Current concepts in Asthma control: Is it achievable?

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Abstract

Asthma control is the central focus of Global Initiative for Asthma (GINA) guidelines, which is defined as the extent to which the various manifestations of asthma observed in the patient are reduced or removed by treatment. It is determined by the interaction between the patient's genetic background, underlying disease processes, the treatment that they are taking, environment and psychological factors.

The long-term goals of asthma management are to achieve good symptom control, and to minimise future risk of exacerbations, fixed airflow limitation and side-effects of treatment. The patient's own goals regarding their asthma and its treatment should also be identified.

Several factors have been identified which contribute to failure in achieving asthma control despite adequate drug therapy. To assist in assessing asthma control, several validated questionnaires have been developed.

Despite the goal of asthma management is attaining optimal control; majority of asthmatics are not well controlled. Global surveys of asthma care have suggested only 5% of asthmatics meet the goals of asthma management as set out in guidelines.

Global multi centre research should be conducted especially in developing countries on asthma control to assess the impact and adequacy of asthma care in all the regions of the world.

Asthma is a heterogenous disease usually characterised by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation.[1]

International guidelines for asthma management indicate that the primary goal of therapy should be optimum asthma control. Asthma control refers to the extent to which the manifestations of asthma can be observed in the patient been reduced or removed by treatment.[1] It is determined by the interaction between the patient's genetic background, underlying disease processes, the treatment that they are taking, environment and psychological factors.[1,2]

Asthma control ranges from well controlled in which the patient is totally unimpaired and unlimited to extremely poorly controlled.[3] Several factors contribute to failure to achieve asthma control despite adequate drug therapy.

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Search methods

A literature search on the following words 'asthma control, factors affecting asthma control, paediatric, childhood, adolescents' was carried out using manual library research and journal publications on Pubmed/Medline, Google Scholar and EMBASE. Selection criteria for the identified publications were specified by subject matter based on their content of up to date information relating to factors affecting asthma control and asthma control studies. The relevant articles included original articles, case control studies and literature reviews.

The objective was to review factors affecting asthma control and asthma control studies conducted in children and adolescents.

Factors affecting asthma control

It has been shown worldwide that achieving and maintaining-paediatric asthma control is difficult.[4] The most important step in assessing asthma control is ensuring the correct diagnosis.[4] Access to and affordability of essential inhaled drugs, especially corticosteroids and short-acting bronchodilators, have been identified as major challenges to effective asthma control in many countries.[4] Factors influencing childhood asthma control may vary from one location to another as environmental, socio-odemographic, and household variables differ.

Several factors are associated with poor asthma control ranging from concomitant rhinitis[5,6] to poor compliance with medications[6-9] or inappropriate inhaler technique.[6,7] Others include co morbidities such as uncontrolled sinusitis, untreated gastroesophageal reflux and obesity.[6,9,10] Presence of infections may cause asthma exacerbation which may consequently give rise to poor asthma control.[11]

Home factors contribute to failure to achieve optimal asthma control. Parental smoking or smoking by other relatives within the home, biomass fuel exposure especially cooking with an open flame, aeroallergen exposure and specific parental/caregiver occupations or hobbies.

Global surveys of asthma care have suggested only 5% of asthmatics meet the goals of asthma management as set out in guidelines.[12] Lack of use of adequate anti-inflammatory medications has been identified as an important cause of poor asthma control. Evidence has shown that asthma therapy is dominated by the use of short acting reliever medication compared to inhaled corticosteroids (ICS).[12]

Another compounding factor to poor asthma control is under-diagnosis of the condition. Surveys from South Africa have suggested delay in asthma diagnosis.[14] Green suggested another reason for poor asthma control to be the fact that patients and doctors consistently over-estimate control.[1]

There are many other factors which can affect asthma control. Some of these are highlighted below:

Smoking

Children are more vulnerable to environmental tobacco smoke (ETS) than adults. This relates to the fact that children spend more time at home and have an underdeveloped respiratory and immune system.[15] Studies[15,16] have shown ETS to be associated with respiratory symptoms in children.

Passive tobacco smoke inhalation is a common environmental inciter of asthma in children. In Brazil, passive smoking was present in 43.8% of study population.[17] Finkelstein et al[18] reported household smokers to be 30%. Smoking by parents of asthmatic children can be as high as 86% regardless of asthma severity even though parents know the effects of passive smoking.[19] Parental smoking is associated with more severe disease and benefits to children are seen if parents stopped smoking after birth, even if the mother smoked during pregnancy.[16]

McGhan et al[20] in Edmonton assessed asthma control in children aged 5-13 years and found 75% of children were rated as having poorly controlled asthma, of which 51% had household tobacco smoke exposure.[20]

Halterman et al[21] reported 15.5% of children in United States were exposed to smoke in the home, withinadequate asthma control seen in 20.9% while 10.7% had suboptimal asthma control.[21] McLeish et al[22] found smoking to be associated with decreased asthma control, increased risk of mortality and asthma exacerbations.

Twenty-one (19.1%) of the children in a study in Ilesa, Nigeria had at least one family member who habitually smokes cigarette.[23]

Biomass fuel

About 3 billion people in the world use solid fuels of which 2.4 billion use biomass fuels as household energy.[24] Use of solid fuels in homes is the most widespread source of indoor air pollution worldwide especially in rural areas.[24] In developing countries, studies on biomass smoke in relation to asthma in children and adults have yielded mixed findings.[25] This exposure may act as an asthma trigger, has been associated with an increased prevalence of asthma[26] and may be a compounder to effective asthma control.

Women and children have largest exposure to indoor air pollution from cooking; exposure from heating may be similar in men and women.[27] Cooking and heating with biomass fuel can be as high as 90% in rural households in sub Saharan Africa,[28] which has been shown to be associated with increase in prevalence of asthma[29] and possible poor outcome.

In another study,[21] 20.5% of all asthmatic children were exposed to a fireplace or wood stove with 24.7% having inadequate asthma control.[21] Limited ventilation of homes is common in many developing countries which increases exposure, particularly for women and young children who spend much of their time indoors.[27]

Kerosene (paraffin)

Kerosene has been an important household fuel since the mid-19th century. In developed countries its use has greatly declined because of electrification. However, in developing countries, kerosene use for cooking and lighting remains widespread.[30]

Mohammed et al[31] observed that use of kerosene in Nairobi, Kenya was not associated with asthma exacerbation. Azizi et al[32] in a case-control study of hospitalised asthmatic children in Kuala Lumpur also made similar observation. Evidence of association between kerosene and asthma was found to be inconsistent in a meta-analysis conducted by Lam et al.[30] In Ilesha, Nigeria 82.7% of children studied use kerosene as a source of cooking fuel.[24]

Pets/poultry

The presence of pets or poultry in homes may also beassociated poor asthma control. Studies have implicated furry pets as triggers of asthma attack hence leading to poor control. In a multicentre study by Finkelstein et al,[18] 59% of households had furry pets including 32% cats and 39% dogs. Rosenstreichet al[33] found allergy to cat dander to be low, while Haltermanet al[21] found 39.6% of children with inadequate asthma control to have pets at home.

Carpets

Carpets are known to harbour house dust mites and removal of carpets from bedrooms or homes completely have been recommended by studies and guidelines.[5,34] Finkelstein et al[18] reported 78% of households in United States had bedroom carpeting. However, no strong evidence has been shown to support the removal of carpets from homes to improve asthma control.

Cockroaches

Cockroach allergy may be a cause of ongoing airway inflammation with sensitivity to cockroaches being a risk factor for more severe asthma.[5] Two South African studies reported cockroach sensitivity to be up to 40% in allergic children.[35,36] Lopata et al[37] reported high level of sensitisation to cockroaches in allergic children and adults living in South Africa.

Halterman et al[21] reported presence of cockroaches was seen in 20.4% of homes of children with inadequate asthma control and 13.8% of homes of those with suboptimal asthma control.

Assessment of asthma control

Achieving and maintaining optimal asthma control is a major asthma management goal advocated by GINA. It has been shown that despite widespread availability of effective therapies, asthma control often falls short of guideline standards.[38] Clinicians are encouraged to concentrate on assessing asthma control, defined by symptoms, lung function and the presence or history of exacerbations.[39] The Asthma Insights and Reality surveys[7] revealed a shortfall in the level of asthma control worldwide. While the majority of patients can achieve control of their asthma a significant minority cannot.[40] Furthermore, the level of control achieved and time taken to do so depends upon asthma measures utilised with more time required to attain control using composite measures.[41]

Recent evidence suggests that asthma control is clearly achievable in most asthmatics.[42] When control is achieved, asthmatic patient is able to lead a physically active and normal life. Assessment of asthma control is more valuable than assessment of

asthma severity.[43] Although assessments of asthma control may be desirable, Green et al[43] proposes such assessment tools fail to incorporate patient-specific goals of treatment and therefore the desired level of control is seldom reached.

The reasons for poor asthma control may be due to overestimation of control by both physicians and parents coupled with low expectations of achievable control.[9] Suboptimal asthma control in children and adolescents has been indicated by several surveys.[44-47]

Asthma control studies

It has been shown that complete asthma control is uncommon in children worldwide.[38] Previous reviews of surveys assessing asthma prevalence and control across the world have concluded that the majority of patients with asthma do not achieve adequate asthma control and under use controller medication.[7,48,49]

Previous studies have highlighted the lack of asthma control in children and adolescents.[9,44] Reasons have been shown to include poor adherence to treatment guidelines which may be related to their parents'insufficient knowledge about the asthma and also influence by parental beliefs and concerns about treatment.[51,52] However, poor inhaler technique, poor adherence or fear of steroid cannot be excluded as a cause for persistent poor control.[38]

Deger et al[11] from Montreal reported 36% of asthmatic children were found to have met at least one of the five criteria of poor asthma control.

Report by Stanford et al[53] and Liu et al[54] from the United States showed overall prevalence of uncontrolled asthma was 58% and 46% in adult and paediatric patients, respectively. The result for children was consistent with previously reported rates in primary care settings which ranges between 37%-64%.[13,55]

A worldwide survey on severity and control of asthma - Asthma Insight and Reality (AIR) survey conducted in 29 countries within North America, Europe and Asia (five regions) showed all the regions performing poorly against the different GINA goals.[7] All the regions showed most of the patients that were having moderate to severe symptoms believed their asthma to be well or completely controlled; however Africa was not included in the survey.

The AIR survey found the current level of asthma control in children is poor and falls far short of the goals in the GINA guidelines.[7] Only one in 20 children with asthma in Western Europe (5.8%) met all the GINA criteria for asthma control.[48] Other surveys have found high levels of inadequate asthma control in the Patient Outcomes Management Survey (POMS) in New Zealand, 90% of children had sub optimally controlled asthma[56] and 31% of children in the Hunair Study had moderate or poor asthma control.[45] Good asthma control was present in 25.7% of asthmatic children in a Switzerland study.[57]

Total or partial control of asthma symptoms was obtained in 85% of children seen at a paediatric reference centre in Brazil using the GINA guidelines.[17] Assessing quality of life with asthma control study, reported 40% of children were having uncontrolled asthma. They concluded that quality of life appears to be directly related to asthma control, being better when asthma is well controlled.[58]

A cross-sectional survey at the Asia-Pacific region[59] comprising 8 countries showed the region fall short of goals specified in international guidelines for asthma management.[58]Adachi et al[59] from Japan revealed 70% of adults and 60% of children with asthma reported some limitation on activities of daily living.[60] It was also found that pulmonary function tests had never been done in 50% of adults and 80% of children.[60] There was a large gap between subjective perception of asthma control and objective findings in patients with severe asthma which showed many Japanese asthmatics underestimate severity of their condition.[60] The study revealed only 5% of asthmatics met goals of asthma control which suggests asthma management in Japan falls far short of goals stated in the guideline.[60]

Green[61] highlighted several barriers that lead to poor asthma control in South Africa which ranged from health authorities, doctors, patients and environmental factors.

Garbaet al[62] studied the home factors that may affect asthma control in children and adolescents in Johannesburg, South Africa and reported 55.7% as having controlled asthma. Good adherence to medications was found to be associated with good asthma control, however none of the home factors were found to be associated with poor asthma control.[62]

A study of asthmatics and their practitioners was conducted in South Africa[12] which showed half of the patients classifying themselves as being not controlled, while the doctors classified only 33% of patients as being not controlled. This study suggests that asthma still appears to be relatively poorly controlled in South Africa.

Most studies done in Nigeria on asthma control were conducted in adults[49,63,64] than children.[24,65] Despite current management guidelines, asthma care is still inadequate in Nigeria and the level of asthma control is not optimal due to several factors.[63,64] Poor delivery of asthma care had a direct relationship with level of facilities and resources available in the hospitals.[63] Desalu et al[63] found that more than 70% of the tertiary hospitals studied lacked the basic infrastructure of asthma care like asthma clinics, asthma clinic registers and nurse educator. Furthermore, there was lack of attendance of asthma care training course by doctors.[63]

A study in Nigerian adult asthmatics[64] revealed 82.9% of patients had poor control with only 2.9% having total control. Additionally, more than half of the patients who perceived their asthma to be well or totally controlled were objectively assessed to be poorly controlled.[64] More than half of the patients used short acting β2 agonist alone and only 20% used ICS which showed level of asthma control was below guideline recommendations.[64]

In a survey of asthma patients in Ilorin, Nigeria, Desalu et al,[65] observed poor control among 69.0% of the patients with a significant association between poor inhaler technique, under-utilisation of ICS and the use of systemic steroids with uncontrolled asthma. Ozoh et al[49] demonstrated poor control among 52% of patients in Lagos, Nigeria. These studies highlight inadequate facilities and inappropriate medications used to manage asthmatics in Nigeria. An asthma control study of children in Enugu by Ayuk et al[65] reported only 16.7% of the children were well-controlled.

Kuti and Omole[67] and Kuti et al[24] reported from Ilesa, Nigeria 83.7% of the studied children had well-controlled asthma, while 17.3% had suboptimal asthma control which was partly controlled in 10.0% and uncontrolled in 7.3%. This may be a

reflection of the fact that most of the children had mild intermittent asthma.

Results from the various studies may have varied due to differences in environment, sample sizes, methodology and asthma control assessment tools used.

Conclusion

From the various reports highlighted in this review, it has been shown that globally, majority of asthmatics are not well controlled. There are multiple factors that can affect asthma control which can be modified by making the right diagnosis, identification of trigger factors, treatment of co-morbidities, adherence to treatment and the availability of medications. In addition, educating patients and their families.

Furthermore, there is need to regularly assess asthma control and manage trigger factors appropriately especially in children in order to achieve and maintain optimal asthma control. Clinicians should routinely assess asthma control in their clinics as this would ensure optimal care.

Global multi-centre research should be conducted especially in developing countries on asthma control to assess the impact and adequacy of asthma care in all the regions of the world.

Author declaration

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