

Original article

Underuse of controller medications in Egyptian asthmatic children

Background: International guidelines recommend daily use of controller medications for children with persistent asthma. Several studies from different regions of the world have reported low asthma control among children.

Objectives: To assess the frequency of underuse of controller medications in Egyptian children and to clarify the causes and predictors for this underuse.

Methods: This observational cross-sectional study was held over a 12-month-period in Zagazig University Hospitals, including 460 children with persistent asthma. All studied patients were submitted to careful history taking, proper medical examination and subsequent sharing, with their parents, in filling a previously designated Arabic asthma interview format concerning the disease course, medications, parents' beliefs about asthma, and causes of underuse.

Results: Of 460 children who have persistent asthma, 84.4% were underusers of controller therapy, with 63.5% reporting no controller use at all and 21.3% reporting improper use. More than half of the studied patients received their medications in emergency department (52.8%), and follow up with a general practitioner (52.2%) with less attendance to our outpatient asthma clinic (15.2%). The most important causes of underuse are non-prescription of controller drugs by managing physician (45%) and financial cost (28%). Furthermore, predictors of this underuse include false beliefs about asthma (OR = 56.2; 95% CI: 13.5-232, $P < 0.05$), negative family history of atopy (OR = 2.4; 95% CI: 1.10-5.18, $P < 0.05$), younger age of the patients ($P < 0.05$), and general practitioner as the treating physician (OR = 3.5; 95% CI: 1.99-6.16, $P < 0.05$).

Conclusion: There is high frequency of underuse of controller medications among Egyptian asthmatic children. Non-prescription of controller medications by managing physician and financial cost remain the most important direct causes of underuse.

Keywords: underuse; controller medications; bronchial asthma; children.

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INTRODUCTION

Asthma is a disease characterized by hyper-responsiveness of the airways to various stimuli, which results in airway obstruction that is reversible either spontaneously or as a result of treatment¹.

Asthma prevalence has increased very considerably in recent decades such that it is now one of the commonest chronic disorders in the world². In a recent Egyptian study, the overall prevalence of wheezing in the last year was 14.7% and of physician-diagnosed asthma was 9.4 %³.

The global burden of asthma is considerable. Its effects include reduced quality of life, lost productivity, missed school days, increased health

care costs, the risk of hospitalization and even death⁴.

Evidence-based international guidelines for asthma care suggest that asthma morbidity can be prevented with appropriate medications and outpatient management practices⁵. Although effective treatments that have been shown to reduce asthma morbidity dramatically are available, they are effective only when properly used by patients⁶.

Extensive research conducted in Australia, Canada, the United Kingdom, the United States and else-where has found that non-adherence to asthma therapy is widespread, and is a significant risk factor for asthma morbidity and mortality⁶. Studies suggest that only 50% of prescribed preventive

asthma medications are taken daily as directed⁷⁻⁹. A more thorough understanding of the patterns of controller medication underuse is needed to help clinicians to develop the most effective strategies for addressing this highly complex problem¹⁰.

So, the aim of the present work is to evaluate rates of underuse of asthma controller medications in Egyptian children and to clarify the causes and predictors for this underuse.

METHODS

This observational cross-sectional study was held over a 12-month-period in Zagazig University Hospitals, on asthmatic children attending either outpatient clinic or emergency room or admitted to the inpatient pediatric ward.

Four hundred and sixty asthmatic children were enrolled into the study. Inclusion criteria included; Diagnosis of bronchial asthma, age of more than three years, and presence of persistent symptoms (persistent asthma). Exclusion criteria included intermittent asthma and any chronic disease (other than asthma). The diagnosis and classification of severity of asthma in these patients were based on the National Asthma Education and Prevention Program Guidelines⁵ relying mainly on clinical examination and supportive history. Spirometry was not done for most patients. Furthermore, those patients were classified regarding their asthma control level into controlled, partly controlled or uncontrolled according to the Global Initiative for Asthma (GINA) recommendations.¹¹ Controller medication underuse was defined operationally as both having suboptimal control and not using a controller medication ≥ 6 days/week⁵.

All children were subjected to thorough history taking and careful clinical examination. A printed copy of a previously designed Arabic interview format was filled for every asthmatic child with answers being derived from his/her guardians. Collected data included child's age and sex, socio-economic status, asthma symptoms, parents' perception of nature of asthma (either acute or chronic diseases), needs for and concerns about controller medications, cause of underuse of therapy.

Informed consent was obtained from the children's guardians. The study protocol was approved by the Pediatric Department Ethics Committee of Zagazig University.

Statistical Analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS), release 16. The quantitative variables were expressed as means and standard deviations. For comparison between two group means, t-test was used. Qualitative variables were expressed by the frequency and percentage and compared using chi-square test. Also, odds ratio (OR) and 95% confidence interval (CI) were calculated. For all tests a probability (*P*) less than 0.05 was considered significant.

RESULTS

The characteristics of the study population are shown in table 1. Asthma prevalence increases in urban areas (60.2%) and among children with low socioeconomic levels (52%). More than half of the studied patients was managed by a general practitioner and receiving their asthma medications in the emergency room in the form of as-needed medications. There are considerable false beliefs about asthma among caregivers of asthmatic patients as being acute disease (53.3%). The vast majority (84.8%) of the studied group doesn't use controller medications properly, out of them, 63.5% hasn't used controllers at all and the remaining 21.3% has used it irregularly. Only 13.9% of our asthmatic children had their asthma under control, while 23.9% had partially controlled asthma and the majorities (62.2%) were totally uncontrolled.

Table 2 shows that physician- related issues represented the most important cause of underuse of controller medications (45%) followed by financial issues (28%) and then false behavior of stopping controller medications on feeling better (25.9%). It should be noted that, physician related issues refer to non-prescription of controller drugs by managing physician in spite of having uncontrolled asthma.

Effects of demographic and clinical characteristics and asthma beliefs on use of controller medications are shown in table 3. There were significant relationships between age of patient, family history of atopy, high socioeconomic level, managing physician as being chest specialist and follow up at our outpatient asthma clinic and the proper use of asthma controllers. Also, there was a highly significant relationship between asthma beliefs and the use of asthma controller medications ($P < 0.05$). Patients, whose parents had false beliefs about asthma were more susceptible to underuse of controller medications (OR = 56.2; CI : 13.5 - 232).

Table 1. Demographic and clinical characteristics of the study population.

Variable	
Age (year) , mean \pmSD	4.69 \pm 2.4
Male gender, n (%)	260 (56.5%)
Urban residence, n (%)	277 (60.2%)
Socioeconomic status, n (%)	
Low	244 (53%)
Middle	124 (27%)
High	92 (20%)
Family history of atopy, n (%)	
Positive	360 (78.3%)
Negative	100 (21.7%)
Duration of asthma (year)	
Mean \pm SD (range)	3.29 \pm 2.59 (0.5-12)
Managing physician	
Chest specialist	143 (31.1%)
Pediatrician	77 (16.7%)
General practitioner , others	240 (52.2%)
Place of asthma follow up	
Outpatient asthma clinic	70 (15.2%)
Private clinic	147 (32%)
Emergency room	243 (52.8%)
Use of controller medications	
Proper use	70 (15.2%)
Irregular use	98 (21.3%)
Not used at all	292 (63.5%)
Asthma control level	
Controlled	64 (13.9%)
Partly controlled	110 (23.9%)
Uncontrolled	286 (62.2%)
Asthma beliefs	
Acute disease	245 (53.3%)
Chronic disease	215 (46.7%)
Asthma health education	
Yes	192 (41.7%)
No	268 (58.3%)

Table 2. Causes of underuse of controller medications.

Causes	Number (%)
Physician-related	207 (45%)
Drug related	
Drug cost	129 (28%)
Fear of side effects	88 (19%)
Difficult use	71 (15.4%)
Unavailability	13 (2.8%)
Patient and family related	
Stopping drugs on feeling better	119 (25.9%)
Shy of inhaler intake	76 (16.5%)
Sense of no improvement	64 (14%)
Fear of adulthood dependence	57 (12.4%)
Irregular follow up	46 (10%)
Bored of many drug intake	42 (9.1%)
Forgetting prescribed dose	18 (4%)

Table 3. Effects of demographic and clinical characteristics and asthma beliefs on use of controller medications.

Variable	Patients using controller medication improperly (n=390)	Patients using controller medication properly (n=70)	OR	95% CI	P
Age (year) , mean \pm SD	4.5 \pm 2.3	5.86 \pm 2.6	-	-	<0.05
Male gender, n (%)	221 (56.7%)	39 (55.7%)	1.04	0.62-1.73	>0.05
Urban residence, n (%)	237 (60.8%)	40 (57.1%)	1.16	0.69-1.94	>0.05
Socioeconomic status, n (%)					
Low	212 (54.4%)	32(45.7%)	1.4	0.84-2.35	> 0.05
Middle	109 (27.9%)	15(21.4%)	1.7	0.91-3.07	> 0.05
High	69 (17.7%)	23(32.9%)	0.43	0.25-0.77	<0.05
Negative family history of atopy, n (%)	92 (23.6%)	8 (11.4%)	2.4	1.10-5.18	<0.05
Managing physician, n (%)					
Chest specialist	107 (27.4%)	36 (51.4%)	0.36	0.21-0.59	<0.05
Pediatrician	62 (15.9%)	15 (21.4%)	0.81	0.43-1.52	> 0.0
GP , others	221 (56.7%)	19 (27.1%)	3.5	1.99-6.16	<0.05
Follow up place, n (%)					
Asthma clinic	52 (13.3%)	18 (25.7%)	0.52	0.28-0.96	<0.05
Private clinic	120 (30.7%)	27 (38.6%)	0.71	0.41-1.19	>0.05
Emergency room	218 (56%)	25 (35.7%)	2.28	1.34-3.86	<0.05
Asthma beliefs, n (%)					
Asthma is an acute disease	243 (62.3%)	2 (2.9%)	56.2	13.5-232	<0.05
Asthma is a chronic disease	147 (37.7%)	68 (97.1%)			

DISCUSSION

This study revealed that, the majority (84.8%) of the studied group is not properly using asthma controller medications and consequently 86.1% of them were uncontrolled asthmatics. This result generally is in accordance with a similar study in Brazil¹² in which only 13% of the studied group reported proper controller medications use. Also, Finkelstein et al.¹³ found 72.9% of Medicaid-insured children with persistent asthma in the United States, were underusers of controller medications; approximately two thirds of these patients reported no use of anti-inflammatory agents.

Our study has revealed un-expectedly that, 45% of controller medications underuse causes were physician-related with non-prescription of controller medications for those with persistent asthma. This denotes that, some physicians are unaware of the new concepts of asthma management.

A recent Egyptian study¹⁴ was conducted to assess the physician's attitude towards asthma guidelines and their adherence to its recommendations. Poor knowledge was found in 28.5%, poor practice was found in 43.6% and poor

attitude was found in 14.4% of the studied physicians. Also, 66.5% of them prescribe inhalation corticosteroids as a controller only for short term therapy and 43.5% of them believe that this therapy affects the patient's growth significantly.

Also, Gharagozlou et al.¹⁵ reported that awareness about the standard guidelines among the Iranian pediatricians was low. Only 29% of them indicated that they would prescribe inhaled corticosteroids for a 6-year-old child with moderate persistent asthma. The reasons as they reported for this mismanagement were the existence of better choices for treatment of asthma and also the fear of the long term side effects of inhaled corticosteroids. In contrast to these results, the prescription of such inhalers by the studied physicians for similar patients was more than 80% in Turkey¹⁶.

Regarding drug and patient-related causes of underuse, the financial issue was the cause in 28% of patients which is largely attributed to the low socioeconomic class in more than half of the studied patients. Moreover, lack of asthma controller medications in the Egyptian health insurance service increases the magnitude of the problem. The fear of side effects was reported by

19% of patients, which is largely attributed to false beliefs about inhaled steroids. Stopping controllers during symptom-free periods was the cause of improper use in about 26% of patients which is attributed mainly to false beliefs about asthma as an acute disease necessitating short term treatment. False beliefs about asthma as a shameful disease with refusal of inhalational medications intake in front of others was found in 16% of patients.

On the contrary to these results, Green et al.¹⁷ conducted a large scale study in which, non-adherence to controller medications was attributed mainly to fear of side effects followed by financial and psychogenic causes and lastly poor patient compliance with asthma medications.

Our study revealed a significant relationship between patient's age and adherence to controller medications (p value <0.05) where it showed proper use of controller medications with older age groups perhaps because by time, parents realize the chronic nature of the disease. This is in agreement with the finding by Finkelstein et al.¹³ that the underuse varied with age, and was more common in children younger than 4 years compared with school-aged children.

Another important factor determining proper use of controller drugs was the socio-economic level with more adherence to controller medications among those with high socio-economic status (p value <0.05). These results are in accordance with those of Sarinho et al.¹². A previous study¹⁸ was conducted to assess physician's adherence to published international asthma guidelines in developing countries. They concluded that financial constraints were a greater obstacle to effective treatment of asthmatic patients.

Our study revealed also a favorable relationship between chest specialist as a treating physician and follow up in our asthma outpatient clinic with proper adherence to controller drugs. This can be attributed to proper health education about asthma in these circumstances. On the other hand, a significant relationship was found between general practitioner as being the managing physician and repeated visits to emergency room and improper use of controller drugs. Doerschug et al.¹⁹ demonstrated that asthma specialists performed better than general and family physicians on a multiple-choice test about asthma guidelines in areas of pharmacology and prevention. Moreover, Salama et al.¹⁴ demonstrated a positive significant correlation between qualification of physicians and their knowledge, practice and attitude towards asthma guidelines.

In our study, among the many factors affecting controllers underuse, false beliefs about asthma come as the most important factor. Most of drug-related or patient-related causes can be attributed to lack of proper health education about asthma as a chronic controllable non-shameful disease, with available efficient medications with least side effects and relatively low cost in comparison to its greater benefits. Smith et al.²⁰ concluded that children with controller medication underuse were significantly more likely to have parents who viewed asthma as an intermittent condition and had more concerns about asthma medications. Also, previous studies²¹⁻²³ have suggested a relationship between parental beliefs about their child's asthma medications and adherence to medications.

Our study revealed deficient health education about asthma in the studied group (only 41.7% received health education about asthma by their treating physician). The great role of proper health education about asthma as a chronic disease, necessitating long term management has been extensively studied. Previous studies^{24,25} concluded that health education about asthma, especially in a small-group, interactive format, improved clinically important outcomes and overall care of children with asthma.

There is high frequency of underuse of controller medications among Egyptian asthmatic children. Non-prescription of controller drugs by managing physician and financial cost remain the most important direct causes. Predictors of this underuse include false beliefs about asthma, low socioeconomic status, younger age of the patients, and general practitioner as the treating physician.

The study recommends adapting the international guidelines for asthma management to suit regional needs and circumstances, and training of health care professionals on the management and control of asthma. Public education about asthma is urgently required. Implementation of national plans for asthma control and provision of asthma medications in the health insurance system will help solve the problem.

REFERENCES

1. **WEINBERGER M, ABU-HASAN M.** Pseudo-asthma: when cough, wheezing, and dyspnea are not asthma. *Pediatrics* 2007; 120 (4): 855-64.
2. **ANANDAN C, NURMATOV U, VAN SCHAYCK O, SHEIKH A.** Is the prevalence of asthma declining? Systematic review of epidemiological studies. *Allergy* 2010; 65(2): 152-67.

3. **GEORGY V, FAHIM HI, EL GAAFARY M, WALTERS S.** Prevalence and socioeconomic associations of asthma and allergic rhinitis in northern Africa. *Eur Respir J* 2006; 28(4):756-62.
4. **BAENA-CAGNANI GE.** The global burden of asthma and allergic diseases: the challenge for the new century. *Curr Allergy Asthma Rep* 2001; 1(4):297-8.
5. National Asthma Education and Prevention Program. Expert Panel Report 3 (EPR-3): Guidelines for the Diagnosis and Management of Asthma-Summary Report 2007. *J Allergy Clin Immunol* 2007;120(5 Suppl):S94-138.
6. **BURKHART PV, SABATÉ E.** Adherence to long-term therapies: evidence for action. *J Nurs Scholarsh* 2003; 35(3):207.
7. **GIBSON NA, FERGUSON AE, AITCHISON TC, PATON JY.** Compliance with inhaled asthma medication in preschool children. *Thorax* 1995; 50(12): 1274 -9.
8. **GELAND M, GELLER RJ, PHILLIPS KM, ZIMAN R.** Treatment adherence among low-income children with asthma. *J Pediatr Psychol.* 1998; 23(6):345-9.
9. **BENDER BG, BENDER SE.** Patient-identified barriers to asthma treatment adherence: responses to interviews, focus groups, and questionnaires. *Immunol Allergy Clin North Am* 2005; 25(1):107-30.
10. **VALERIO M, CABANA MD, WHITE DF, HEIDMANN DM, BROWN RW, BRATTON SL.** Understanding of asthma management: Medicaid parents' perspectives. *Chest* 2006;129(3):594-601.
11. **KOSHAK EA.** Classification of asthma according to revised 2006 GINA: Evolution from severity to control. *Ann Thorac Med* 2007; 2(2):45-6.
12. **SARINHO E, QUEIROZ GR, DIAS ML, QUEIROZ E, SILVA AJ.** Asthma-related hospitalizations and lack of outpatient follow-up treatment. *J Bras Pneumol.* 2007; 33 (4): 365-71.
13. **FINKELSTEIN JA, LOZANO P, FARBER HJ, MIROSHNIK I, LIEU TA .** Underuse of controller medications among Medicaid-insured children with asthma. *Arch Pediatr Adolesc Med* 2002;156(6):562-7.
14. **SALAMA AA, MOHAMMED AA, ELOKDA EL SE, SAID RM.** Quality of care of Egyptian asthmatic children: Clinicians adherence to asthma guidelines. *Ital J Pediatr.* 2010; 36: 33-42.
15. **GHRAGOZLOU M, ABDOLLAHPOUR H, MOINFAR Z, BEMANIAN MH, SEDAGHAT M.** A survey of pediatricians' knowledge on asthma management in children. *Iran J Allergy Asthma Immunol* 2008;7(2):85-90.
16. **GIVELEK E, SEKEREL BE.** Management of childhood asthma: Physicians' perspective in Turkey. *Pediatr Allergy Immunol* 2004,15 (4): 372-5.
17. **GREEN R, DAVISB G, PRICEC D.** Perceptions, impact and management of asthma in South Africa: a patient questionnaire study. *Prim Care Respir J* 2008; 17(4): 212-6.
18. **WATSON JP, LEWIS RA.** Is asthma treatment affordable in developing countries? *Thorax* 1997; 52:605-7.
19. **DOERSCHUG KC, PETERSON MW, DAYTON CS, KLINE JN.** Asthma guidelines. An assessment of physician understanding and practice. *Am J Respir Crit Care Med* 1999, 159 (6): 1735-41.
20. **SMITH LA, BOKHOUR B, HOHMAN KH, MIROSHNIK I, KLEINMAN KP, COHN E, ET AL.** Modifiable risk factors for suboptimal control and controller medication underuse among children with asthma. *Pediatrics* 2008;122 (4);760-9.
21. **CONN KM, HALTERMAN JS, FISHER SG, YOOS HL, CHIN NP, SZILAGYI PG.** Parental beliefs about medications and medication adherence among urban children with asthma. *Ambul Pediatr* 2005;5 (5):306-10.
22. **CHAN PW, DEBRUYNE JA.** Parental concern towards the use of inhaled therapy in children with chronic asthma. *Pediatr Int* 2000; 42(5):547-51.
23. **HANDELMAN L, RICH M, BRIDGEMOHAN CF, SCHNEIDER L.** Understanding pediatric inner-city asthma: an explanatory model approach. *J Asthma.* 2004; 41(2):167-77.
24. **WATSON WT, GILLESPIE C, THOMAS N, FILUK SE, MCCOLM J, PIWNIUK MP, ET AL.** Small-group, interactive education and the effect on asthma control by children and their families. *CMAJ* 2009;181(5):257-63.
25. **COSTA MDD R, OLIVEIRA MA, SANTORO IL, JULIANO Y, PINTO JR, FERNANDES AL.** Educational camp for children with asthma. *J Bras Pneumol* 2008; 34(4):191-5.