins A, D, E, selenium, magnesium, zinc and n-3 polyunsaturated fatty acids (PUFA), as well as an increased consumption of fresh fruits, vegetables, nuts and fatty fish may be relevant in the oxidative mechanisms and immune modulation. However there are no data directly relating diet and lung function. (31,32)

Life style – Smoking

In the USA approximately 1,4 million of adolescents younger than 18 years start smoking every year and up to 90% of adults start smoking during the period of adolescence.

Although both active and passive smoke has a tremendous negative impact on asthma, teens with asthma smoke 1,5 times more than those without asthma. Smokers with asthma more frequently have uncontrolled asthma, poor quality of life, more frequent exacerbations and hospital admissions, together with an accelerated decline in lung

function compared to never-smokers with asthma. Moreover active cigarette smoking is associated with a reduced therapeutic response to corticosteroids. (33) The passive exposure to tobacco (second hand tobacco smoke) can occur both at home especially in low-income families or with peers who are smokers in public places. (34)

Smoking cessation programs for parents may reduce the burden of asthma attacks and exacerbations (35) as teenagers start to spend more time outside, the legislation to control cigarette smoking in public places may improve symptom control. (36)

Environmental exposure and asthma

In western countries, adolescents spend a considerable part of their lives indoor. Indoor exposure to mite, animal dander, molds, chemicals and inhaled particles can elicit and/or exacerbate allergic diseases. The best assessed among the indoor pollutants are volatile organic compounds (VOCs) and environmental tobacco smoke (ETS), which is a mixture of VOCs, carbon monoxide and solid particles . (37,38)
Typical outdoor pollutants that can trigger and exacerbate asthma include pollens, mold spores and air pollutants. A high degree of traffic and urbanization are hallmarks of Western civilization. A recent meta-analysis of prospective, multi-center trials did not find a clear association between traffic-related air pollution and allergic sensitization in children. Other studies showed an association between exposure to diesel exhaust particles (DEP), NO2, ozone and particulate matter (PM), and asthma, allergic rhinitis or sensitization to aeroallergens. These conflicting results illustrate how exposure and confounding factors (e.g. genetic predisposition, lifestyle and nutrition) interact closely in switching from health to disease. Besides environmental exposure, extreme weather conditions (extreme cold, hot, humidity, barometric pressure, thunderstorm or strong winds) and climate changes may also be an asthma trigger in certain people. Avoiding or minimizing the exposure to the environmental pollutants should be one of the primary goals for asthma management . (39,40)

Psychological changes - Stressful events

As a period of great challenges including independence from parents, needs for school and vocational achievements, interaction with peers, adolescence is characterized by an increased number of stressful events, which are in positive correlation with asthma and asthma severity.
Adolescents are exposed to stressful events both in the family and in the school environment. (41) Psychosocial stress has been associated with increased rates of smoking and other substance abuse (42), reduced adherence to medications (43), and bothersome psychological symptoms (e.g. depression, anxiety) (44) which have, in turn, been linked to asthma morbidity. From a physiological point of view, stress leads to the alteration of immune expression and indirect pathways linking stress to asthma expression have been repeatedly suggested.
According to data psychological triggers are one of the most important predictors of self-reported asthma control and symptoms but without actual impact on lung function. They are also marked as indicators of patients' perceptions of suboptimal asthma control. (45) During childhood and adolescence parents and/or families usually are the "caregivers" for asthma treatment. Stressful events in the family environment are proven to positively correlate with asthma in adolescents. (46) Asthma is also one of the leading causes of missed school days in the USA especially for adolescents with severe asthma. (48) Based on those considerations, the social and environmental factors such as family, peer and neighbourhood have an important role in adolescent asthma. The data from the Chen study suggest that family support and neighborhood problems have an important impact on asthma, while the peer support does not influence adolescent asthma. Performing mental arithmetic tasks, watching emotional films as well as listening to stressful interaction can provoke bronchoconstriction in 15% to 30% of asthmatic patients without any other relevant triggers. (49)

Developmental and behavioral comorbidities of asthma in children

Poor symptom control, increased health care use, impairment in the quality of life, non-adherence to medication and poor treatment outcome in severe asthmatic young people increase the rate of depression, attention-deficit/hyperactivity disorder (ADHD), behavioral disorders, and learning disabilities. (50) Unfortunately, asthma treatment is typically focused on disease management rather than on developmental and behavioral comorbidities, that may affect quality of life or contribute to poor disease control. These mental disorders as well as other functional impairment, increase the need for asthma medication, emergency room admissions and hospitalizations. In order to achieve best asthma control, physicians have to consider not only asthma symptoms but also behavioral comorbidities. (51) Furthermore, a diagnosis of asthma is associated with an increased likelihood of being bullied, along with higher rates of lost school days. Asthma is also related to increased risk-taking behaviors in children, including increased substance abuse, driving without a seat belt and dangerous sexual practices. (52) Epidemiological data showed that almost 30% of asthmatic adolescents suffer from anxiety or panic attacks. Agoraphobia is also more common in teens with asthma as compared to the general population. The major risk factors for anxiety in asthmatic adolescents are: female gender, Caucasian race, smoking, living with a single parent, more parent-externalizing behaviors and a more recent diagnosis of asthma. (53)

Depression is the second most common mental health disorder in asthmatic patients, particularly among females with a prevalence between 20% and 50%. (54)

The depression in adolescents is characterized by the following symptoms: absenteeism from school or work, social isolation, problems with concentration and studying, emotional problems, suicide considerations, suicide plans and suicide attempts. (55, 56)
Adolescents frequently engage in risky behaviors for their health. The Youth Risk Behavior Survey (YRBS) documented risky behaviors in high school students across the United States. According to this study 22% of healthy students in grades 9 to 12 smoked cigarettes, 22% smoked marijuana, and 45% used alcohol.

The prevalence of risk taking behavior is even more common in adolescents with asthma. A number of studies showed higher risk of dating violence, unhealthy weight control practices, smokeless tobacco product usage and obesity in a population of asthmatic adolescents.
Those risky behaviours obviously have a negative impact on asthma control and increase the need for drugs and hospitalizations. (57,58,59,60)

Therapeutic adherence in the adolescent with asthma

A global burden of poor adherence to chronic medical treatment can be observed in all age groups. It results in poor health outcomes and increased health care costs. (61)

Across all ages, adherence to medical advice is now understood to be a complex cluster of associated behaviors rather than a single factor. In the multivariable model lower adherence to asthma treatment was observed in males, non-Hispanic black race, Hispanic ethnicity, patients without insurance, lower household income patients and those who prefer use of EDs (emergency departments) as the source of asthma prescriptions. (62)

According to literature, a significant proportion of children and adolescents with asthma do not receive any asthma medication. Among those who receive medications, adherence is poor, whereas the use of chronic oral corticosteroides (OCS) is surprisingly high. (63)

Recent studies pointed out that there is need for a novel approach to asthma management, in which therapy is tailored to the specific disease-causing mechanism, which offers the potential for improved asthma care outcomes - particularly for patients with severe persistent asthma who are not well or poorly controlled. (64)

According to GINA, drug and non-drug factors related to poor adherence are summarized in Table 1. (65)

Table 1. Drug and non-drug related factors in non-adherence
Tabela 1. Loša saradljivost i povezanost sa lekovima i ostalim faktorima

Drug related factors
1. Difficulties with inhaler devise
2. Uncomfortable regimens
3. Side effects
4. Cost of medications
5. Distant pharmacies

Non-drug related factors
1. Misunderstanding or lack of instruction
2.Dissatisfaction with health care professionals
3.Inappropriate expectations
4.Unexpressed/undiscussed fears or concerns
5.Poor supervision, training, or follow-up
6. Anger about condition or its treatment
7.Underestimation of severity
8. Cultural issues
9.Stigmatization
10.Forgetfulness or complacency
11.Attitudes toward ill health
12. Religious issues

With the improvement in cognitive functions, reasoning, collecting and processing information adolescents become more aware of the asthma related limitations. (66,67) Feelings of embarrassment about asthma and/or fear of being "interrogated" about their medications in front of peers, negative attitudes towards HCP-health care providers, forgetfulness, bad taste of drugs, oppositional behaviors (e.g., smoking, drinking alcohol) and interference between treatment and daily activities lead to the change in medication behavior during the adolescence period. (68)Data unfortunately also suggest that lack of health insurance is a negative predictor of adherence in both children and adolescents. (69)

To overcome the many barriers that impair to achieve a good compliance with treatment in adolescents, it is mandatory to view and treat teenagers with asthma as a special group. Consequences of poor adherence for adolescents with asthma include poor asthma control and greater asthma morbidity. In addition, poorly controlled asthma diminishes child and adolescent health-related quality of life and it is responsible for increased missed school days, emergency room visits, office visits, and inpatient care, resulting in a cost of more than one billion dollars per year. (70)

Considering both physiological and psychological aspects of adolescents, an optimal management plan for asthma treatment represents a challenge for clinicians. Symptoms monitoring, avoidance of triggers and strict adherence to the treatment plan are recognized to be three crucial factors for asthma control. Multiple steps and long-term strategies should be used to achieve a satisfactory compliance.

Educational plans, regular assessments and electronic devices are considered the most useful tools to improve adherence. Educational plans as a cornerstone of that improvement play a main role in motivating patients, to actively increase their own health literacy, and to take their own responsibility for their specific condition.

žBuilding an effective patient - HCP relationship during adolescence is crucial, and consists of five components: willingness of the patient to share a therapeutic plan; open discussion and evaluation of the available options; information about the pros and cons of the treatment modality; balanced conversation between the physician and the patient; a proper amount of time for the visit.

The support of other HCP such as nurses or pharmacists may also be very helpful in improving the adherence Table 2. (71)

Table 2. Adherence improvement steps
Tabela 2. Poboljšanje saradljivosti

Acceptation	*Patient agrees to take medicament*
Understanding	*Patient understands the role and conditions of treatment use (dosage, time and technique)*
Observance	*Patient takes medicament according to recommendation*
Perseverance	*Persistence of adequate treatment during the recommended period*

Of note, recent data evidenced a positive attitude towards tablets therapy in comparison with inhaled corticosteroids among the adolescents. (72)

The literature shows that perception (necessity and concerns) about asthma, its treatment and its comorbidities, satisfaction and expectation with respiratory allergies management are the most important factors to improve adherence. (73,74,75)

Accordingly, future research should be more focused on the use of simple questionnaires in order to assess the level of perception, knowledge, satisfaction and expectation with asthma and asthma treatment. Table 3

Table 3. Questionnaire on perception, satisfaction, expectation regarding asthma and asthma treatment
Tabela 3. Upitnik o shvatanjima, očekivanjima, zadovoljstvu u vezi astme i terapije

1. Do you believe that drugs are necessary for asthma control?
2. Do you have any concern about your asthma medications?
3. What do you expect from asthma treatment?
4. Are you satisfied with your asthma treatment?

The positive attitude towards the use of social media or mobile technology among adolescents opens the possibility for future studies to further explore the potential benefits of such interventions in adherence improvement and asthma control. (76,77)

According to recent studies self-management of asthma can now leverage new media technologies. Creation of one application for digital media resource was embraced by both parents and teens, particularly with respect to the possibility of receiving medication reminders, symptom and allergy alert, weather conditions that can alert asthma risk, and education about administering medication. In addition, parents or caregivers agreed on the fact that digital and media tools can help teens to remember them to refill medication.

Although teens are very active on social networking sites, the idea of a dedicated asthma support group has always been viewed with some fear. (78) As patients with asthma frequently use electronic devices, such as tablet computers and social media (e.g. Twitter, YouTube, on line networks) one of the most important role of the HCPs involved in their assessment is to provide quality educational material and information regarding asthma and its treatment. (79)

Since forgetfulness is one of the leading cause of missed appointments especially in young adults, mobile phone messaging applications such as Short Message Service (SMS) and Multimedia Message Service (MMS) could provide an important and inexpensive delivery tool. (80) Even so, the scientific literature provides little information about how such interventions affect patient outcomes.

Recent literature demonstrates that Mobile Health technology / mHealth technology can have a positive impact on the quality of life, self-efficacy and ability to monitor biochemical or physiologic markers of disease control across a wide array of illnesses. With the global improvement of the smart phone technology, they become widely used among all kinds of customers and it seems likely that there will be an increasing demand for this type of health care delivery from patients, particularly from adolescents who are usually very familiar with new technologies. (81)

Future studies should use these types of approaches to address the subject and to identify how they can be used in educational programs to improve adherence (82,83,84).

Many different special devices have been developed to allow self-management. Their main aim is to provide patients with immediate feedback about the disease status and remind them about the appropriate treatment schedule. MASK-rhinitis (MACVIA-ARIA Sentinel NetworK for allergic rhinitis) is a recent example based on the most widely used guideline in allergic rhinitis and asthma co-morbidity (ARIA 2015 revision).

Three tools have already been used for the electronic monitoring of allergic diseases: a mobile- phone daily-based visual analogue scale (VAS) assessment of disease control, CARAT (Control of Allergic Rhinitis and Asthma Test) and the e-Allergy screening (Premedical system of early diagnosis of allergy and asthma based on online tools). These tools, combined with a clinical decision support system (CDSS) are available in many languages. An e-CRF and e-learning tool is also available within MASK (85).

An important place of asthma in MASK allows to assess this co-morbidity also in AR patients. Education of adolescents and their parents is a cornerstone of any strategy to increase adherence, and it should not be limited to a routine visit. Other HCPs like nurses, pharmacists, general practitioners should be more involved in the educational plan for asthma management. The new media and Internet tools can be very helpful in education and in reinforcing information.

General practitioners should be more involved, since they play a key role in any long-term treatment, to support patients and to increase the adherence rate, as well as to educate patients about the possible risk factors and how to avoid them. (86) Although school personnel respect the value of cell phones for safety or as learning adjuvant tools, they still express concerns about their use for "sexing" or "cyber bullying". Before diffusing health related applications for school age children and adolescents on cell phones and mobile devices, school policies must declare how and under what circumstances.

Conclusions

Adolescence is a turbulent period of life with tremendous sudden physiological and psychological changes that may have an impact on asthma development and severity.

It is of great importance to identify the possible risk factors (sex hormones changes, obesity, physical activity or sedentary life style, bad nutritional habits, stressful events, tobacco, drugs and alcohol abuse) and to address them through tailored action plans.

The global burden of non-adherence is even higher in adolescence. All the above-mentioned, lead to poor asthma control and increase the incidence of exacerbation and hospitalization.

Considering all the obstacles, developing an optimal asthma management plan for adolescents represent a big challenge for physicians. Improving the knowledge on asthma and its treatment, as well as increasing the awareness of the use of appropriate treatments and focusing patients' expectations and satisfaction may lead to the improvement of adherence, thus of the overall wellbeing of the asthmatic adolescent.

The dramatic increase in social networks use, especially in adolescents and young adults, is leading health care researchers and professionals to further investigate the effects of these media on people with chronic diseases. Moreover, from a public point of view, social networks have already showed beneficial effects, both in driving health care system reforms and improving patients network.

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