Original Research

Parents of asthmatic children knowledge of asthma, anxiety level and quality of life: unveiling important associations

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Abstract

Purpose: Asthma in children affects millions around the world. Parents' knowledge of asthma and their quality of life (QoL) may affect the management of their asthma child. The study aimed to assess the knowledge of asthma, anxiety, and QoL of parents who have children diagnosed with asthma living in Amman, Jordan. **Patients and methods:** This cross-sectional study was conducted over five months in Amman, Jordan. Children with asthma were recruited from outpatient respiratory clinics. Parents were interviewed while waiting to see the child's respiratory specialist. The Consumer Asthma Knowledge Questionnaire (twelve true/false items), Parent Asthma-Related Anxiety Scale (eleven questions), and QoL Questionnaire (thirteen questions) were used. **Results:** Recruited parents of the children with asthma (n= 150, mean age 5.05±3.5) showed poor asthma knowledge (score= 5.8±1.75 out of 12, and the 11-item mean is 2.42). Screening of anxiety revealed an increased risk of mild anxiety among parents (score= 26.59±7.3 out of 55, and the 13-item mean is 3.55). The QoL screening showed that parents had a median QoL (score= 39.5±12.0). **Conclusion:** Asthma knowledge among parents of children with asthma living in Jordan is poor. Screening of anxiety and QoL showed that many parents had mild anxiety and poor QoL. These results shed light on an urgent matter that needs to be addressed as quickly as possible in Jordan and for parents of asthma children worldwide..

Keywords: children; parents; asthma; quality of life; anxiety; Jordan

INTRODUCTION

Asthma is the most prevalent chronic childhood disease causing morbidity and mortality in children and adults.[1] Regardless of the treatments, asthma symptoms exist in 14% of children worldwide.[2-4] The morbidity associated with asthma reflects the severity and stage of the disease, which can be measured through the disability and premature death rates.[5] The greatest asthma rates are found in children between the ages of 10 to 14 years old,[6] while the mortality rates due to asthma have been stable over the last decade in developed countries and continue to increase in developing countries.[7] Asthma in Jordan has doubled over the past two decades.[8] Among children living in Jordan, asthma is common, and as is the case worldwide, asthma is slightly more common in boys (79%) than girls (73%).[8]

Asthma-related knowledge includes an understanding of pathological mechanisms, medications, and prevention.[9] According to international childhood asthma guidelines, routine clinical care visits should include training parents to improve their asthma-related knowledge.[10] In an ideal

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world, each child with asthma should have a current asthma action plan that specifically states how parents need to act to manage the child's condition better.[11] Unfortunately, a wide gap exists between ideal, recommended, and actual practice, owing mainly to the educational barriers and lack of adequate asthma-related knowledge amongst parents.[12-14] Assessing and improving knowledge of asthma amongst parents can improve their children's asthma management.[15]

Anxiety is a problem that many children with asthma, and their parents, live with.[16] A study from the United States of America (USA) proved that asthma and anxiety disorders are prevalent in children, as up to one-third of children suffer both conditions simultaneously.[17] This association between asthma and increased anxiety in children is of concern,[18] as anxiety affects asthma negatively. Anxiety has been associated with higher severity of asthma, overuse of medications, poor adherence to medications, daily peak flow rate monitoring, longer and more frequent hospital visits, and more school absences due to asthma.[19] With this said a certain level of high anxiety related to asthma might positively impact the management of the disease.[20] Hence, an acceptable level of anxiety can benefit the management of children with asthma; an assessment of anxiety level for children and/or their parents is needed for successful long-term asthma management.

Besides poor psychological health, uncontrolled asthma can cause other negative issues that children with asthma and their parents live with, including poor QoL.[21] Dealing with acute asthma exacerbations is another critical issue for the parents responsible for managing their children.[11] Many children with asthma are still untreated or undertreated, resulting in a poor QoL for them and their parents.[23] It can be hypothesized that a better level of asthma knowledge can be associated with

lower anxiety levels and better QoL among parents of children with asthma. No previous study has examined the association between these three cornerstones of asthma management. This study aimed to assess the knowledge of asthma among parents of children with asthma. In addition, to assessing the anxiety and QoL among the parents, it also unveils important associations between these three variables.

MATERIAL AND METHODS

Study design and clinical setting

This cross-sectional study was conducted over five months (April to August 2018) at Amman (the capital) outpatient respiratory clinics in Jordan. Ethics approval was issued from the Institutional Review Board (IRB) committee at the Applied Science Private University and the Jordanian Ministry of Health/Education.

A list of paediatric respiratory clinics in Amman, Jordan, was prepared from the internet and randomly approached to be recruited into the study. Randomization was conducted using a predefined list generated through a computer randomisation program (www.randomizer.org). The researcher who visited the clinics was a clinical pharmacist with extensive experience in asthma management. Following the recruitment of clinics, eligible participants were recruited, and the researcher approached each participant while waiting to see the paediatric respiratory specialist.

Inclusion criteria included having a child under the age of 16 years visiting the asthma clinic involved in the study during the study period, being diagnosed with intermittent or persistent asthma (as defined by the Global Initiative for Asthma guidelines), with the condition confirmed in the patient file. Exclusion criteria included children with respiratory diseases other than asthma and patients who refused to participate in the study.

Each eligible participant was informed of the nature of the study and was asked to sign the informed consent form before study entry. All parents of asthma children who agreed to participate in the study signed the informed consent.

The researcher interviewed parents of children with asthma who fulfilled the inclusion criteria to collect all relevant information, including demographic data (age, gender of the child, place of living, education of the parent and income). This data was collected via direct questions included in the demographic questionnaire to be answered by the parents. Asthma knowledge (assessed through the Asthma Knowledge Questionnaire), their level of anxiety (reported through the Parent Asthma-Related Anxiety Scale) and QoL (reported through the Quality of Life Questionnaire). Asthma control was assessed for the children with asthma of the parents using the validated and published Asthma Control Test questionnaire.

Data collection tools

For data documentation and evaluation, the following questionnaires were used by the researcher via an interview style:

Asthma Knowledge Questionnaire: The Consumer Asthma Knowledge Questionnaire (CAKQ) contains questions about asthma and its treatment for consumers (parents of children with asthma). The parents of children with asthma were requested to answer the 12 true/false items found in the questionnaire published by Kritikos et al. in 2005 to assess their asthma knowledge and how to correctly deal with their asthmatic children.[24] The questionnaire assessed important information parents of asthma children needed to acknowledge, such as the importance of the asthma action plan, triggers, side effects and the difference between the types of inhalers used. The questionnaire was translated into Arabic and was tested for clarity, accuracy and repeatability by the researchers following translation.

Asthma-Related Anxiety Scale: The parents of asthmatic children were requested to answer the questions found in the anxiety questionnaire to screen for their anxiety level related to having an asthmatic child/children.[20] The used questionnaire is titled Parent Asthma-Related Anxiety Scale (PAAS), published by Bruzzese et al. in 2011. This scale consists of eleven items including questions of:

How often during the last two weeks the parent felt nervous and anxious due to their child having an asthma attack out of the blue and without a warning

The child having an asthma attack and not having his/her asthma medication

The child having an asthma attack when the parents were not there

The child not knowing how to manage an asthma attack without the parents

The child dying because of asthma

The child having asthma symptoms in front of his/her friends

Side effects of asthma medications

The child missing school because of asthma

The child not keeping up with other kids because of asthma

The child having an asthma attack while doing physical activities like sports or exercise

The child not doing well in sports because of asthma

The measurement scale used in this questionnaire was answered using a 6-point Likert scale; 0 (never), 1 (hardly ever), 2 (sometimes), 3 (often), 4 (most of the time) and 5 (always). Hence, anxiety was analyzed on a continuous scale giving a score out of 55; the higher score, the more anxious the parents were.

There is no global cut-off point for the PAAS. Thus, the total mean for all of the items was taken into consideration. The anxiety scores were evaluated by calculating the mean for each item (possible range= 0-5), then assessing the total mean for all 11 items.

Quality of life questionnaire

Parents' quality of life was screened using the QoL scale titled Paediatric Asthma Caregiver's Quality of Life Questionnaire (PACQLQ) published by Juniper et al. in 1996, composed of thirteen questions related to generalized QoL assessment.[25] The questionnaire was answered using a 7-point Likert scale. The questions investigated parents' feelings of helplessness, frustration, fear, and sadness due to their child's condition. Other questions assessed how the child's asthma affected the house and family relations and life plans, work, and night rest. The possible score for each participant would be out of 91, with higher scores indicating lower QoL.

Parents' QoL was calculated by assessing the mean for each item and then the total mean for all items. No cut-off point is found for the PAQLQ.

Asthma Control Test Questionnaire (ACT)

Participants were asked to complete the self-reported Asthma Control Test questionnaire to assess the control of their children's asthma.[26] ACT consists of five items including questions on: how often during the last month asthma prevented the child from living his/her days normally; how often the child suffered from shortness of breath; awakened from sleep because of asthma symptoms; used short reliever medications; plus a general rate of asthma control assessment 4 weeks before study entry. The measurement scale used in this questionnaire was scored at 1 (all the time), 2 (most of the time), 3 (sometimes), 4 (rarely) and 5 (never). Hence, asthma control was analyzed as a continuous scale giving a score of 25, with higher scores indicating better asthma control. The children were considered to have very poor control of asthma if they scored 15 or less; not well-controlled if their score was 16-19; well-controlled if their score was 20 or more.[27]

Statistical analysis

The Statistical Package for the Social Science (SPSS) software version 22.0 was used to analyze the collected data (IBM Corp, 2012). Descriptive statistical analysis was used to describe sample characteristics, including the mean and standard deviation. Outliers, skewness and missing data were checked and handled before analyzing the collected data. All continuous variables were expressed as mean ± SD, and analyzed using the Independent sample t-test or the Mann-Whitney U test. Categorical variables, expressed as a proportion, were analyzed using the Chi-square test.

In order to determine the predictors of the dependent variables: parent's asthma knowledge (Model A); parent's anxiety (Model B); and parent's QoL (Model C); multiple linear regression analyses were performed. The independent variables included the child's age, gender, school/nursery type (public versus private), place of living, parents' education, parents' income, ACT score, and the number of doctors' visits a year.

RESULTS

A total of 170 parents of children with asthma were approached for recruitment into the study. Some parents refused to participate in the study (n= 20) because they were busy with their children (n= 14) or for a reason they refused to declare (n= 6). Therefore, the total number of recruited patients who signed the consent form was 150 (Figure 1, study CONSORT diagram). All parents approached for study participation had a scheduled consultation (none came in due to an on-demand consultation due to an exacerbation).

The mean age of children was 5.05±3.5, and most of them were males (63.3%). More than half of them had a normal body mass index (56.7%). Most children were in kindergarten (72.0%) and living in the East of Amman (48.7%). More than half of the parents (58.0%) were smokers. Most of them had a BSc degree (68.7%), were employed (56.0%) and had insurance (66%). The mean number of family members was 5±1.2. The monthly income was 600-800 JD for a third of the parents (Table 1).

The ACT scores showed that asthma prevented 34% of the children from doing their normal activities during the past four weeks. Many children with asthma (32%) had at least one or two chest tightness episodes a week. Many children (31.3%) were awakened due to asthma symptoms 2-3 nights a week, while many of them used their reliever at least once or twice a day (31.3%). When the parents were asked about their children's perceived control over asthma, several parents said that they experienced weak control of the condition (35.3%).

The total asthma control scores of the children showed that 59.3% had very poorly controlled asthma, 28% were not well-controlled, and 12.7% were well-controlled.

Regarding parents' knowledge of asthma, the percentage of questions answered correctly ranged from 44.0% to 54.7%. The mean number of questions answered correctly was 5.8±1.75 out of a score of 12 (Table 2). These scores indicated poor asthma knowledge among the parents.

Multiple linear regression modelling (Model A) for asthma knowledge score indicated that the total score of ACT was the only variable significantly associated with knowledge score (R^2= 0.067, P= 0.019); while age, gender, school type, place of living, parents' education, income and doctor visits per year were not significant factors (Table 3, Model A).

Although most children were found to have very poorly controlled asthma (n= 89, 14.80±5.15), followed by not well-controlled asthma (n= 42, 13.92±5.16), and then controlled asthma (n= 19, 12.21±4.95); no significant association was found between parents' asthma knowledge scores and children's asthma control (P=0.019, One-way ANOVA).

The mean anxiety score for the parents of asthmatic children was 26.59±7.3 out of 55 (Table 4). The overall mean of the 11-item was 2.42 (SD= 1.14). Therefore, the scale is positively skewed, suggesting that parents were screened positive for mild anxiety.

A statistically significant correlation between parent's anxiety level and the yearly number of doctor visits. Higher anxiety levels correlated significantly with a higher number of doctor visits (r= 0.171, P= 0.036, Pearson's correlation).
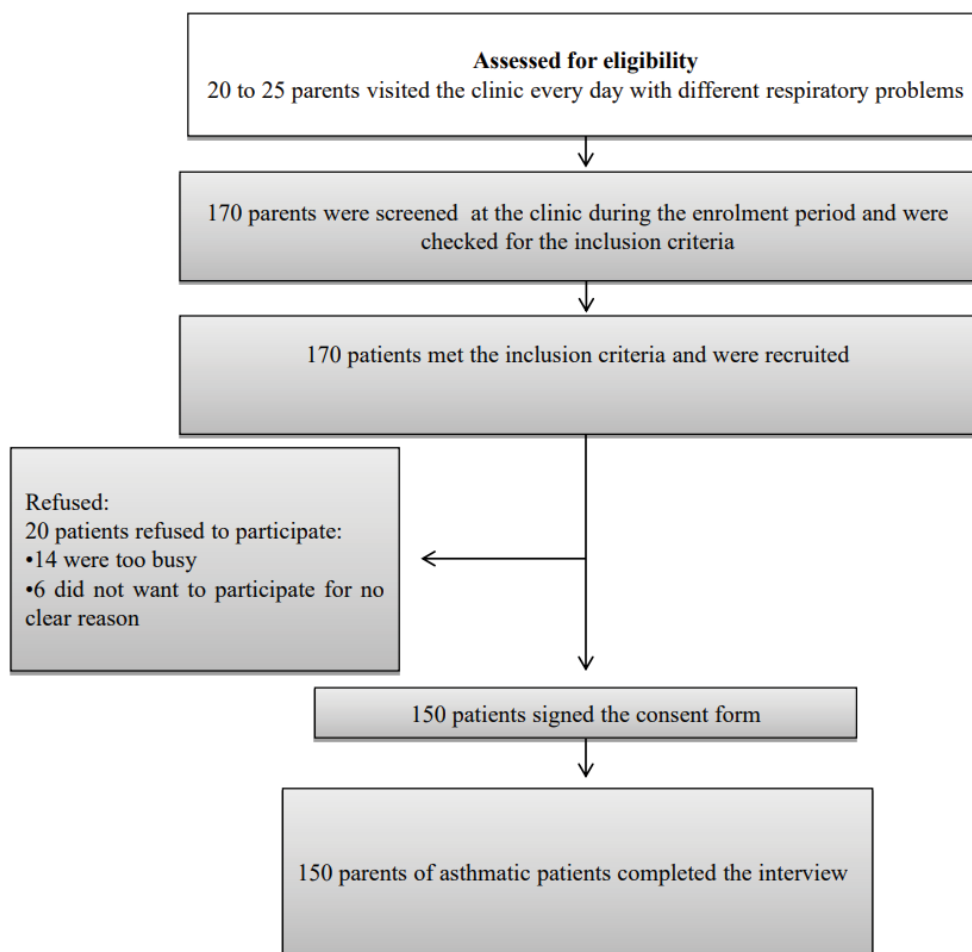
Figure 1. CONSORT diagram showing patients' recruitment and retention during the study period in the clinic

Table 1. Demographic information for parents of asthmatic children (n= 150) enrolled in the study	
Parameter	**n (%)**
Number of parents, n (%)	150 (100.0)
Child Age (year), mean (SD)	5.05 (3.5)
Gender, n (%) Male Female	95 (63.3) 55 (36.7)
Body mass category, n (%) Underweight Normal weight Over weight Obese	24 (16.0) 85 (56.7) 18 (12.0) 23 (15.3)
School type, n (%) Private Public Kindergarten	25 (16.7) 17 (11.3) 108 (72.0)
Living place, n (%) West of Amman East of Amman South of Amman North of Amman	58 (38.7) 73 (48.7) 10 (6.7) 9 (6.0)

Marital status of parents, n (%) Divorced Married Widow	0 (0.0) 150 (100.0) 0 (0.0)
Number of family members, mean (SD)	5 (1.2)
Monthly income, n (%) 400-600 JD 600-800 JD < 800 JD	52 (34.7) 56 (37.3) 42 (28.0)
Smoking of parents, n (%) Yes No	87 (58.0) 63 (42.0)
Education level of parents, n (%) Elementary Secondary BSc MSc	1 (0.7) 45 (30.0) 103 (68.7) 1 (0.7)
Parents job, n (%) Employee Non-employee	84 (56.0) 66 (44.0)
Insurance, n (%) Yes No	99 (66.0) 51 (34.0)

Table 2. Asthma knowledge of the study parents of asthmatic children (n= 150)		
Parameter	**Correct answer**	**n (%)**
You can become addicted to asthma medications if you use them all the time. Correct Incorrect	(F)	 71 (47.3) 79 (52.7)
An asthma action plan can prevent hospitalizations due to asthma. Correct Incorrect	(T)	 67 (44.7) 83 (55.3)
When you know that you are going to be exposed to something that triggers your asthma, you should take the recommended medication just before exposure. Correct Incorrect	(T)	 68 (45.3) 82 (54.7)
When you know that you are going to be exposed to something that triggers your asthma, you should wait until you develop symptoms before taking medication Correct Incorrect	(F)	 73 (48.7) 77 (51.3)
Side effects are less likely with inhaled medications than with tablets. Correct Incorrect	(T)	 74 (49.3) 76 (50.7)
With preventer medications, it does not matter if you miss some doses or if you go on and off them. Correct Incorrect	(F)	 82 (54.7) 68(45.3)
If you get a cold or flu, you should increase your asthma medications. Correct Incorrect	(T)	 68 (45.3) 82 (54.7)
Some medications can trigger asthma attacks. Correct Incorrect	(T)	71 (47.3) 79 (52.7)
You should use ''preventer medication'' when you have an asthma attack. Correct Incorrect	(F)	 66 (44.0) 84 (56.0)
Going from cold to hot environment can trigger asthma, but going from hot to cold environment does not trigger asthma. Correct Incorrect	(F)	 83 (55.3) 67 (44.7)
Parents should give ''reliever medication'' to a child as soon as they recognize the first sign of asthma. Correct Incorrect	(T)	 78 (52.0) 72 (48.0)
Blue puffer (Ventolin), Brown puffer (Flixotide) and Green puffer (Serevent) are called ''preventer medications,'' so they should be used every day although you are well. Correct Incorrect	(F)	 71 (47.3) 79 (52.7)

Number of correct answers, mean (SD) = 5.8 (1.75)

Table 3. Summary of the regression models for the dependent variables: asthma knowledge score (Model A), anxiety score (Model B), and quality of life score of parents of asthma children (n= 150) (Model C)			
Variable (n= 150)	**Beta**	**T**	**P value**
Model A			
Age of child	0.165	1.098	0.274
Gender of child	0.012	0.143	0.886
School/nursery type (public versus private)	0.149	0.984	0.327
Location of place of living	0.036	0.370	0.712
Education of parent	0.091	1.001	0.319
Income of parent	-0.080	-0.839	0.403
Sum of asthma control test score	0.263	2.366	**0.019**
Model B			
Age of child	0.326	2.697	**0.008**
Gender of child	0.001	0.013	0.990
School/nursery type (public versus private)	0.234	1.933	0.055
Location of place of living	0.125	1.637	0.104
Education of parent	0.116	1.588	0.115
Income of parent	0.042	0.546	0.586
Sum of asthma control test scores	-0.480	-6.924	**0.000**
Asthma knowledge scores	-0.206	-3.025	**0.003**
Model C			
Age of child	0.102	0.927	0.355
Gender of child	-0.087	-1.417	0.159
School/nursery type (public versus private)	-0.009	-0.084	0.933
Location of place of living	-0.135	-1.941	0.054
Education of parent	-0.061	-0.916	0.361
Income of parent	0.083	1.192	0.235
Sum of asthma control test scores	0.626	9.932	**<0.001**
Asthma knowledge scores	0.027	0.433	0.666

This table shows the output from a multivariable regression analysis in which "Beta" is the standardized regression coefficient. Asthma knowledge score (score out of 12, the higher the score the higher the knowledge). Numbers in '**bold**' indicate significant results. Asthma control score (ACT, is a continuous scale with a score out of 25).

Multiple linear regression modelling the independent variable anxiety indicated that age, ACT and asthma knowledge scores were the variables that showed a statistically significant association with higher anxiety scores (R^2= 0.391, P<0.001, Table 3, Model B).

Parents who had children with controlled asthma (n= 19) reported significantly better anxiety levels (19.79±5.01) compared to parents who had children with not well-controlled asthma (n= 42, 23.40±6.61) or very poorly controlled asthma (n= 89, 29.55±7.31), P<0.001 (One-way ANOVA) (Table 4).

Table 4. Assessment of asthma-related anxiety for parents of asthmatic children (n= 150)

In the last 2 weeks, how often did you become nervous or worried about:	n (%)
Your child having an asthma attack out of the blue and without warning	
Never	51 (34.0)
Hardly ever	31 (20.7)
Sometimes	24 (16.0)
Often	16 (10.7)
Most of the time	13 (8.7)
Always	15 (10.0)
Your child having an asthma attack and not having his/her asthma medicine	
Never	79 (52.7)
Hardly ever	47 (31.3)
Sometimes	21 (14.0)
Often	2 (1.3)
Most of the time	0 (0.0)
Always	1 (0.7)
Your child having an asthma attack when you are not there	
Never	
Hardly ever	60 (40.0)
Sometimes	34 (22.7)
Often	37 (24.7)
Most of the time	11 (7.3)
Always	7 (4.7)
	1 (0.7)
Your child knowing how to manage an asthma attack without you	
Never	12 (8.0)
Hardly ever	9 (6.0)
Sometimes	18 (12.0)
Often	22 (14.7)
Most of the time	35 (23.3)
Always	54 (36.0)
Your child dying because of asthma	
Never	3 (2.0)
Hardly ever	1 (0.7)
Sometimes	34 (22.7)
Often	26 (17.3)
Most of the time	41 (27.3)
Always	45 (30.0)
What your child's friends think if your child has asthma symptoms in front of them	
Never	66 (44.0)
Hardly ever	33 (22.0)
Sometimes	29 (19.3)
Often	11 (7.3)
Most of the time	7 (4.7)
Always	4 (2.7)
The side effects of asthma medicine	
Never	9 (6.0)
Hardly ever	7 (4.7)
Sometimes	16 (10.7)
Often	37 (24.7)
Most of the time	34 (22.7)
Always	47 (31.3)
Your child missing school because of asthma	
Never	23 (15.3)
Hardly ever	33 (22.0)
Sometimes	56 (37.3)
Often	12 (8.0)
Most of the time	17 (11.3)
Always	9 (6.0)

Your child not keeping up with other kids because of asthma	
Never	17 (11.3)
Hardly ever	21 (14.0)
Sometimes	47 (31.3)
Often	25 (16.7)
Most of the time	23 (15.3)
Always	17 (11.3)
Your child having an asthma attack when doing physical activity like sports or exercise	
Never	0 (0.0)
Hardly ever	4 (2.7)
Sometimes	23 (15.3)
Often	24 (16.0)
Most of the time	50 (33.3)
Always	49 (32.7)
Your child not doing well in sports because of asthma	
Never	4 (2.7)
Hardly ever	13 (8.7)
Sometimes	36 (24.0)
Often	24 (16.0)
Most of the time	35 (23.3)
Always	38 (25.3)

Score of parent's anxieties out of 55, mean (SD)= 26.59 (7.3)

The mean score of QoL for the parents was found to be 39.50±12.00 out of a score of 91 (Table 5). The overall mean of the 13-item was 3.55 (SD= 0.54). Thus, the parents had a median QoL.

A statistically significant correlation between the parents' levels of anxiety and QoL was found, as higher anxiety levels correlated significantly with lower levels of QoL (r= -0.5, P< 0.001).

Multiple linear regression modelling the independent variable QoL indicated that the total score of ACT was the only significantly associated independent variable with QoL scores (R^2= 0.495, P<0.001, Table 3, Model C).

Parents who had a child with controlled asthma (n= 19) reported better QoL (56.10±6.86) compared to parents who had a child with not well-controlled asthma (n= 42, 46.95±9.74) or very

Table 5. Asthma-related quality of life for parents of asthmatic children (n= 150)

Parameter	n (%)
1. During the past week, how often did you feel helpless or frightened when your child experienced cough, wheeze, or breathlessness	
None of the time	2 (1.3)
Hardly any of the time	2 (1.3)
Once in a while	17 (11.3)
Some of the time	36 (24.0)
Quit often	18 (12.0)
Most of the time	37 (24.7)
All of the time	38 (25.3)
2. During the past week, how often did your family need to change plans because of your child's asthma	
None of the time	14 (9.3)
Hardly any of the time	18 (12.0)
Once in a while	23 (15.3)
Some of the time	31 (20.7)
Quit often	14 (9.3)
Most of the time	26 (17.3)
All of the time	24 (16.0)

3. During the past week, how often did you feel frustrated or impatient because your child was irritable due to asthma	
None of the time	5 (3.3)
Hardly any of the time	5 (3.3)
Once in a while	19 (12.7)
Some of the time	45 (30.0)
Quit often	20 (13.3)
Most of the time	41 (27.3)
All of the time	15 (10.0)

4. During the past week, how often did your child's asthma interfere with your job or work around the house, n (%)	
None of the time	6 (4.0)
Hardly any of the time	6 (4.0)
Once in a while	11 (7.3)
Some of the time	31 (20.7)
Quit often	27 (18.0)
Most of the time	50 (33.3)
All of the time	19 (12.7)

5. During the past week, how often did you feel upset because of your child's cough, wheeze, or breathlessness	
None of the time	2 (1.3)
Hardly any of the time	2 (1.3)
Once in a while	8 (5.3)
Some of the time	34 (22.7)
Quit often	31 (20.7)
Most of the time	50 (33.3)
All of the time	23 (15.3)

6. During the past week, how often did you have sleepless nights because of your child's asthma	
None of the time	5 (3.3)
Hardly any of the time	6 (4.0)
Once in a while	29 (19.3)
Some of the time	41 (27.3)
Quit often	24 (16.0)
Most of the time	28 (18.7)
All of the time	17 (11.3)

7. During the past week, how often were you bothered because your child's asthma interfered with family relationships	
None of the time	13 (8.6)
Hardly any of the time	18 (12.0)
Once in a while	29 (19.3)
Some of the time	49 (32.7)
Quit often	17 (11.3)
Most of the time	13 (8.7)
All of the time	11 (7.3)

8. During the past week, how often were you awakened during the night because of your child's asthma	
None of the time	5 (3.3)
Hardly any of the time	6 (4.0)
Once in a while	22 (14.7)
Some of the time	41 (27.3)
Quit often	26 (17.3)
Most of the time	31 (20.7)
All of the time	19 (12.7)

9. During the past week, how often did you feel angry that your child has asthma	
None of the time	3 (2.0)
Hardly any of the time	6 (4.0)
Once in a while	10 (6.7)
Some of the time	37 (24.7)
Quit often	33 (22.0)
Most of the time	41 (27.3)
All of the time	20 (13.3)

10. During the past week, how worried or concerned were you about your child's performance of normal daily activities	
Not worried or concerned	4 (2.7)
Hardly worried or concerned	5 (3.3)
A little worried or concerned	14 (9.3)
Somewhat worried or concerned	39 (26.0)
Fairly worried or concerned	28 (18.7)
Very worried or concerned	38 (25.3)
Very very worried or concerned	22 (14.7)

11. During the past week, how worried or concerned were you about your child's asthma medications and side effects	
Not worried or concerned	2 (1.3)
Hardly worried or concerned	2 (1.3)
A little worried or concerned	5 (3.3)
Somewhat worried or concerned	18 (12.0)
Fairly worried or concerned	23 (15.3)
Very worried or concerned	57 (38.0)
Very very worried or concerned	43 (28.7)

12. During the past week, how worried or concerned were you about being overprotective of your child	
Not worried or concerned	1 (0.6)
Hardly worried or concerned	1 (0.6)
A little worried or concerned	4 (2.7)
Somewhat worried or concerned	25 (16.7)
Fairly worried or concerned	24 (16.0)
Very worried or concerned	42 (28.0)
Very very worried or concerned	53 (35.3)

13. During the past week, how worried or concerned were you about your child being able to lead a normal life	
Not worried or concerned	2 (1.3)
Hardly worried or concerned	3 (2.0)
A little worried or concerned	13 (8.7)
Somewhat worried or concerned	26 (17.3)
Fairly worried or concerned	13 (8.7)
Very worried or concerned	35 (23.3)
Very very worried or concerned	58 (38.7)

Score of parent's qualities of life, mean (SD) = 39.5 (12)

poorly controlled asthma (n= 89, 33.98±10.06), (P<0.001, One-way ANOVA).

Multiple linear regression modelling for QoL indicated that the total ACT score was the only variable significantly associated with QoL scores (R^2= 0.495, P<0.001).

Figure 2 shows the normal probability plots (P-P) of the regression standardised residuals and the scatterplots of asthma knowledge score, anxiety, and the QoL of parents of the children with asthma. The plots were generated via multiple linear regression. All the normal P-P Plots were found to lie in a reasonably straight diagonal line, indicating no major deviation from the normality. All of the scatterplots were shown to be roughly rectangularly distributed, with most of the scores concentrated in the centre which indicates that the assumptions for this analysis were not violated.

DISCUSSION

This is the first study to be conducted for parents of children with asthma in Jordan, showing the size of the impact of children's asthma on the parent's anxiety and QoL scores. The results of this study unveiled poor knowledge of asthma among the parents, high anxiety and median QoL, in addition to low asthma control among the children. Significant associations between asthma knowledge, anxiety, and QoL of
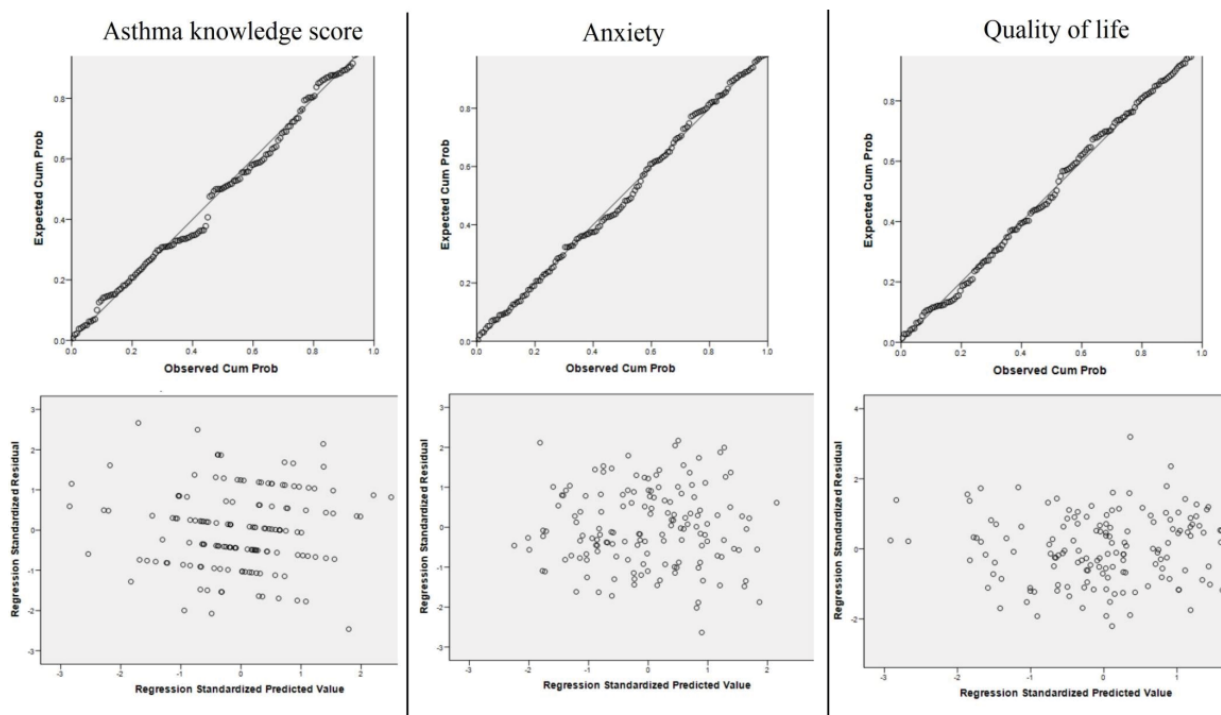
Figure 2. PThe normal probability plots (P-P) of the regression standardised residual and the scatterplots of asthma knowledge score, anxiety, and the quality of life generated via the multiple linear regression

parents with children's asthma control levels were found. A significant association between better asthma knowledge and lower anxiety scores was also found. Such findings highlight the importance of asthma knowledge for parents of asthma children to lead a better QoL with lower anxiety.

Parent's asthma knowledge is vital for them to manage the condition of their children with asthma properly. The tool used in this study to assess the parent's asthma knowledge was used previously and validated.[28] The 12-item questionnaire provides a score, where higher scores indicated better asthma knowledge. Parents in this study had a low mean score of 5.8±1.75. A significant association between parent's asthma knowledge and child's ACT scores was found, drawing attention to the vital role of knowledge in optimizing asthma control in children. This resonates well with results published previously from Australia, where a score of 7.7±2.6 was obtained by the parents of asthma child,[24] and results that indicated that children's asthma control level is higher when their parent has a good asthma knowledge.[15]

Asthma affects the QoL and anxiety levels of the families of asthma children.[18] The result of this study indicated that lower asthma control amongst children was the only variable associated with lower QoL and higher anxiety amongst the parents. Previous studies have linked the worst asthma control amongst children with increased psychological and depression symptoms among parents.[29,30] Therefore, as long as children with asthma have asthma symptoms recurring, their mothers' distress, hence anxiety, continues.[31] Thus, it can be concluded that in order to decrease parent's anxiety levels, better asthma control amongst children with asthma needs to be reached.

Better asthma knowledge was associated with lower levels of anxiety. This comes in line with previous findings indicating that any method of education leading to increased parents' asthma knowledge decreases parents' anxiety scores. These findings call into question mass asthma education campaigns and have crucial implications for the layout of future asthma education programs.[32]

When it comes to mothers' anxiety and having a child with asthma, a study from Turkey reported a higher level of anxiety (40±4.54) among mothers of children with asthma compared to those mothers who do not have a child with asthma (34±3.17).[33] Another study also conducted in Turkey evaluated anxiety and depression in mothers of children with asthma, revealing significantly (p = 0.02) higher scores of anxiety (8.5±4.1) in mothers of children with asthma compared to mothers without children with asthma (6.9 ± 2.3).[34] Of noteworthy, these studies used a different assessment tool for anxiety; the study by Ozkaya et al. used the State-Trait Anxiety Inventory (STAI), while the other used the HADS. Hence, the anxiety of parents of children with asthma exists in Jordan and worldwide. Parents of children with asthma deserve to live a normal life, free of fear and worry, and it is the role of healthcare providers to deliver the needed care to these parents.

As for the QoL, the mean score of QoL for the parents of children with asthma was high (39.5±12, score out of 91), indicating median QoL. A study in the Netherlands previously reported that 30% of caregivers of children with asthma had major psychosocial problems indicating low QoL.[36] The case was similar in a study conducted in the USA where parent's QoL was found to be affected by the level of children's asthma control.[37]

Both studies used the same QoL assessment tool as this study (PAQLQ). Hence, improving the child's asthma management can improve the parent's QoL. In the current study, only 12.7% of the children were found to have well-controlled asthma. Such results are very close to those published in Northern Jordan, where Al-sheyab et al. stated that all students who participated in his study reported uncontrolled asthma.[38] In a study conducted in Algeria, Morocco, and Tunisia, 54.7% of children were found to have uncontrolled asthma.[26] Similar results were reported in Turkey, where 39.1% of children with asthma were found to have uncontrolled asthma.[39] Hence, with the treatments found in the market to manage children's asthma, more healthcare services targeting this group of patients are needed. In addition, parents need continuous educational workshops tailored to their level of learning to enhance their knowledge of asthma and asthma management strategies, most importantly, management and prevention of side effects, essential tips about preventer and reliever use, and identifying trigger factors. With increased parenteral knowledge, better healthcare management can be provided to children with asthma leading to better asthma control.

A limitation of this study is that it was only conducted in Amman, the capital of Jordan; hence, it may not be generalizable to the rest of Jordan. Rural areas can have a different prevalence of asthma and different results compared to the ones obtained from Amman. In addition, the healthcare system is more easily reached in Amman compared to the rural areas in Jordan. A cross-cultural adaptation procedure was not performed for the questionnaires involved in this study. Also, the questionnaires were conducted using an "interview style", which may have caused interviewer bias. This modality to collect data from the questionnaires was used to enhance recruitment and ensure that all parents could understand each question clearly and in the same manner.

CONCLUSION

This study revealed that most children with asthma in Amman, the capital of Jordan, have poor asthma control. Parents of these children have poor knowledge of asthma, high anxiety levels and median QoL. Increasing asthma knowledge amongst parents of asthma children is called for. These results shed light on an urgent issue that needs to be addressed quickly, not just in Jordan, but all around the world.

AUTHORS' CONTRIBUTIONS

All authors were involved in all parts of the study and manuscript preparation, including literature search, study design, analysis of data, manuscript preparation, and review of the manuscript.

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DISCLOSURE

The author reports no conflicts of interest in this work.

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