Original article

Health-related quality of life assessment using EQ-5D-Y questionnaire in a group of Egyptian asthmatic children

Background: Asthma, as a common chronic illness, negatively influences children's quality of life. We sought to investigate the health-related quality of life (HRQoL) in a sample of Egyptian asthmatic children. Methods: A cross-sectional study was conducted in the Pediatric Allergy and Immunology Unit of Ain Shams University, including three groups of age and gender-matched children, aged 6-12 years; an asthma group (n=100), non-asthmatic group with respiratory tract infections (n=114), and a healthy control group (n=100). The EQ-5D-Y questionnaire was used to evaluate the HRQoL in each study group. This questionnaire also comprises a visual analogue scale (VAS) which is scored from zero (worst) to 100 (best) as judged by the patient. Results: HRQoL assessment revealed that 86% of the asthmatic children faced problems with their daily activities, 43% had worries, sadness and unhappiness and 22% had mobility problems (walking around). Thirteen percent of the cases expressed some pain or discomfort due to their disease, while self-care was the least affected (6%). Parameters of mobility, doing usual activities, feeling worried or sad were more frequently affected among the asthmatics in comparison to the other two groups (X2 = 37.02, 46.38, 22.90, respectively with p <0.001). Enrolled asthmatic children showed the lowest values of visual analogue scale (VAS) scores (mean ± SD: 72.2 ± 24.6) in comparison to the infection and healthy control groups (mean ± SD: 84.6 ± 12, 92.8 ± 9.6, respectively; f = 39.03; p value = 0.001). Conclusion: Asthma has a significant adverse impact on HRQoL of children and the EQ-5D-Y questionnaire could be an applicable instrument to measure their quality of life.

Keywords: Asthma, children, EQ-5D-Y, GINA, quality of life, visual analogue scale.

INTRODUCTION

Quality of life is defined as the perception that individuals have of their position in life, in the context of the culture and system of values in which they live and in relation to their objectives, expectations, standards, and concerns. Quality of life can change according to the environment and the experiences, as well as in response to certain diseases. Asthma is a common chronic health care problem in children and adolescents. Current clinical practice guidelines emphasize that the overall goal of asthma management is to achieve asthma control. The quality of life of children and adolescents with asthma deserve special attention, because asthma affects not only the individuals with the disease, but also their caregivers, thereby altering the family's normal life activities.

We sought to investigate the health-related quality of life (HRQoL) in a group of asthmatic children in relation to their asthma severity and symptom control. We used the EQ-5D-Y questionnaire, which is a generic, youth-specific and age-appropriate measure of HRQoL. In comparison to other questionnaires, EQ-5D-Y questionnaire is relatively short, easy and quick to fill, with age-appropriate wording and a short recall period and time frame to avoid comprehension and memory problems. This questionnaire has already proved its applicability in various indications and populations. This questionnaire also comprises a visual analogue scale (VAS) which is scored from zero (worst) to 100 (best) as judged by the patient.

METHODS

Study design: We conducted an observational, cross-sectional, analytical study that was carried out at the Pediatric Allergy and Immunology unit,
Children’s Hospital, Ain Shams University during the period from April 2018 to May 2019.

**Study subjects:** The study included three gender and age-matched groups of children. The first group comprised 100 children, aged 6-12 years, with physician-diagnosed persistent asthma with/without other allergic disorders. Two control groups were recruited; the infection group (n=114) included children presenting with acute upper and/or lower respiratory tract infections not necessitating hospital admission and no present or past history suggestive of asthma. The third study group comprised 100 clinically healthy children. Patients having chronic illness other than asthma, or those having significant social, medical or environmental problems unrelated to asthma were excluded from the study.

**Ethical Considerations:** Informed consent was obtained from the parents before enrollment and after explanation of the aim of the study. The study protocol gained approval of the local Ethics Committee of the Pediatric Department, Ain Shams University - Cairo, Egypt.

**Study Methods:**

- Detailed clinical evaluation was conducted including frequency of asthma symptoms, severity, duration, treatment received and adherence to treatment, exacerbations, hospitalization frequency and the presence of other allergic disorders. Physical chest examination was performed at enrollment for the presence of wheeze and signs of respiratory distress. Asthma severity over the past three months and asthma control over the past month were assessed according to GINA.

- Assessment of HRQoL was done by using the EQ-5D-Y questionnaire. The EQ-5D-Y descriptive system comprises the following five dimensions:
  1. Mobility
  2. Looking after myself
  3. Doing usual activities
  4. Having pain or discomfort
  5. Feeling worried, sad or unhappy

  - Each dimension has three levels: no problems, some problems and a lot of problems. The decision results in a one-digit number that expresses the level of severity selected for that dimension (1 indicates no problems, 2: Some problems and 3: a lot of problems). The digits for the five dimensions can be combined into a five-digit number that describes the patient’s health state and is named “health profile”. The EQ-5D-Y questionnaire also comprises an additional visual analogue scale (VAS). It records the patient’s self-rated health on a vertical visual analogue scale where the endpoints are labelled “The best health you can imagine”-scored 100 and “The worst health you can imagine”-scored zero. The VAS can be used as a quantitative measure of health outcome that reflects the patient’s own judgement.

- Subjects were interviewed in the presence of their parents/caregivers and the questionnaire was interpreted by the same researcher for all subjects.

**Statistical methods**

Data were analyzed using IBM® SPSS® Statistics version 23 (IBM® Corp., Armonk, NY). Numerical variables were presented as mean and SD and inter-group differences were compared using one-way analysis of variance (ANOVA) with application of the Tukey test for post hoc comparison if needed. Categorical variables were compared using the Pearson chi-squared test or Fisher’s exact test when appropriate. Ordinal data were compared using the chi-squared test for trend. Associations between ordinal and continuous variables were tested using the Spearman rank correlation. Rank bi-serial correlation was used to test the association between ordinal and nominal variables. Associations between continuous and nominal variables were tested using point bi-serial correlation. Probability values less than 0.05 were considered significant.

**RESULTS**

The age and gender distribution of enrolled children are shown in table 1. Among the 100 enrolled asthmatic children, 19% had controlled asthma, 51% had partly controlled asthma and 30% had uncontrolled asthma. According to asthma severity, 58% of patients were categorized as mild to moderate and 42% as severe.

Sixty-four asthmatic children (64%) presented for follow up without having asthma exacerbation. Sixty-Six patients had associated allergic disorders, with allergic rhinitis/rhinosinusitis the most frequently reported (n=56; 56%). Other associated allergies included urticaria/angioedema (9%), allergic rhino conjunctivitis (6%), and eczema (4%). Concerning asthma medications, all cases were on inhaled corticosteroids (ICS) with 24 % on low dose, 70% on medium dose and 6 % on high dose ICS. Systemic corticosteroids (SCS) were received by only 4% while, 58% were on leukotriene receptor antagonists (LTRA). Sixteen patients were receiving regular oral vitamin D therapy. Ninety-two percent of the cases were
adherent to their asthma treatment as reported by their parents.

HRQoL in the asthma group

**Dimensions of the EQ-5D-Y questionnaire**
The data showed that 86% of the asthma children faced problems with their daily activities (74% of them had some problems and 12% had a lot of problems). Also, 43 patients with asthma suffered from emotional problems in the form of worries, sadness or unhappiness in relation to their illness (31 patients), while 12 had several of these emotional problems (12 patients). Mobility was adversely affected in 22% of the cases expressed some pain or discomfort due to their disease, while self-care was the least commonly affected among asthmatics (6%). These results are demonstrated in Figure 1.

**Associations between the EQ-5D-Y questionnaire dimensions and asthma patients’ characteristics**

(Tables 2 and 3)

Mobility problems: were positively associated with age, disease duration, asthma control and use of inhaled long acting beta-2 agonists (LABA) as well as moderate positive association with the VAS score results. The dimension of doing usual activities showed a strong positive association with VAS score and moderate positive association with the degree of asthma control, but weak positive association with the asthma disease duration, and intake of SCS and its dose, leukotriene receptor antagonist (LTRA) and LABA. The parameter of having pain or discomfort showed a strong positive association with the VAS scores, but the association was weak with age, intake of SCS and its dose and asthma control. Feeling worried, sad or unhappy showed strong positive association with the VAS scores but was moderately associated with age, asthma duration and control. Weak positive associations were found in relation to asthma exacerbations and LABA use, and inverse association with adherence to asthma treatment. The VAS scores correlated negatively to age, frequency of asthma exacerbations, or SCS dose, LABA use, asthma duration and level of asthma control.

**Comparison between the study groups**

**EQ-5D-Y dimensions:** Parameters of mobility, doing usual activities, feeling worried or sad were more frequently impacted among the asthmatic children in comparison to the other two groups ($X^2 = 37.02, 46.38, \text{and} 22.89$, respectively; $p <0.001$).

On the other hand, the parameter of having pain or discomfort was most commonly affected among the infections’ group in comparison to the other two groups. The parameter of looking after myself was comparable among the three studied groups (Table 4).

**VAS score:** Asthmatic patients had the lowest VAS scores (range: 10-100; mean± SD: 72.2 ± 24.6) in comparison to the infection and healthy control groups (mean± SD: 84.6 ± 12.2 and 92.8 ± 9.6, respectively; $f=39.03$, $p$-value = 0.001).

**Health profiles**

We outlined 32 different health profiles in this study. The three study groups varied significantly in their health profiles according to the EQ-5D-Y questionnaire ($p<0.001$). Among asthmatics, there were 22 different health profiles, most common (39%) of which was 11211 (some problems in all dimensions). The second most common reported health profile was 11221 (some problems with doing usual activities and having pain or discomfort) being expressed in about 51% of patients. The health profile 11111 (no problems in all five dimensions of the questionnaire) was expressed in 27% of healthy control, 13% of asthmatics and 3.5% of the infection group.

### Table 1. Demographic characteristics of the three study groups

| Variable         | Bronchial Asthma (n=100) | Infections (n=114) | Healthy Control (n=100) | F       | p value* |
|------------------|--------------------------|--------------------|------------------------|---------|----------|
| Age (years)      | 8.3 ± 2.1                | 8.3 ± 1.8          | 8.2 ± 1.9              | 2,311   | 0.815*   |
| Gender (F/M)     | 38/62                    | 54/60              | 48/52                  | -0.204  | 0.285#   |

Data are mean ± SD or ratio; *One-way analysis of variance (ANOVA); #Fisher’s exact test.
### Table 2. Correlation between different EQ-5D-Y dimensions and other variables in asthmatic children

| Variable | Coefficient | Mobility | Looking after myself | Doing usual activities | Having pain or discomfort | Feeling worried, sad or unhappy | VAS score |
|----------|-------------|----------|----------------------|-----------------------|---------------------------|--------------------------------|-----------|
| **Age**  | Coefficient | .323**   | .164                 | .067                  | .207*                     | .418**                         | -.348**   |
|          | P-value     | .001     | .103                 | .507                  | .039                      | <.001                          | <.001     |
| **Gender** | Coefficient | .068     | -.149                | .051                  | .058                      | .075                           | -.062     |
|          | P-value     | .504     | .138                 | .614                  | .569                      | .456                           | .539      |
| **Disease duration** | Coefficient | .205*    | -.102                | .274**                | .144                      | .424**                         |-.421**   |
|          | P-value     | .041     | .314                 | .006                  | .154                      | <.001                          | <.001     |
| **Exacerbations** | Coefficient | .205*   | .104                 | .070                  | .072                      | .339**                         | -.267**   |
|          | P-value     | .040     | .302                 | .490                  | .479                      | .001                           | .007      |
| **Associated allergies** | Coefficient | -.150    | .251*                | .052                  | -.080                     | .059                           | -.039     |
|          | P-value     | .136     | .012                 | .607                  | .431                      | .557                           | .702      |
| **Asthma severity** | Coefficient | .043    | -.125                | .057                  | .155                      | .007                           | -.001     |
|          | P-value     | .673     | .217                 | .575                  | .124                      | .944                           | .995      |
| **Asthma control** | Coefficient | .339**  | .021                 | .537**                | .291**                    | .450**                         | -.542**   |
|          | P-value     | .001     | .837                 | .001                  | .003                      | <.001                          | <.001     |

* Correlation is significant at the 0.05 level (2-tailed).  
** Correlation is significant at the 0.01 level (2-tailed).
Table 3. Correlation between different EQ-5D-Y dimensions and medications, compliance and VAS score in asthmatic children

| Variable                | EQ-5D-Y Dimension                  | Mobility    | Looking after myself | Doing usual activities | Having pain or discomfort | Feeling worried, sad or unhappy | VAS score |
|-------------------------|------------------------------------|-------------|----------------------|------------------------|---------------------------|---------------------------------|-----------|
| Systemic steroids       | Coefficient                        | .138        | -.052                | .207*                  | .225*                     | .047                            | -.129     |
|                         | P-value                            | .171        | .610                 | .039                   | .025                      | .643                            | .200      |
| Prednisone dose         | Coefficient                        | .143        | -.052                | .207*                  | .231*                     | .048                            | -.130     |
|                         | P-value                            | .156        | .610                 | .039                   | .021                      | .634                            | .199      |
| Inhaled steroids        | Coefficient                        | .022        | .151                 | -.069                  | .055                      | -.121                           | .062      |
|                         | P-value                            | .829        | .134                 | .494                   | .585                      | .230                            | .543      |
| LTRA                    | Coefficient                        | .012        | -.126                | .206*                  | .088                      | .194                            | -.157     |
|                         | P-value                            | .908        | .211                 | .039                   | .384                      | .053                            | .118      |
| LABA                    | Coefficient                        | .278**      | -.021                | .264**                 | .030                      | .373**                          | -.207*    |
|                         | P-value                            | .005        | .835                 | .008                   | .769                      | <.001                           | .039      |
| Vitamin D              | Coefficient                        | .163        | .119                 | -.036                  | -.006                     | .124                            | -.039     |
|                         | P-value                            | .105        | .237                 | .725                   | .949                      | .218                            | .702      |
| Compliance              | Coefficient                        | -.199*      | -.236*               | -.155                  | -.105                     | -.226*                          | .174      |
|                         | P-value                            | .047        | .018                 | .125                   | .297                      | .024                            | .083      |
| VAS score               | Coefficient                        | -.452**     | -.323**              | -.641**                | -.419**                   | -.860**                         |           |
|                         | P-value                            | <.001       | .001                 | <.001                  | <.001                     | <.001                           |           |

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).
Table 4. Results of EQ-5D-Y questionnaire in the three studied groups

| EQ-5D-Y dimension            | Parameter affection | Bronchial Asthma (n=100) | Infection group (n=114) | Healthy controls (n=100) | $\chi^2$(1) | p-value* |
|------------------------------|---------------------|--------------------------|--------------------------|--------------------------|-------------|----------|
|                              | n                   | %                        | n                        | %                        |             |          |
| Mobility                     | No problems         | 78                       | 78.0%                    | 114                      | 100.0%      | 100.0%   | 37.024 | <0.001 |
|                              | Some problems       | 22                       | 22.0%                    | 0                        | 0.0%        | 0.0%     |        |        |
|                              | A lot of problems   | 0                        | 0.0%                     | 0                        | 0.0%        | 0.0%     |        |        |
| Looking after myself         | No problems         | 94                       | 94.0%                    | 104                      | 91.2%       | 100.0%   | 3.710  | 0.054  |
|                              | Some problems       | 6                        | 6.0%                     | 10                       | 8.8%        | 0.0%     |        |        |
|                              | A lot of problems   | 0                        | 0.0%                     | 0                        | 0.0%        | 0.0%     |        |        |
| Doing usual activities       | No problems         | 14                       | 14.0%                    | 14                       | 12.3%       | 52       | 46.379 | <0.001 |
|                              | Some problems       | 74                       | 74.0%                    | 95                       | 83.3%       | 48       |        |        |
|                              | A lot of problems   | 12                       | 12.0%                    | 5                        | 4.4%        | 0        |        |        |
| Having pain or discomfort    | No problems         | 87                       | 87.0%                    | 21                       | 18.4%       | 49       | 22.897 | <0.001 |
|                              | Some problems       | 13                       | 13.0%                    | 81                       | 71.1%       | 50       |        |        |
|                              | A lot of problems   | 0                        | 0.0%                     | 12                       | 10.5%       | 1        |        |        |
| Feeling worried, sad or unhappy | No problems         | 57                       | 57.0%                    | 106                      | 93.0%       | 100      | 61.518 | <0.001 |
|                              | Some problems       | 31                       | 31.0%                    | 7                        | 6.1%        | 0        |        |        |
|                              | A lot of problems   | 12                       | 12.0%                    | 1                        | .9%         | 0        |        |        |

Data are number (n) and percentage (%); $\chi^2$ = chi-squared statistic; *Chi-squared test for trend.

Figure 1. EQ-5D-Y dimensions among the studied asthmatic children.
DISCUSSION
We applied a HRQoL questionnaire on a group of asthmatic Egyptian children aiming to investigate the real impact of asthma on their quality of life. HRQoL was estimated among the asthmatic Egyptian children before but none of the studies used the EQ-5D-Y questionnaire.10-13 Healthy children might have their quality of life affected owing to several factors including multidimensional poverty, crowdedness and multiple deprivations related to lack of access to services and support mechanisms. It is estimated that 28% of Egyptians are living below the national monetary poverty line.14 We enrolled children from a university hospital that offers medical care for economically unprivileged patients. A group of children with respiratory tract infections was included as a second control group as infection is quite prevalent in Egyptian children whether asthmatic or not especially in the context of malnutrition and poor living conditions.15-17

The three groups enrolled were quite matched in terms of age, gender and socioeconomic status. The study revealed that HRQoL is adversely affected in the asthmatic group; this was noticeable from their health profiles and VAS scores. It involved all aspects of children’s lives namely social, mental, physical and emotional. Our findings are consistent with many previous studies that investigated and discussed the impact of asthma on HRQoL and reported significant adverse effects.9,18,19

The most affected aspect in the asthmatic group in our series was the physical function with problems in the "doing usual activities" dimension. The asthmatic children stated that the main issue with activity limitation was in their school absenteeism affecting their scholastic achievement, in addition to the impact on their playing with peers and doing sports. The ability to do their daily routine tasks with their families was also impaired. This item of the questionnaire showed significant positive association with the asthma duration, asthma control and VAS score. Furthermore, it correlated significantly with the need of add-on controllers (LTRA and LABA) and the required systemic corticosteroid dose to control symptoms. Noteworthy, only 19% of our series had controlled asthma while 51% had partly controlled and 30% had uncontrolled asthma.

In agreement with our findings, a study on Brazilian children and adolescents with asthma (7-17 years old) revealed that the activity limitation domain was lowest in comparison to other domains of the Pediatric Asthma Quality of Life Questionnaire (PAQLQ); this was more obvious in the children with poorest asthma control and greatest asthma severity.20 Similar findings were reported as well by Josie et al. in disadvantaged
African American youth. EQ-5D-Y performed better than other generic questionnaires such as PedsQL 4.0 which was not sensitive enough to distinguish HRQoL between children with different levels of asthma severity and control in relation physical activity.

Mobility also was adversely affected among our series as 22% had some problems walking around. The main influencing factors on this dimension were age, disease duration and asthma control. Poor asthma control limits the mobility of asthmatic children. In addition, increased disease duration might be associated with more structural airway changes, further limiting the ability to walk about. Remberg and colleagues noted that asthmatic children and adolescents who need regular asthma treatment have reduced functional capacity and exhibit a sedentary behavior.

The dimension of feeling worried, sad or unhappy was the second most affected parameter of HRQoL in our asthmatic group as 31% of children reported some problems within this dimension and 12% suffered a lot of problems. Interviewed children attributed that feeling to their fears of having exacerbations in an inappropriate place or in front of their friends. Bergfors et al. studied 94 Swedish children with asthma, aged 8 to 16 years. They used the EQ-5D-Y and the pediatric asthma quality of life (PAQLQ) questionnaires and found that, emotional and mental aspects were significantly affected. In the same context, Shankar et al. used the Center for Epidemiological Studies Depression Scale and found that 28% of 277 urban asthmatic adolescents had depressive symptoms that were associated with less sleep and impaired physical activity. In a relevant study, a generalized anxiety disorder and emotional dependency of asthmatic children on their care givers were observed. These observations collectively show the importance of psychological support to patients and caregivers in the context of asthma management.

We demonstrated that the emotional status of asthmatic children is significantly influenced by age, asthma duration, presence of exacerbation and poor asthma control. As children grow-up, they become emotional and stressed due to pubertal changes and their disease perception especially when they have partial or poor asthma control. In a study that comprised 140 Egyptian asthmatic children, the authors noted that poor access to medications was one of the factors that adversely affected the patient PAQLQ scores. On the other hand, having emotional problems reduces the patients’ adherence to treatment leading to reduced level of asthma control.

Having pain or discomfort was affected in only 13% of our asthma patients. The affection of this dimension is expected to occur with acute rather than chronic medical illnesses during asthma exacerbations and may be linked to poor asthma control. The dimension named looking after myself was the least affected one among the studied asthmatic patients with some problems only in 6%. Impaired self-care would be expected during acute severe asthma exacerbation with marked compromise of respiratory functions while our series comprised outpatients. This dimension was associated with the presence of other concomitant allergies which might compromise their ability to self-administer excessive medications.

Asthma control but not asthma severity had significant impact on the results of the EQ-5D-Y questionnaire as far as several parameters were concerned including mobility, doing usual activities, having pain or discomfort, and feeling worried, sad or unhappy as well as the VAS score. Asthma control is probably the most valuable determinant of HRQoL whatever the level of disease severity.

Nevertheless, a proportion of our asthmatic children (13%) reported no problems in all the 5 dimensions. This was previously reported by Bergfors et al who used the PAQLQ in addition to the EQ-5D-Y and found that 50% of their asthma children had a health profile of 11111 denoting no problem. This observation was considered by some investigators to reflect a ceiling effect which means that the EQ-5D-Y might not be able to operate when the participant’s status is close to full health.

Expectedly, the most frequent reported health profile in our asthma patients was 11211 that points to having some problems in doing usual activities. Among the infection group participants, the health profile 11111 represented only 3.5%, while the most commonly reported profile was 11221 (having pain and discomfort and difficulty in doing usual activities). The observation reflects the ability of the EQ-5D-Y questionnaire to reflect acute health problems including acute infections making them feel pain or discomfort.

In conclusion, our results indicate that bronchial asthma has a significant adverse impact on HRQoL of children and that EQ-5D-Y questionnaire could be a valuable instrument to assess it. The asthmatic children had impaired parameters of doing usual activities, having pain or discomfort, and feeling worried, sad or unhappy, as well as limited
mobility. The findings are indeed limited by the sample size and cross-sectional study design. The consecutive manner of enrollment hindered the distribution of the sample according to severity and level of control. We recommend the integration of asthma-related QoL assessment and psychosocial screening to the routine pediatric asthma care to improve the well-being of the children. Prospective wider-scale studies are needed to confirm our conclusions. Translation and validation of the EQ-5D-Y questionnaire into the Arabic language is also needed to be more feasible and to decrease bias during the interpretation of the results.

REFERENCES

1. La Scala CS, Naspitz CK, Solé D. [Adaptation and validation of the Pediatric Asthma Quality of Life Questionnaire (PAQLQ) in Brazilian asthmatic children and adolescents]. J Pediatr (Rio J) 2005; 81(1):54-60.

2. de Benedictis FM, Attanasi M. Asthma in childhood. Eur Respir Rev 2016; 25(139):41-7.

3. Dean BB, Calimlim BC, Sagoo P, Asgilar D, Maykut R, Tinkelman D. Uncontrolled asthma: assessing quality of life and productivity of children and their caregivers using a cross sectional Internet-based survey. Health Qual Life Outcomes 2010; 8:96.

4. Stelmach I, Podlecka D, Smejda K, Majak P, Jerzyńska J, Stelmach R, et al. Pediatric asthma caregiver’s quality of life questionnaire is a useful tool for monitoring asthma in children. Qual Life Res 2012; 21(9):1639-42.

5. Ravens-Bieberer U, Wille N, Badia X, Bonzel G, Burström K, Cavarini G, et al. Feasibility, reliability and validity of the EQ-5D-Y: results from a multinational study. Qual Life Res 2010; 19:887-97.

6. Kreimeier S, Breiner W. EQ-5D-Y as a health-related quality of life instrument for children and adolescents: The instrument’s characteristics, development, current use, and challenges of developing its value set. Value Health 2019; 22(1):31-7.

7. EQ-5D-Y User Guide. Basic information on how to use the EQ-5D-Y instrument. http://www.euroqol.org/fileadmin/user_upload/Documenten/PDF/Folders_Flyers/EQ-5D-Y_User_Guide_v1.0_2014.pdf.

8. GINA. Global Initiative for Asthma guidelines. Global Strategy for Asthma Management and Prevention, 2018. Available from: www.ginasthma.org. Accessed on March, 2018.

9. Bergfors S, Aström M, Burström K, Esgar AC. Measuring health-related quality of life with the EQ-5D-Y instrument in children and adolescents with asthma. Acta Paediatr 2015; 104(2):167-73.

10. Abdel Hai R, Taher E, Abdel Fattah M. Assessing validity of the adapted Arabic Paediatric Asthma Quality of Life Questionnaire among Egyptian children with asthma. EMJI 2010; 16(3): 274-80.

11. Al-Gewely MS, El-Hosseiny M, Abou Elezz NF, El-Ghoneemy DH, Hassan AM. Health-related quality of life in childhood bronchial asthma. Egypt J Pediatr Allergy Immunol 2013; 11(2):83-93.

12. Elshazly H, El Mahalawy II, Gabr HM, Abd El Naby SA, Elzoghby EE. Quality of life among asthmatic children attending the Outpatient Clinic in Menoufia University Hospital. Menoufia Med J 2015; 28(2):442-6.

13. Elsady HG, Sherif LB, Sabry RN, Abu Zeid D, Atta H, Hassanai AI, Fouad WA, et al. Relation of asthma control with quality of life among a sample of Egyptian asthmatic school children. Open Access Macedonian Journal of Medical Sciences 2019; 7(17): 1-6.

14. UNICEF Annual Report 2017. Visited at: https://www.unicef.org/annual report. 2017.

15. Hassan EM, El-Meneza SA, El-Rashidy Z, Rashad R, Rabie S, Fahmy SA. Detection of entero-pathogens in diarrheal diseases among malnourished Egyptian infant and children. J Egypt Public Health Assoc 1989; 64(5-6):461-74.

16. Labib Jr, El Shafei AM, Haggab AA. The clinical profile of students attending informal schools in three rural governorates in upper Egypt: a community-based study. J Egypt Public Health Assoc 2013; 88(3):153-9.

17. Azab SF, Sherief LM, Saleh BH, Elsaeed WF, Elshaief MA, Abdellam SM. Impact of the socioeconomic status on the severity and outcome of community-acquired pneumonia among Egyptian children: a cohort study. Infect Dis Poverty 2014; 3:14.

18. Hobbny E, Caraballo L, Cabale T, El-Gamal Y, Robenwarber L. Severe asthma and quality of life. World Allergy Organ J 2017; 10(1):28.

19. Lozier MJ, Zahran HS, Bailey CM. Assessing health outcomes, quality of life, and healthcare use among school-age children with asthma. J Asthma 2019; 56(1): 42-9.

20. Matsunaga NY, Ribeiro MA, Saad IA, Morcillo AM, Ribeiro JD, Toro AA. Evaluation of quality of life according to asthma control and asthma severity in children and adolescents. J Bras Pneumol 2015; 41(6):502-8.

21. Jobie KL, Greenley RN, Droton D. Health-related quality-of-life measures for children with asthma: reliability and validity of the Children's Health Survey for Asthma and the Pediatric Quality of Life Inventory 3.0 Asthma Module. Ann Allergy Asthma Immunol 2007;98(3):218-24.
22. Silva AA, Maciel ÁC, Furtado PR, Tomaz RR, Macêdo TMF, Mendonça KM. Applicability of a generic questionnaire for quality of life assessment for asthmatic children. Rev Paul Pediatr 2018; 36(2):207-13.

23. Bai TR, Knight DA. Structural changes in the airways in asthma: observations and consequences. Clin Sci (Lond) 2005; 108 (6): 463–77.

24. Reimberg MM, Pachí JP, Sogolo RS, Serra AJ, Fereandes L, Politti F, et al. Patients with asthma have reduced functional capacity and sedentary behavior. J Pediatr (Rio J) 2018. pii: S0021-7557(18):30555-2.

25. Shankar M, Fagnano M, Blaakman SW, Rhee H, Halterman JS. Depressive Symptoms Among Urban Adolescents with Asthma: A Focus for Providers. Acad Pediatr 2019; 19(6):608-14.

26. Doğru H, Sürer-Adanır A, Özatalay E. Psychopathology, health-related quality-of-life and parental attitudes in pediatric asthma. J Asthma 2019; 56(11):1204-11.

27. Holley S, Morris R, Kniss R, Latter S, Liossi C, Mitchell F et al. Barriers and facilitators to asthma self-management in adolescents: A systematic review of qualitative and quantitative studies. Pediatr Pulmonol 2017; 52(4):430-42.

28. Winn CON, Mackintosh KA, Eddolls WTB, Stratton G, Wilson AM, Range JY, et al. Perceptions of asthma and exercise in adolescents with and without asthma. J Asthma 2018; 55(8):868-76.

29. McQuaid EL. Barriers to medication adherence in asthma: The importance of culture and context. Ann Allergy Asthma Immunol 2018; 121(1):37-42.

30. Baiardini I, Sicuro F, Balbi F, Canonica GW, Braido F. Asthma Research and Practice. Psychological aspects in asthma: do psychological factors affect asthma management? Asthma Res Pract 2015; 17.

31. Scott D, Ferguson GD, Jelbma J. The use of the EQ-5D-Y health related quality of life outcome measure in children in the Western Cape, South Africa: psychometric properties, feasibility and usefulness - a longitudinal, analytical study. Health Qual Life Outcomes 2017; 15(12):1-14.

32. Furtado PR, Maciel ÁCC, Barbosa RRT, Silva AAMD, Freitas DA, Mendonça KMPP. Association between quality of life, severity of asthma, sleep disorders and exercise capacity in children with asthma: a cross-sectional study. Braz J Phys Ther 2019; 23(1):12-8.

33. Petsios KT, Priftis KN, Hatziagorou E, Tzanakas JN, Antonogeorgos G, Matziou VN. Determinants of quality of life in children with asthma. Pediatr Pulmonol 2013; 48:1171–80

34. Taminskiene V, Alasevicius T, Valiulis A, Vaitkaitiene E, Stukas R, Hadjianayis A, et al. Quality of life of the family of children with asthma is not related to asthma severity. Eur J Pediatr 2019; 178(3):369-76.

35. Eidt-Koch D, Mittendorf T, Greiner W. Cross-sectional validity of the EQ-5D-Y as a generic health outcome instrument in children and adolescents with cystic fibrosis in Germany. BMC Pediatr 2009; 9: 55.

36. Burström K, Svartengren M, Edmar AG. Testing a Swedish child-friendly pilot version of the EQ-5D instrument--initial results. Eur J Public Health. 2011; 21(2):178-83.