Research Article

Quality of Life using AQLQ (S), ACT and GINA in patients with bronchial asthma in South India

Priyadarsini John[1*] Leah Macaden[2], Christopher[3]

[1*]Associate Professor, D Y Patil College of Nursing, Nerul, Navi Mumbai, India
[2]Lecturer & Senior Fellow of the UK Higher Education Academy, Faculty of Health Sciences & Sport, University of Stirling, UK
[3]Professor & Head, Department of Pulmonary Medicine, Christian Medical College, Vellore, India.

Abstract

Asthma has been notified as a chronic illness that impacts a large number of individuals and affects their quality of life. **Aim:** To measure the Quality of Life in patients with Bronchial Asthma in a tertiary care setting in South India. **Method:** Structured face to face interviews were conducted using standardized tools i.e. Standardized version of Juniper's Asthma Quality of Life Questionnaire and the responses were classified under the domains of activity limitations, symptoms, emotions and exposure to environmental stimuli. The Asthma Control Test was also used categorizing respondents as demonstrating total control, well controlled or uncontrolled asthma. GINA guidelines was used to classify the patients based on severity of Asthma as intermittent, mild persistent, moderate persistent and severe persistent. **Result:** 200 physician diagnosed patients with Bronchial Asthma participated in the study. Majority were male (n=115) and rest female (n=85). 143 were married and many were graduates (n=52). The mean QOL of the patients was 4.83 on 7 point scale. More than half of the sample population (57% n=114) were found to experience uncontrolled asthma. The average score received in Asthma Control Test was 17 against a maximum of 25. Less than half the patients (37.5% n =75) in the study were classified as having moderate Asthma. **Conclusion:** The findings suggest that there is a need to control asthma and the environmental factors that trigger it. Educating patients on treatment and precautionary measures may be a potential solution to enhance the overall sense of well-being in patients with bronchial asthma.

Keyword: Quality of Life, Bronchial Asthma, Asthma Quality of Life Questionnaire, Asthma Control Test, GINA classification.

*Corresponding author: Mrs Priyadarsini John, Associate Professor, D Y Patil College of Nursing, Nerul, Navi Mumbai**.,** Email: priyapearljohn@yahoo.co.in

1. Introduction

Asthma is a chronic inflammatory disorder of the airways. The chronic inflammation causes an increase in the airway hyper responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and cough, particularly at night or in the early morning. These episodes are associated with widespread but variable airflow obstruction that is usually reversible, either spontaneously or with treatment. The clinical course of asthma is unpredictable, ranging from periods of adequate control to exacerbations [1].
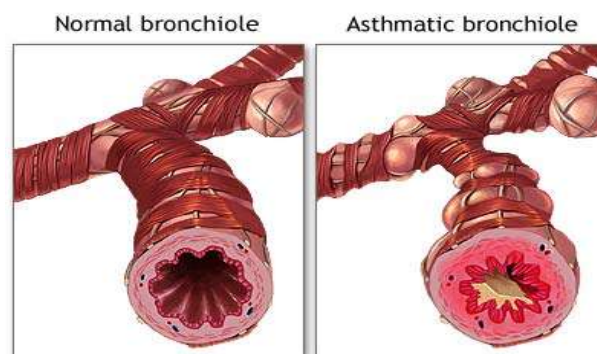

Figure 1 Airway obstructions in Asthma

Asthma is one of the most prevalent chronic health conditions among adults. Most asthma related hospital admissions and related mortality are both preventable. Prevalence varies from region to region depending upon the definition used for the diagnosis of asthma. Current asthma is reported in 1.2 to 6.3% adults in most countries. On the other hand, diagnosed asthma (*i.e.* asthma ever diagnosed by a clinician) in adults is generally reported as 2.7 to 4.0% in most European countries, 12.0% in England and 7.1% in the US. In Australia, the prevalence is rather high (9.5 to 17.9%). Tristan da Cunha a group of islands in the South Atlantic Ocean is a unique example where more than half the population (56%) is reported to suffer from asthma, supporting a strong genetic link [2].

There is very limited data on asthma epidemiology from the developing world, including India. The overall burden of asthma in India is estimated at more than 15 million patients [3]. Finding specific data on the number of people with bronchial asthma in India is a major challenge. Different reports and unscientific studies present an inaccurate picture of the prevalence of asthma in India. 50 per cent of the patients visiting the OPD at the Post Graduate Institute of Medical Research in Chandigarh are asthmatic [4]. It is reported that despite the higher prevalence amongst men, women suffer the most from asthma. An asthma epidemiological field study conducted on both prevalence and the risk factors influencing disease prevalence reported one or more respiratory symptoms in 4.3-10.5% patients from 73605 respondents surveyed [5]. As part of the European Community Respiratory Health Survey, asthma prevalence in adults aged 20-44 years was reported to be 3.5% as per 'clinician diagnosis' and 17%, using a very broad definition (which included prior physician diagnosis and/or a positive broncho- provocation test). Prevalence was similar in men (3.8%) and women (3.4%). Thus, the study concluded that the prevalence estimates of asthma in adults, although lower than several previously reported figures, point to a high overall national burden of the disease.

The overall burden of asthma in India is estimated at more than 15 million patients [6]. It is estimated that the prevalence of asthma among adults in India is close to the figure of 2.78% reported three decades ago in a middle-aged urban population. These results were also similar to the asthma prevalence of 3.5%, more recently reported in Mumbai using a 'clinician diagnosis' based on the European Community Respiratory Health Survey protocol [7].

The concept of QOL varies culturally. Whilst literature on QOL is available on patients with asthma, research evidence from India is still very limited. This study aimed to measure the Quality of Life in patients with Bronchial Asthma in a South Indian setting. The study would also provide guidelines for nurses who take care of these patients since the patients and their family members approach nurses, seeking information on improving QOL.

Aim

To measure the Quality of Life in patients with Bronchial Asthma in a tertiary care setting in South India.

Objectives of the study

1. To assess the QOL of patients with bronchial asthma.
2. To identify factors affecting QOL.
3. To compare the QOL in patients with bronchial asthma selected demographic, clinical and physiological variables.
4. To compare the QOL with the severity of asthma using Global Initiative for Asthma (GINA) classification
5. To compare QOL with asthma control as measured by Asthma Control Test (ACT).

Hypothesis

- Patients with higher QOL scores are likely to attain higher scores on the Asthma Control Test.
- Patients with higher QOL scores are likely to experience lower severity of asthma.

2. Methods

Research design

A descriptive study design was used to assess the QOL in 200 men and women aged between 18-65 years with Bronchial asthma using consecutive sampling technique. Data were collected from patients attending the asthma clinic and respiratory clinics at a large tertiary care hospital in South India. All patients visiting the clinic underwent the Pulmonary Function Test (PFT) in the Pulmonary Function Testing Lab. For the purpose of interviewing patients for this study the PFT lab was used. The charts, of all patients attending the respiratory and asthma clinics were personally reviewed by the researcher to assess their suitability using the Entry Criteria Determinant Questionnaire. Following this an informed consent was sought from patients, who were eligible to participate in the study. These patients were interviewed using the Asthma Clinical Parameters Record, Standardized version of Asthma Quality of Life Questionnaire [AQLQ (S)], and Asthma Control Test (ACT). The patients were classified into four categories namely: intermittent, mild persistent, moderate persistent and severe persistent using the Global Initiative for Asthma (GINA) classification guidelines.

Inclusion Criteria

Patients aged between 18 – 65 years with a diagnosis of Bronchial Asthma and were able to converse in Hindi / English.

Exclusion Criteria

Patients who had any of the following were excluded from the study.

- History of smoking >10years.
- History of active pulmonary tuberculosis.
- Acute exacerbation within the past month.
- Other Respiratory disorders such as Chronic Obstructive Pulmonary Disease (COPD), Bronchiectasis, Allergic Rhinitis and Tuberculosis.
- Chronic systemic diseases that could affect QOL such as diabetes, hypertension, coronary artery diseases, and arthritis.
- Women who were pregnant or breastfeeding
- Cognitive impairment

Instruments

The Standardized version of Asthma Quality of Life Questionnaire [AQLQ (S)] is a 32-item disease specific questionnaire (Appendix A) which has been developed to measure the functional impairments that are most important for adults (17-70 years) with asthma. Patients in the study responded to each question on a 7- point Likert scale and the overall score is the mean of all the items. The items were classified under four domains (activity limitations, symptoms, emotions and exposure to environmental stimuli). The instrument was used with the interviewer format. The instrument was employed since it had been validated within the Indian context and proved to be a reliable and valid tool [8].

Pilot Study

A pilot study was conducted for a period of 1 week on 20 patients, in the Respiratory clinic, Asthma clinic and the PFT lab.

3. Results

Section A

Table No 1: Socio- demographic characteristics of patients

N=200

Demographic Variables	Number (n)	Percentage (%)
Gender		
Male	115	57.5
Female	85	42.5
Age (in years)		
18-30	71	35.5
31-40	53	26.5
41-50	42	21
51-65	34	17
Marital status		
Married	143	71.5
Single	55	27.5
widow/widower	2	1
Religion		
Hindu	169	84.5
Christian	23	11.5
Muslim	7	3.5
Buddhist	1	0.5
Locality		
Rural	105	52.5
Urban	95	47.5

The socio-demographic samples characteristics of the study are presented in Table 1. Most patients in the study were men (57.5), married (71.5%), were Hindu by religion (84.5%) and from a rural background (52.5%).
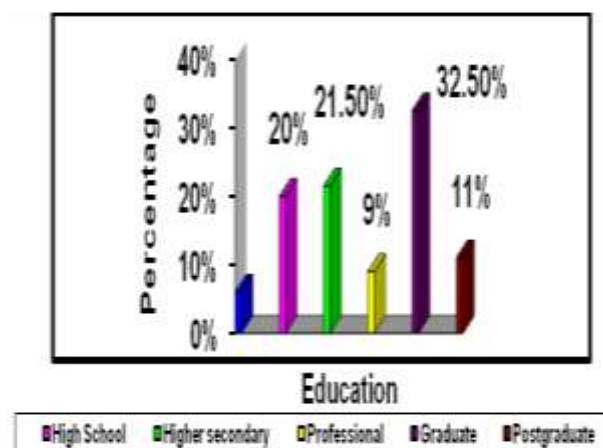

Figure 2 Distribution of samples according to Education. As shown in Fig 2, 32.5% of patients were graduates and 11% had post graduate education.

The Figure 3 depicts the distribution of patients according to their education. Among them 32.5% were Graduates and 11% of the sample being post graduates.
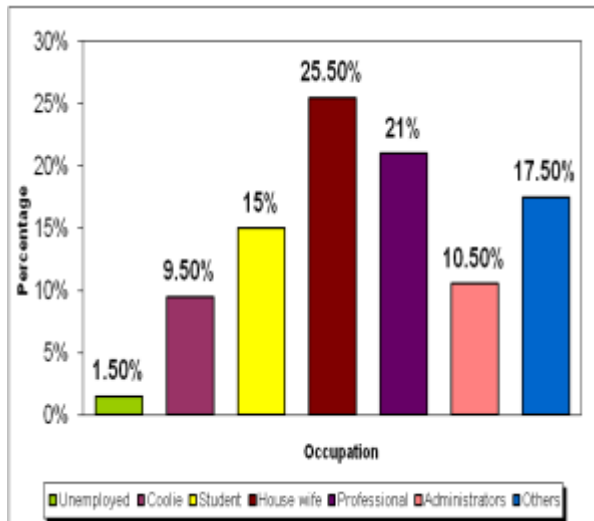
Fig. 3. Distribution of sample based on occupation.
Distributions of Samples according to Occupation
25.5 % of the patients were house wives followed by
21% of professionals and 10.5% administrators.

Table No 2: Clinical characteristics of patients

N=200

Demographic variables	Number (N)	Percentage (%)
Treatment at Hospital		
First visit	108	54
<1yr	37	18.5
1-5yrs	48	24
>5yrs	7	3.5
Compliance to Treatment		
YES	90	45
NO	110	55
Smoking		
Non Smoker	180	90.0
Smoker (<10 pack yrs)	6	3.0
Ex - Smoker	14	7.0
Visit to Hospital		
First	108	54
Routine	92	46

18.5% of patients in the study had asthma diagnosed
within the past 5 years. Many (55%) of patients
interviewed were non compliant with the treatment
protocol. Most (90%) of the patients who participated in
the study were non-smokers, 7% ex-smokers, and 3% of
the patients were currently smoking with smoking
history less than 10 yrs during the study. Patients
smoking for more than 10 years were excluded from the
study. Among the patients, 54% were utilizing the
services for first time and 46% were visiting the
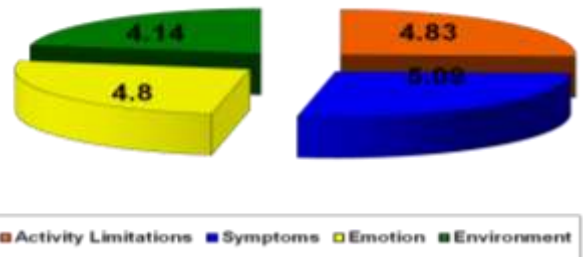Pulmonary OPD for review.

Figure 4 Domain Specific Scores on the AQLQ
Figure 4 depicts the scores achieved for Quality of Life
the different domains assessed. The symptom domain
achieved the highest mean score of 5.09 with the lowest
mean score achieved for the environment in the different
domains assessed. (4.14).

Table No 3: Comparison of mean values of socio-demographic values

N=200

Variables	Mean	SD	t value	Df	P
Gender Male Female	4.96 4.67	1.15 1.35	1.633	198	0.104
Marital Status Married Unmarried Widow/Widower	4.78 4.96 5.35	1.26 1.21 0.06	0.565		0.569
Locality Rural Urban	4.90 4.76	1.31 1.17	0.802	198	0.423
Education Primary High school Secondary Technical Graduate Post-graduate Professionals	4.26 4.59 4.75 4.49 4.90 5.11 5.56	1.22 1.43 1.23 1.24 1.19 1.17 0.81	2.22	06	0.040
Occupation Unemployed Cooley Student House wife Technical Professionals Business Administrator Others	5.91 4.51 4.90 4.69 4.50 5.19 5.10 4.64 4.49	0.23 1.26 1.35 1.39 1.19 0.97 0.97 1.32 1.45	1.26	08	0.266
Compliance to treatment Yes No	4.32 4.86	1.37 1.09	-0.26	198	0.790
Visit to Hospital First Routine	4.62 5.07	1.22 1.21	-0.262	197	0.009

Table 3 represents the mean values and its comparison
within the group.

Table No 4: Distribution of patients according to GINA classification and ACT

N=200

Clinical profile	Number (n)	Percentage (%)
Asthma Classification (GINA)		
Intermittent	60	30
Mild	35	17.5
Moderate	76	38
Severe	29	14.5
Asthma control test (ACT)		
Not controlled	114	57.0
Well controlled	72	36.0
Total controlled	14	7.0

The clinical profiles of the 200 patients interviewed are depicted in Table 4. Majority (37.5%) of the patients had moderate asthma, followed by 31% with intermittent asthma, 17% with mild asthma, and 14.5% with severe asthma.

On the ACT, majority of the patients (57%) experienced uncontrolled asthma, followed by 36% of patients with well-controlled asthma and only 7% patients gained an absolute score of 25 and experienced total control of asthma.
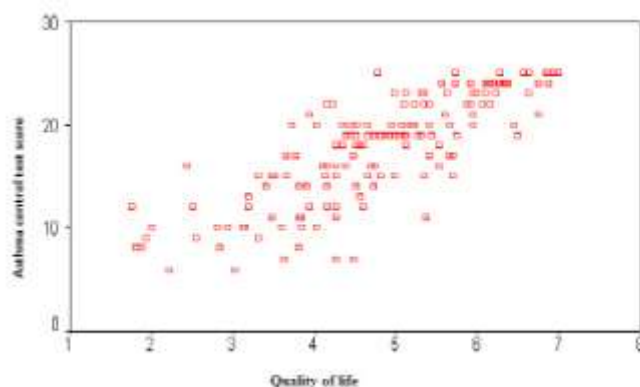

Figure 5 Correlations between AQLQ with ACT

The scatter plot depicts the positive correlation between AQLQ and ACT scores and the relation was highly significant (p=.000, r = 0.795)

Section B

Table No 5: Correlation of Asthma Quality Of Life with Demographic, Clinical, and Physiological variables

N=200

Variables	Correlation R	Significance
Age	-.078	.270
Duration Of Asthma	.015	.83
FEV1 Actual	.229	.002
FEV Post	.233	.001
FEV1 Reversibility	-.157	.034
PEFR	.231	.002
PEFR Post	.216	.003
PEFR Variability	-.153	.042
PEFR Reversibility	-.207	.005

Table 5 indicates no significant correlation between Asthma Quality of Life and the demographic variables. While a negative correlation between age of patients and the quality of life was evidenced, this was not significant. Thus older the patient, lower the perceived quality of life, however this was not statistically found to be significant. There was no significant correlation between the duration of asthma and the quality of life.

The Spirometry readings for FEV1 and PEFR positively correlated with QOL and were statistically found to be significant while Reversibility was found to be negatively correlated.

Table No 6: Correlation between Asthma Control Test and Demographic, Clinical and Physiological Variables

N=200

Variables	Correlation (R)	Significance
Age	-.084	.236
Duration of Asthma	.009	.895
Duration of Treatment	.014	.843
Duration of Treatment at CMC	.127	.074
FEV1 actual	.293	.000
FEV Post	.287	.000
FEV1 Reversibility	-.197	.007
PEFR	.314	.000
PEF Post	.300	.000
PEFR Variability	-.195	.007
Reversibility	-.207	.005

Table 6 indicates a negative correlation between age of patients and the Asthma Control Test but this was not significant. Thus older the patient, lower the Asthma

Control Test. There was no significant correlation between the duration of asthma and the Asthma Control Test. The Spirometry readings were found to be positively correlated except the scores received on reversibility and variability. The scores were statistically significant.

Table 7 Correlation of Asthma Quality Of Life with Asthma Control Test

Variables	Correlation (r)	Significance
Asthma Quality Of Life	.795	.000
Activity Limitation	.715	.000
Symptoms	.779	.000
Emotional Function	.739	.000
Environmental Factors	.541	.000

A generally positive correlation was evidenced between the Quality of Life perceived by the patients and the degree of asthma control experienced by them. This trend was evident across the various domains of QOL focused upon in the current study. The degree of correlation was substantively lower with regards to the environment domain (r =.541) as compared with the other domains that ranged from .715 to .779.
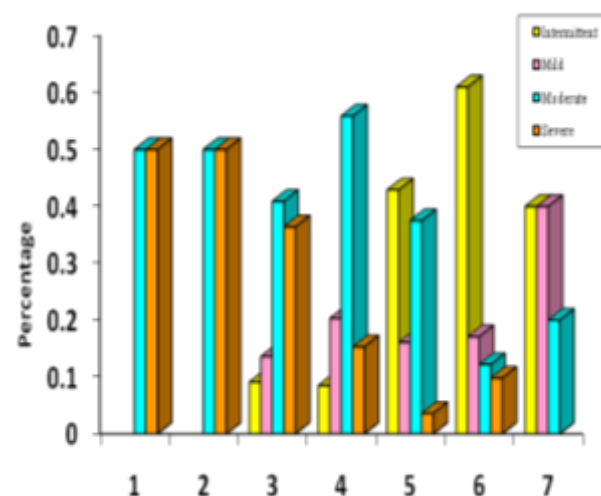
Section C

Figure 6 Relationships between Asthma Quality of Life and GINA Classification

Table No 8: Association of Asthma Quality Of Life with GINA Classification

N=200

GINA classification	AQLQ Scores						Total		Statistical Test
	Poor		Moderate		Good				
	n	%	n	%	n	%	n	%	
Intermittent	-	-	12	12.6	48	53.3	60	30.0	$X^2 = 58.973$ P = 0.000 df = 6
Mild Persistent	-	-	19	20.0	16	17.8	35	17.5	
Moderate Persistent	8	53.3	48	50.5	20	22.2	76	38.0	
Severe Persistent	7	46.7	16	16.8	06	06.7	29	14.5	
Total	15	100	95	100	90	100	200	100	

Table 8 depicts the association of Asthma QOL with GINA scores. The scores are grouped together for analysis and interpreted as follows: Scores 1-3 as Poor QOL, 3-5 as Moderate QOL & 5-7 as Good QOL. Patients who achieved a higher mean score on AQLQ were found to experience a lower grade of severity of asthma (intermittent). The correlation between AQLQ and the classification of asthma were highly significant.

Table No 9: Association of Asthma Control Test with GINA Classification

N=200

GINA Classification	Asthma control test								Statistical test
	Uncontrolled		Well Controlled		Total control		Total		
	N	%	N	%	N	%	N	%	
Intermittent	09	7.9	45	62.5	06	42.9	60	30.0	$X^2 = 72.464$
Mild	19	16.7	12	16.7	04	28.6	35	17.5	
Moderate	62	54.4	11	15.3	03	21.4	76	38.0	P =.000
Severe	24	21.1	04	05.6	01	07.1	29	14.5	
Total	114	100	72	100	14	100	200	100	df = 6

Table 9 reports the association between ACT and GINA. Patients who achieved a total control on asthma on ACT and indicated better controls on GINA were classified as experiencing intermittent asthma and thus not affecting their day to day functioning. Patients who described themselves as experiencing greater severity of asthma achieved lower control in the ACT test.

4. Discussion

This study was conducted to assess the Quality of Life in patients with Bronchial Asthma, compare it with disease severity, Asthma control and PFT measurements. Validated instruments of repute with international acclaim were used to assess the diverse factors that affect patients with Bronchial Asthma. Elizabeth Juniper's AQLQ(S) was used to assess the Quality of Life [20]. GINA classification was employed to assess the severity of Asthma. The Asthma Control Test was deployed to assess the degree of control exercised by patients.

Physician diagnosed patients with Bronchial Asthma (n=200) who attended the Respiratory or Asthma clinics were the sample in this study. The AQLQ(S), ACT and GINA classification were used on all the 200 patients while only 184 patients performed technically adequate spirometry. The study was carried out over a six-week period from 14th May 2007 to 24th June 2007.

The AQLQ (S) was administered to all the patients who met the inclusion criteria. The mean QOL rating emerged as 4.84 on a 7-point likert scale. This essentially indicates that most of the patients studied experienced an above average QOL, with a minimum score of 1.41 and a maximum score of 7. The standard deviation emerged as 1.25. A similar study conducted [9] on patients with bronchial asthma had a mean value of 4.7. Studies from New York State, Connecticut, and Los Angeles that used the Behavioural Risk Factor Surveillance System (BRFSS) questions showed that people with asthma experienced worse quality of life than people without asthma. Studies conducted by [10] clearly demonstrated that asthma significantly affects quality of life among older adults. A study conducted on Hispanics by [11] found that asthma is a common medical condition in the older adults and it significantly impacts the quality of life and general health status. A study carried out by [12] to assess the QOL among adolescents using Paediatric Asthma Quality of Life Questionnaire revealed a mean score of 4.78 which is lower than the mean achieved by patients in the current study.

The QOL of patients were captured across four specific domains namely: activity limitations, symptoms, environmental factors and emotional function. The principal domain that impacted QOL was the "environmental factors" with a mean score of 4.14 and the least impacted domain was "symptoms" with a mean score of 5.09. The mean scores of 4.83 and 4.80 were

attained on activity limitations and emotional function respectively. A study conducted by [13] emerged with score of 5.0 in activity limitations, 4.5 on symptoms, 5.1 on emotion and 4.7 on environmental stimuli.

The present study is consistent with a study conducted by [14] where patients' domain scores on AQLQ improved on medication except the environmental domain signifying that the environmental factors such as smoking, dust, air pollution, weather changes and exposure to strong smell influences or impairs the quality of life maximally. Since 43% (86) of the patients who were part of the study came from West Bengal where the air pollution and incidence of dust is high, as reported by patients, the impact of the environmental domain is explainable. Studies conducted on children with asthma by [15] showed that seasons affected the quality of life among children with bronchial asthma. A previous study [16] showed that QOL was severely impaired by wheezing. This is contrary to the present study where the mean score on the symptoms domain was the highest at 5.09 and the environment domain's mean was lowest at 4.14 This is perhaps due to the severity of the environmental influence in the Indian context that is riddled with pollution of varied kinds, which is not the case with the western environment where the study in comparison was based.

Another study carried out on children by [17] revealed that the children's' median emotional score was 6.3, whereas median activity limitation score was 5.0. In contrast the present study revealed a median emotional score of 4.8 and activity limitation score of 4.83. These trends indicate that increased age with asthma lowers the perceived QOL.

57.5% (n=115) patients were male and 42.5% (n=85) were female. A study reported that women with asthma attained lower scores on HRQOL. The present study did not bring about any significant relation between QOL of men and women [18]. A study to measure the impact of age, sex and disease severity on quality-of-life in asthma patients using SF-36 reported better quality-of-life in men with statistically significant differences (p<0.01) [19]

The lung compliance measured through the spirometry test showed significant correlation between FEV1, FEV Post and AQLQ(S) (r=. 293, r =.287, p=.000, p=.000) respectively. The FEV1 reversibility correlated negatively with AQLQ(S) (r=-.197, p=. 007). A study conducted by [20] showed that there was a significant longitudinal and cross-sectional correlation between asthma quality of life and other measures of both clinical asthma and generic quality of life. This is in contrast to findings from (12). This is not surprising as lung function tests during the hospital visits reflect the situation at one instant, while asthma is a disease characterized by much variability. Similarly, no correlation was found between Pediatric Asthma Quality of Life (PAQLQ) scores and FEV1 [21]. In contrast,

there was a significant correlation with home monitoring of peak expiratory flow.

The study indicated a highly significant correlation between the QOL and the ACT scores. (r =. 795, p=.000). Thus with enhanced control of asthma the perceived QOL increases. This is consistent with a study reported in Reuters Health which showed a tangible improvement in the QOL when asthma is totally controlled than when well controlled. Findings are similar from other studies reporting significant associations between perceived control of asthma (PCAQ), and asthma-specific QOL (AQLQ) [22, 23].

The study showed a significant relationship between GINA and QOL in this sample. Consistent with previous studies, findings from this study confirmed patients who experienced severe asthma experienced a lesser quality of life (p=.000) [23].

A study on the impact of age, sex and disease severity on quality-of-life in asthma patients using SF-36 reported decreasing values with increasing disease severity in all eight domains (14). Statistically significant differences (p<0.001) between disease severity levels were found for physical functioning, physical role limitations, general health, vitality and social function. Similar findings were evident in a study conducted on children with asthma [24] where on all measures of severity, a significant correlation with quality of life (range r =0.23-0.51, all p<.01) emerged. Improvements in the PACQLQ correlated with decreases in symptom scores including symptom days (r=-0.27, p<.001) and symptom nights (r =-0.22, p=.005).

Although FEV_1 was used by most guidelines to indicate the presence of severe disease, it is clear that the correlation between FEV_1 and disease symptoms were poor [25]. Another study also confirms that disease severity by patients or clinicians correlated poorly with disease-specific QOL scores [26].

Conclusion

In conclusion, the study shows that Bronchial Asthma has an impact on the QOL. The QOL was largely affected by environmental factors. Improving the environment can assist patients in enhancing their QOL. Among the four domains the least affected is the symptom domain. The severity of asthma correlated highly with the QOL. The severity of Asthma is inversely proportional to the Quality of life. Patients was with Asthma live a compromised life. Clinical measures and a conducive environment can significantly enhance the QOL. There is a significant association between AQLQ & ACT. These findings are consistent with many of the QOL studies. In conclusion, this study highlights the importance of assessing Quality of Life as perceived by patients with bronchial asthma, the factors affecting QOL, the Asthma Control and its impact on QOL as also the relationship between QOL and the severity of Asthma. Nurses have a prime responsibility to educate their patients with bronchial asthma and facilitate

improvement with their QOL. Focused patient education provides an effective vehicle for increased self-management of chronic illnesses such as asthma and promotes modifications to and the environment in particular lifestyle and the environment that are considered important in enhancing the quality of life.

Limitations

The limitations of the study were: The study didn't include children / adults over the age of 65 and those with multi-morbidities. The findings on QOL in bronchial asthma are therefore limited to as specific age range and may not be representative of everyone living in South India with bronchial asthma.

Reference

1. Lewis HDO & B. Medical Surgical Nursing. St. Louis, Missouri: Mosby. 2007; (7th ed).
2. Sear C, Hulme M, Adger N, Brown K. The impacts of global climate change on the UK overseas territories. National Resource Institute, The Tyndall Centre, London, England. 2001 Mar.
3. Viswanathan R, Prasad M, Thakur AK, Sinha SP, Prakash N, Mody RK, Singh TR, Prasad SN. Epidemiology of asthma in an urban population. A random morbidity survey. Journal of the Indian Medical association. 1966 May 1; 46(9):480.
4. Jindal SK, Gupta D, Aggarwal AN, Jindal RC, Singh V. Study of the prevalence of asthma in adults in North India using a standardized field questionnaire. Journal of Asthma. 2000 Jan 1; 37(4):345-51.
5. Aggarwal AN, Chaudhry K, Chhabra SK, D Souza GA, Gupta D, Jindal SK, Katiyar SK, Kumar R, Shah B, Vijayan VK. Prevalence and risk factors for bronchial asthma in Indian adults: a multicentre study. Indian Journal of Chest Diseases and Allied Sciences. 2006 Jan 18; 48(1):13.
6. Viswanathan R, Prasad M, Thakur AK, Sinha SP, Prakash N, Mody RK, Singh TR, Prasad SN. Epidemiology of asthma in an urban population. A random morbidity survey. Journal of the Indian Medical association. 1966 May 1; 46(9):480.
7. Aggarwal AN, Chaudhry K, Chhabra SK, D Souza GA, Gupta D, Jindal SK, Katiyar SK, Kumar R, Shah B, Vijayan VK. Prevalence and risk factors for bronchial asthma in Indian adults: a multicentre study. Indian Journal of Chest Diseases and Allied Sciences. 2006 Jan 18; 48(1):13.
8. hhabra, S.K. & Kaushik S. Asthma Quality of Life.. The Indian Journal of Chest Diseases & Allied Sciences. 2005; 169(47):167 – 173.
9. Riccioni G, D'Orazio N, Di Ilio C, Della Vecchia R, Ballone E, Menna V, Guagnano MT. Bronchial hyperresponsiveness and quality of life in asthmatics. Respiration. 2003 Dec 5; 70(5):496-9.
10. Plaza V, Serra-Batlles J, Ferrer M, Morejón E. Quality of life and economic features in elderly asthmatics. Respiration. 2000 Feb 24; 67(1):65-70.
11. Arif AA, Rohrer JE, Delclos GL. A population-based study of asthma, quality of life, and occupation among

elderly Hispanic and non-Hispanic whites: a cross-sectional investigation. BMC public health. 2005 Sep 21; 5(1):97.

12. Rich M, Lamola S, Woods ER. Effects of creating visual illness narratives on quality of life with asthma: A pilot intervention study. Journal of Adolescent Health. 2006 Jun 30; 38(6):748-52.

13. Riccioni G, D'Orazio N, Di Ilio C, Della Vecchia R, Ballone E, Menna V, Guagnano MT. Bronchial hyperresponsiveness and quality of life in asthmatics. Respiration. 2003 Dec 5; 70(5):496-9.

14. Chhabra SK, Gupta CK, Chhabra P, Pal SR. Prevalence of bronchial asthma in schoolchildren in Delhi. Journal of asthma. 1998 Jan 1; 35(3):291-6.

15. Garcia-Marcos L, Carvajal Uruena I, Escribano Montaner A, Fernandez Benitez M, Garcia de la Rubia S, Tauler Toro E, Perez Fernandez V, Barcina Sanchez C. Seasons and other factors affecting the quality of life of asthmatic children.

16. Matheson M, Raven J, Woods RK, Thien F, Walters EH, Abramson M. Wheeze not current asthma affects quality of life in young adults with asthma. Thorax. 2002 Feb 1; 57(2):165-7.

17. Mussaffi H, Omer R, Prais D, Mei-Zahav M, Weiss-Kasirer T, Botzer Z, Blau H. Computerised paediatric asthma quality of life questionnaires in routine care. Archives of disease in childhood. 2007 Aug 1; 92(8):678-82.

18. Wijnhoven HA, Kriegsman DM, Snoek FJ, Hesselink AE, de Haan M. Gender differences in health-related quality of life among asthma patients. Journal of asthma. 2003 Jan 1; 40(2):189-99.

19. Gaebel K, Goldsmith C, Levine M, Poston J, Hu X, Borden K, Willison D. Quality of Life of Asthma and Bronchitis Patients as Diagnosed from Telephone Interview Data. Quality of Life Research. 1997 Jul 1:464-.

20. Juniper EF, Guyatt GH, Ferrie PJ, Griffith LE. Measuring quality of life in asthma. American Review of Respiratory Disease. 1993 Apr 1; 147:832-.

21. Ehrs PO, Nokela M, Stallberg B, Hjemdahl P, Jonsson EW. Brief questionnaires for patient-reported outcomes in asthma: validation and usefulness in a primary care setting. CHEST Journal. 2006 Apr 1; 129(4):925-32.

22. Olajos et al., Perceived control and quality of life in asthma: impact of asthma education. Journal of Asthma. 2005 Jan 1; 42(9):751-6.

23. Hallstrand TS, Curtis JR, Aitken ML, Sullivan SD. Quality of life in adolescents with mild asthma. Pediatric pulmonology. 2003 Dec 1; 36(6):536-43.

24. Halterman JS, Yoos HL, Conn KM, Callahan PM, Montes G, Neely TL, Szilagyi PG. The impact of childhood asthma on parental quality of life. Journal of Asthma. 2004 Jan 1; 41(6):645-53.

25. Teeter JG, Bleecker ER. Relationship between airway obstruction and respiratory symptoms in adult asthmatics. CHEST Journal. 1998 Feb 1; 113(2):272-7.

26. Ehrs PO, Nokela M, Stallberg B, Hjemdahl P, Jonsson EW. Brief questionnaires for patient-reported outcomes in asthma: validation and usefulness in a primary care setting. CHEST Journal. 2006 Apr 1; 129(4):925-32.