



UNIVERSITI PUTRA MALAYSIA

***EFFECTS OF ADOLESCENT ASTHMA EDUCATION INTERVENTION ON
ASTHMA CONTROL IN NORTHWEST OF LIBYA***

NADYA MOHAMED ELFETURI

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By

NADYA MOHAMED ELFETURI

**Thesis Submitted to the School of Graduate Studies, Universiti Putra
Malaysia, in Fulfilment of the Requirements for the Degree of
Doctor of Philosophy**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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November 2020

Chairman : Professor Shamsul Bahri bin Hj. Mohd Tamrin, PhD
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Among adolescents, asthma is an important public health issue that is associated with high morbidity and mortality. Despite most national guidelines consider education as an essential component of effective asthma self-management to promote asthma control and reducing negative impact of this disease on daily life, a little number of educational programs target asthmatic adolescents in Libya. Therefore, the aim of this study was to develop, implement and evaluate the effectiveness of asthma education intervention program on asthma control, asthma knowledge, self-efficacy, asthma quality of life, and pulmonary function test among adolescents with persistent asthma in Northwest of Libya. A parallel randomized controlled trial was conducted in Sabratha Teaching Hospital. A sample of 92 adolescents were randomized by concealment block randomization into either the intervention group (n=46) or the control group (n=46). The asthma educational program for intervention group was held in one day workshop in form of handouts, play role activities, practice session for inhaler devices and booklet. The control group received the same educational program at the end of the study. Delivery of program was based on Social Cognitive Theory. Pre-validated Arabic questionnaires were used to collect the data on demographic characteristics, asthma control, asthma knowledge, self-efficacy, and asthma quality of life. The data were collected at baseline, 3-months, and 6-months post-intervention. Forced expiratory volume in one second (FEV1) was measured by Spiro Pro spirometry at base line and 6-months post intervention. The data was analyzed using SPSS version 22. Generalized Estimating Equation (GEE) was applied to assess the effectiveness of the educational intervention.

The results of the current study showed that only 24% of the participants had well-controlled asthma. Adolescents whose asthma were well-controlled reported higher level asthma knowledge (OR= 1.224, 95%CI: 1.070- 1.399, p= 0.003), and higher self-efficacy (OR= 1.124, 95%CI: 1.047 – 1.208, p= 0.001), had greater odds of

using preventive inhalers every day (OR= 3.355, 95%CI 1.174-9.588, p=0.024), and had three times the odds of not having allergic rhinitis (OR= 3.221 95%CI 1.196-8.676, p=0.021). There were no significant differences between the two groups regarding the respondents' characteristics and the outcome variables at baseline.

The GEE results from the comparisons between groups at 3-months, and 6-months post intervention demonstrated a significant change in asthma control level between the groups across the time (p= 0.008). The adjusted odds of well-controlled asthma among the intervention group was 3.68 (95%CI: 1.42-9.58). For secondary outcomes, compared to the control group, the GEE results showed that participants in intervention group had better asthma knowledge at 3-months (mean difference= 2.53, p= 0.002) and 6- months post intervention (mean difference= 2.94, p< 0.001), higher self-efficacy at 3-months (mean difference= 5.77, p= 0.006) and 6-months post intervention (mean difference= 7.58, p< 0.001), and clinically significant improvement in mean symptoms and limited activity domains of asthma quality of life at 3 months (mean differences = 0.52, and 0.54) and 6-months post intervention (mean differences = 0.74, and 0.61) respectively. However, there was no significant difference between the two study groups in total asthma quality of life, emotional domain of asthma quality of life, and FEV1%. These results provide evidence for the effectiveness of asthma educational program to improve the level of asthma control, as well as the asthma knowledge and self-efficacy among Libyan asthmatic adolescents.

Keywords: Asthma, Asthma control, Adolescents, Asthma educational intervention, Libya.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**KESAN INTERVENSI PENDIDIKAN ASMA DALAM KALANGAN
REMAJA TERHADAP PENGENDALIAN ASMA DI BARAT LAUT LIBYA**

Oleh

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Asma dalam kalangan remaja merupakan masalah kesihatan masyarakat yang penting yang berkaitan dengan tahap kematian dan kematian yang tinggi. Walaupun terdapat sebilangan besar garis panduan nasional yang menganggap pendidikan sebagai komponen penting dalam pengurusan diri asma yang berkesan untuk mempromosikan kawalan asma dan mengurangkan kesan negatif penyakit ini terhadap kehidupan seharian, hanya sebilangan kecil program pendidikan yang menasaskan remaja yang menghidap asma di Libya. Oleh itu, tujuan kajian ini adalah untuk mengembangkan, melaksanakan dan menilai keberkesanan program intervensi pendidikan asma terhadap kawalan asma sebagai hasil utamanya dan hasil sekunder yang merangkumi pengetahuan asma, keberkesanan diri, kualiti hidup asma dan ujian fungsi paru di kalangan remaja dengan asma yang berterusan di Barat Laut Libya. Percubaan terkawal selari secara rawak dijalankan di Sabratha Teaching Hospital. Sampel seramai 92 remaja diacak secara rawak menggunakan blok penyembunyian ke dalam kumpulan intervensi ($n = 46$) atau kumpulan kawalan ($n = 46$). Program pendidikan asma untuk kumpulan intervensi diadakan dalam bengkel yang dianjurkan selama sehari dalam bentuk pemberian bahan-bahan, aktiviti main peranan, sesi latihan bagi alat penyedut asma dan bukubuku kecil. Kumpulan kawalan mendapat program pendidikan yang sama pada akhir kajian. Penyampaian program ini adalah berdasarkan Teori Kognitif Sosial. Soal selidik bahasa Arab yang telah disahkan telah digunakan untuk mengumpulkan data mengenai ciri-ciri demografi, kawalan asma, pengetahuan asma, keberkesanan diri dan kualiti hidup asma. Data dikumpulkan pada peringkat awal, 3 bulan dan 6 bulan selepas intervensi. Volume ekspirasi paksa dalam satu saat (FEV1) diukur oleh Spiro Pro spirometry pada garis dasar dan enam bulan selepas intervensi. Data dianalisis menggunakan SPSS versi 22. Generalized Estimating Equation (GEE) telah digunakan untuk menilai keberkesanan intervensi pendidikan.

Hasil kajian semasa menunjukkan bahawa hanya 24% peserta mempunyai asma yang terkawal. Remaja yang mempunyai asma terkawal melaporkan tahap

pengetahuan asma yang lebih tinggi (OR = 1.224, 95% CI: 1.070-1.399, p = 0.003), keberkesanan diri yang lebih tinggi (OR = 1.124, 95% CI: 1.047 - 1.208, p = 0.001), mempunyai kebarangkalian lebih besar menggunakan alat sedut pencegahan asma setiap hari (OR= 3.355, 95% CI 1.174-9.588, p = 0.024) dan mempunyai tiga kali ganda kebarangkalian tidak mengalami rhinitis alergi (OR = 3.221 95% CI 1.196-8.676 , p= 0.021). Tiada perbezaan yang signifikan ditemui mengenai ciri-ciri responden dan pemboleh ubah hasil antara kedua-dua kumpulan pada peringkat awal.

Hasil GEE dari perbandingan antara kumpulan pada bulan 3 dan bulan 6 selepas intervensi menunjukkan perubahan yang signifikan dalam tahap kawalan asma antara kumpulan sepanjang masa (p = 0.008). Peluang asma terkawal yang diselaraskan dalam kumpulan intervensi adalah 3.68 (95% CI: 1.42-9.58). Berbanding dengan kumpulan kawalan bagi hasil sekunder, keputusan GEE menunjukkan bahawa peserta dalam kumpulan intervensi mempunyai pengetahuan asma yang lebih baik pada 3 bulan (perbezaan min = 2.53, p = 0.002) dan 6 bulan selepas intervensi (perbezaan min = 2.94, p<0.001), keberkesanan diri yang lebih tinggi pada 3 bulan (perbezaan min = 5.77, p = 0.006) dan 6 bulan selepas intervensi (perbezaan min = 7.58, p <0.001) dan peningkatan klinikal yang signifikan dalam min gejala dan domain aktiviti terhad kualiti hidup asma pada 3 bulan (perbezaan min = 0,52, dan 0,54) dan 6 bulan selepas intervensi (perbezaan min = 0,74, dan 0,61). Walau bagaimanapun, tiada perbezaan yang signifikan antara dua kumpulan kajian tersebut dalam kualiti hidup asma, domain emosi kualiti hidup asma dan FEV1%. Hasil ini memberikan bukti keberkesanan program pendidikan asma bagi meningkatkan tahap kawalan asma serta pengetahuan dan keberkesanan asma di dalam kalangan remaja yang menghidap asma di Libya.

Kata kunci: Asma, Kawalan Asma, Remaja, Intervensi pendidikan Asma, Libya.

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LIST OF ABBREVIATIONS / NOTATIONS / GLOSSARY OF TERMS

\leq	Less than or equals to
\geq	Greater than or equals to
ACQ	Asthma Control Questionnaire
ACT	Asthma Control Test
ALA	American Lung Association
AOR	Adjusted odds ratio
aPR	Adjusted Prevalence Rate Ratios
AR	Allergic Rhinitis
IRR	Incidence Rate Ratio
ATS	American Thoracic society
BMI	Body Mass Index
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
ED	Emergency Department
EFA	Exploratory Factor Analysis
EM	Expectation Maximization
EPR3	Education Program Expert Panel Report 3
FEV1	Forced expiratory Volume in One Second
FVC	Forced vital capacity
GEE	Generalized Estimating Equation
GINA	Global Initiative for Asthma guidelines
HBM	Health Belief Model
HRQL	Health-Related Quality of Life

ICS	Inhaled Corticosteroids
LABA	Long - Acting Beta Agonist
mini PAQLQ	mini Pediatric Asthma Quality of Life Questionnaire
NAKQ	Newcastle Asthma Knowledge Questionnaire
NHLBI	National Heart, Lung, and Blood Institute
PAF	Principal Axis Factors
PEF	Peak Expiratory Flow
PFM	Peak Flow Meter
QOL	Quality of Life
SCT	Social Cognitive Theory
SD	Standard Deviation
SE	Standard Error
TMM	Transtheoretical Model
US	United States
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Asthma is a major non-communicable disease affecting all age groups. It is a chronic respiratory disease characterized by intermittent dry cough, wheezing, chest tightness, and breathlessness that fluctuate in severity and frequency from person to another, due to inflammation of the airways (Liu, Covar, Spahn, and Leung, 2011). During an asthma attack, the lining of the airways swells and secretion of mucus product increase, leading to narrowing of bronchial tubes and reducing the flow of air to get in and out of the lung (National Heart, Lung, and Blood Institute (NHLBI), 2007; Reddel et al., 2015). Airway remodeling causes severe damage of the airway epithelium with areas of denudation and areas of regeneration. These changes are irreversible and occur early in the course of the disease (Fehrenbach, Wagner, & Wegmann, 2017). This reflects importance of proper asthma management and well controlled, in order to prevent disease progression and minimize symptoms.

Asthma is a global public health problem with respect to its high prevalence. About 334 million people suffer from asthma around the world, and current trends suggest that an additional 100 million may have asthma by 2025 (Adeloye, Chan, Rudan, & Campbell, 2013). Compared to adults, the prevalence of asthma is higher in children below 18 years old. The global prevalence rate of asthma is approximately 12% for 6-7 year age group, and global prevalence rate of asthma for adolescents aged between 13-14 year is 14.1% (Lai et al., 2009). In adults, the global prevalence rate of asthma was 8.6% (To et al., 2012). According to CDC National Asthma Control Program report, about 7 million children (9%) under 18 years old have asthma (CDC, 2013). Over 10.5% of children aged 12-17 years reported a diagnosis of asthma (Zahran, Bailey, Damon, Garbe, & Breyse, 2018).

Although the asthma cannot be cured, the symptoms can be prevented and controlled with appropriate medical management, and by avoiding exposure to asthma triggers. Medication for asthma consists of two types of medicines: quick-relief asthma medicines that used to relieve acute asthma symptoms, and long-term control medicines aims to prevent asthma symptoms from starting and prevent asthma attack.

Asthma control is a primary goal of asthma management. It includes assessment of symptoms, use of reliever medication, and frequency of asthma exacerbations (Reddel et al., 2009). The NHLBI collaborated with the World Health Organization (WHO) to establish the Global Initiative for Asthma guidelines (GINA) in 1993 (Kroegel, 2009). These guidelines address specially the issue of asthma control, and improve the management by helping the patients and clinicians choose the appropriate treatment options, making the control is ultimate goal of asthma

management (GINA, 2018). Moreover, The NHLBI developed the National Asthma Education Program Expert Panel Report 3 (EPR3) on the Management of Asthma. The EPR-3 emphasizes that all patients that have asthma should be educated to recognize symptoms of poor asthma control after each visit (NHLBI, 2007).

The negative effects of poor controlled asthma range from increased the risk of recurrent asthma attacks and visits to emergency department, to hospitalization and even death. The global disability for asthma was estimated in systematic and comprehensive assessment in Global Burden of Disease Study 2010 (Asher & Pearce, 2014). Disability weights for asthma range from 0 value that refers to no loss of health to 1 which refers to loss of health equivalent to death. Disability weight for person with well controlled asthma (who has wheeze and cough once a month with no limitation of daily activity) was 0.009 (0.004-0.018), and person with poor asthma control (who has wheeze, cough, and chest tightness more than twice a week and sometimes waking up at night due to cough with restriction of daily activity) was 0.132 (0.087-0.190) which is approximately 14.7 times more than a well-controlled person.

Despite the availability of effective therapies and established guidelines for asthma management, the global level of control is still suboptimal (Demoly et al., 2009; Thompson et al., 2013; Nathan et al., 2015). In a global survey called Asthma Insights and Management Survey that conducted in 20 countries in North America, Europe, Latin America, and Asia-Pacific region from 2009-2011 to determine the level of asthma control based on GINA and EPR-3 guidelines among 10,302 adults and adolescents with asthma, results showed poor levels of asthma control were being determined, where the global median of well controlled asthma was 9% ranging from 0% to 29% (Nathan et al., 2015).

Among adolescents, the morbidity and mortality are high, with higher rates of death than in younger children (Akinbami, Moorman, Garbe, & Sondik, 2009; Rhee et al., 2018). Possible reasons for high burden are that adolescents are less confidence in using the preventive inhaler medication to prevent asthma exacerbation and control their symptom (Ayala, Yeatts, & Carpenter, 2009; Naimi et al., 2009), express difficulty to remember taking their medication because of their other priorities, and try to deny their asthma symptoms (Van der Meer et al., 2007; Rhee, Belyea, Ciurzynski, & Brasch, 2009; Naimi et al., 2009). Moreover, during the period of adolescence, issue with emerging independence may contribute to poor asthma control and higher mortality rates, as parents become less able to manage asthma among their teenage children (Akinbami et al., 2009; Sadof & Kaslovsky, 2011).

Asthma morbidity and mortality in adolescents can be prevented by effective self-management educational programs (Hennessy-Harstad, 2013). When teaching adolescents the asthma self-management techniques health educators should address adolescent developmental issues, such as building positive self-image and confidence and gaining problem-solving skills (Sadof & Kaslovsky, 2011). To accomplish this approach, it is often helpful to involve the adolescent directly in

setting goals for therapy, increase self-efficacy and develop an appropriate asthma action plan (NHBLI, 2007). The improving self-efficacy might provide the foundation for long-term behavior change among adolescents with asthma by improving self-care skills which can lead to better control of asthma (Van der Meer et al., 2007).

A number of studies have found asthma health education programs to be effective; however, a majority of these programs were conducted in developed countries. For instance, Joseph et al. (2007), Magzamen, Patel, Davis, Edelstein, & Tager, (2008) and Bruzzese et al. (2011) studies assessed the effectiveness of educational interventions in United States, and results showed that the adolescents with asthma who attended behavioral Interventions reported more confidence to manage asthma, fewer asthma symptoms and night awakenings, less restricted activity, and fewer visits to the emergency departments. Furthermore, there is a dearth of health education and promotion programs in Libya to educate adolescents about chronic conditions such as asthma.

This proposed study was designed to develop asthma educational program by using several constructs of Bandura's Social Cognitive Theory (SCT) and it provided a basis for long-term behavioral changes in adolescent asthmatics. The proposed intervention targets self-efficacy by providing a visual cue, increasing knowledge, and building a mastery experience. Therefore, this research was conducted in an effort to increase knowledge and self-efficacy of Libyan adolescents with asthma with the ultimate goal of improving the asthma control, pulmonary function, and quality of life.

1.2 Problem Statement

Education is an essential element in effective management of asthma to improve outcomes and reduce the negative impact of this disease on daily life. Furthermore, both the guidelines of the “National Asthma Education and Prevention Program” and “Global Initiative on Asthma” emphasize the importance of asthma education, highlighting that educational intervention should be one of essential components of asthma care (NHBLI, 2007; GINA, 2018). This plays an important role by increasing motivation, skills, and confidence with subsequent benefits in asthma control. This results in improved asthma symptoms and lung function, and a decreased economic burden in terms of medical expenses (Clark, Griffiths, Keteyian, & Partridge, 2010).

Among adolescents, asthma is an important public health issue that is associated with high morbidity and mortality (Akinbami et al., 2009; Hennessy-Harstad, 2013; Asher & Pearce, 2014). Akinbami et al. (2009) showed a higher asthma mortality rate among adolescents by approximately 1.5 times compared with younger children. Moreover, from the literature many researchers have recorded increasing prevalence of asthma in worldwide. In the United States, the prevalence rate for children under age 17 is 9.6 % (7 millions). Of those, 39% (2.8 millions) were adolescents (12–17 years). Prevalence increased significantly during 2001-2009 for all children (8.7%

to 9.6%) (CDC, 2013). In Africa, the prevalence of asthma over the past two decades has increased. A review of asthma prevalence studies in Africa from 1990 to June 2013 that included 45 studies the results showed that the prevalence of asthma increased from 12.1% (34.1 million) [95% confidence interval [CI] 7.2-16.9] to 13.9% (49.7 million) [95% CI 9.6-18.3] among children and adolescents (Adeloye et al., 2013).

In Libya, the prevalence of wheezing experience in past 12 months among adult asthmatic patients in Sirte city based on modified International Study of Asthma and Allergies questionnaire was 17.6% which is comparable to the other part of the world, while the prevalence of asthma after confirmed by pulmonary function tests was 6.9% (Iesa, Awooda, Konozy, & Musa, 2017). Unfortunately, based on literature research, no published studies have examined the prevalence of asthma in children and adolescents, as well as the level of asthma control among all age groups in Libya. However, in neighbouring countries such as Egypt that located near to northeast of Libya, the prevalence of asthma varied from 9.1% for adolescents in Damietta Governorate which approximately same as in United States (Mansour, Yasein, Ghandour, Zaidan, & Abo El-Abaas, 2014) to 13.4% (95% CI 11.6 -15.1) in Dakahlia Governorate (Meatty, El-Desoky, El-Domyaty, El-Gilany, & Nasef, 2018). 47.2% of children under 17 years in Dakahlia Governorate were considered to be suboptimal control (El-Gilany, El-Desoky, El-Domyaty, Nasef, Meatty, 2018). In Tunisia, Which is located at the border of Libya from the northwest, although the prevalence rate among children and adolescents was low is 3.5% [95% CI: 2.9% to 4.2%], but only 7.6% [95% CI: 4.8 -11.8%] of children were considered to be controlled. This is likely to reflect unsatisfactory asthma control and high burden of asthma in Tunisia (El-Ftough et al., 2009).

Suboptimal control and poor understanding of asthma are likely in adolescents (Rhee et al., 2009; Sadof & Kaslovsky, 2011; Asher & Ellwood, 2014). The burden of asthma is very high among this age group (Asher & Ellwood, 2014) (figure 1.1). The effects of poor asthma control may include impaired health related quality of life (HRQL), especially physical and emotional well-being, emergency hospitalizations, school absences, and fatality if the illness is poorly managed (Braido, 2013). However, these can be largely prevented by effective self-management educational programs (Liptzin & Szeffler, 2016). These effective programs should include sufficient knowledge of the nature of the disease and self-management skills to deal with asthma such as avoidance of triggers and proper use of inhalers, how to assess whether asthma is under control, regular follow-up visits, and the ability to identify and solve problems associated with symptoms of asthma and treatment which negatively affect the desire to use regular therapy (Boulet, 2015). According to Hennessy-Harstad (2013), control of asthma in adolescents depends on learning how to self-manage their asthma. Therefore, implementation of self-management education for adolescents with asthma facilitates the prevention of asthma exacerbations. The need for such implementation in clinical setting when patients come to the hospital for asthma care is critical in order to reduce the cost, morbidity and mortality associated with asthma (Clark, Houle, & Partridge, 2007).

Inadequate control in adolescents has been attributed to developmental characteristics. Adolescents with asthma must accomplish all of the developmental goals for their age group while struggling to understand and manage a chronic illness. Because of the tumultuous changes of adolescence, combined with concerns of normalcy, peer approval, and independence, adolescents with asthma are particularly at risk for poor asthma control. Furthermore, the transition during adolescence from parent-managed asthma care to asthma self-care, adolescents with asthma are particularly at risk for poor asthma control, often resulting in ineffective management of this potentially life-threatening condition (Srof, Taboas, & Velsor-Friedrich, 2012).

Several asthma health education programs have been developed to change behaviors, such as avoiding allergens or regularly taking preventive medications, necessary for long-term control of asthma; however, a majority of these programs targeted adult or child patients with asthma (Al-sheyab, Gallagher, Crisp, & Shah, 2012). Moreover, most of the behavioral intervention studies that target adolescents to improve asthma outcomes through educational programs were conducted in developed countries. In a review to educational asthma interventions for school students by Coelho and colleagues, 94% of studies were in developed countries and delivered by health professional. Authors conclude that educational interventions reduce the impact of asthma morbidity (Coelho, Cardoso, Souza-Machado, & Souza-Machado, 2016).

In developing countries, although there were few studies to improve asthma outcomes among adolescents, these studies confirm importance of educational intervention for improving asthma control, asthma knowledge, self-efficacy, and health related quality of life (HRQL) (Al-sheyab et al., 2012; Zarei, Valizadeh, & Bilan, 2013; Valizadeh et al., 2014; Suwannakeeree, Deerojanawong, & Prapphal, 2016). Al-sheyab et al. (2012) assessed the effectiveness of the peer-led educational program among high school students with asthma in Jordan. The results showed, compared to control group, the participants in the intervention group had significant improvements in HRQL ($p=0.02$), self-efficacy ($p=0.03$), and asthma self-management knowledge ($p=0.03$). Zarei et al. (2013) and Valizadeh et al. (2014) examined the effect of an educational and modifying intervention about asthma triggers on asthma control and self-efficacy respectively among the same population of adolescents with asthma in Iran. Results demonstrated the participants in intervention group reported better asthma control ($p<0.001$) and higher self-efficacy ($p<0.001$) than who receive usual provider asthma care. In Thailand, quasi-experimental study by Suwannakeeree et al. (2016) evaluated the effectiveness of school based asthma educational intervention found a significant improvement in asthma knowledge post the intervention ($p<0.001$) with significant reduce of daytime symptoms ($p=0.03$) and night symptoms ($p=0.02$) after 6 months.

In summary, despite the availability of effective therapies and established guidelines for asthma management, the level of control among adolescents remains suboptimal. Poor asthma control in adolescence can lead to ineffective management in adulthood and increase the risk of fixed airflow obstruction. However, this burden can be

largely prevented by effective self-management educational programs. Furthermore, most national guidelines consider education as an essential component of effective asthma self-management to promote asthma control and reduce the negative impact of the disease on daily life. However, a little number of educational materials and programs in Libya to educate patients about chronic conditions such as asthma. To date, no studies have been evaluated such asthma educational programs among Libyan asthmatic adolescents. In response to this issue, develop asthma educational program in Northwest of Libya could be one of the effective ways to control the asthma in this age group and enhance to develop educational programs for other age groups.

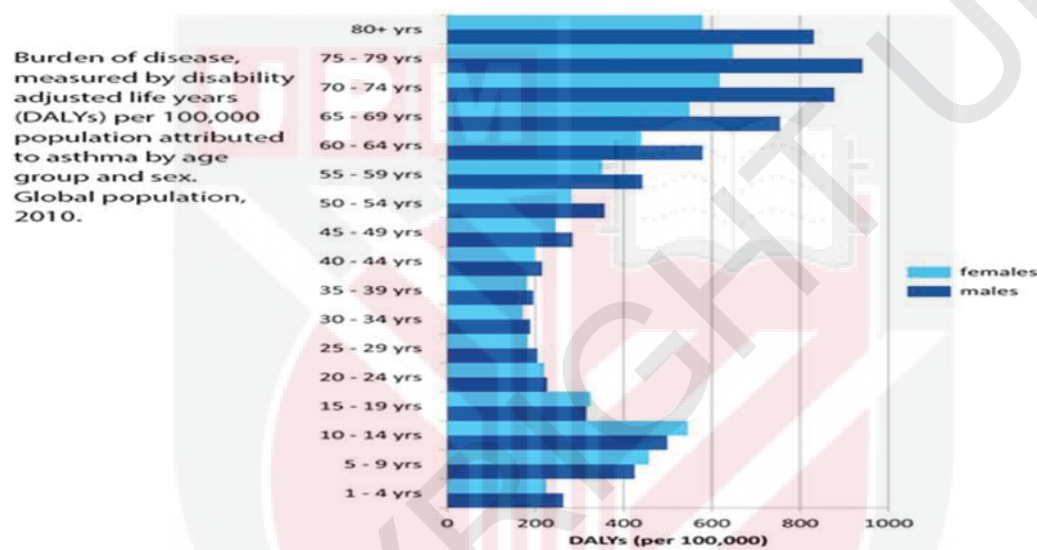


Figure 1.1 : Burden of asthma disease. (Adapted from: The Global Asthma Report, 2014)

1.3 Significance of Study

This research is important because it demonstrates whether or not a structured asthma education program results in positive health outcomes in Libyan adolescents with persistent asthma. Adolescents with poor asthma control are at higher risk for poor health outcomes in terms of increased morbidity and mortality. They tend to consume more health care resources due to poorly controlled asthma and increased symptoms, thus the findings from this study may help them to reduce their personal burden and societal burden of asthma. The finding from this study have provided valuable data regarding the importance of implementation of asthma education in clinical care setting.

Further, This study is the first study in Libya to measure not only intermediate outcomes of an asthma education program such as knowledge and self-efficacy, but go beyond of this to measure major health outcomes from adolescents with persistent

asthma such as asthma control, pulmonary function and asthma quality of life. It is the first study in Libya to acknowledge that more needs to be done in consideration of adolescents living with asthma. This research aimed to confirm the potential benefits associated with this asthma education intervention. So, the results will be used to influence national policy decisions regarding asthma education programmes in order to improve asthma control in adolescents and reduce health care expenditures. Likewise, the health care leaders in the Libya must consider the need to implement asthma education programs in health care system. Moreover, when considering the financial burden of asthma, adolescents with persistent asthma and who have disability from asthma severity should receive the proper education and management that will help bring their asthma under control, thus decreasing the need for disability resources.

1.4 Research Questions

1. What are the predictors for asthma control among asthmatic adolescent patients in Libya?
2. What are the effects of asthma education intervention program in terms of asthma control, quality of life, knowledge, self-efficacy, and pulmonary function test among asthmatic adolescent patients?

1.5 Research Objectives

1.5.1 General Objective

The general objective of this study is to develop, implement and evaluate the effectiveness of asthma education intervention program on asthma control, asthma quality of life, asthma knowledge, self-efficacy, and pulmonary function test among adolescents with persistent asthma in Northwest of Libya.

1.5.2 Specific objectives

1. To determine socio-demographic characteristics, medical characteristics, level of asthma control, quality of life, asthma knowledge, self-efficacy, and pulmonary function among asthmatic adolescent patients in Northwest of Libya at base line.
2. To determine the association between socio-demographic, medical history characteristics, asthma knowledge, and self-efficacy with the level of asthma control among adolescent patients in Northwest of Libya at base line
3. To develop and implement asthma education intervention program for asthmatic adolescent Libyan patients.
4. To determine the effect of asthma education intervention program on asthma control level, asthma related quality of life, asthma knowledge, and self-efficacy after three and six months post intervention, and pulmonary function test six months post intervention.

5. To compare the asthma control, asthma related quality of Life, asthma knowledge, self-efficacy, and pulmonary function test between the intervention and control groups at base line, three and six months post intervention after adjusting for other factors.

1.6 Research Hypotheses

H1: Socio-demographic, medical characteristics, asthma knowledge, and self-efficacy are significant predictors of asthma control among adolescents with persistent asthma.

H2: Adolescents with persistent asthma who participate in asthma education program will significantly report better asthma control, improved asthma quality of life, improved asthma knowledge, and higher self-efficacy when compared to adolescents with persistent asthma who receive usual provider asthma care at three and six months post intervention.

H3: Adolescents with persistent asthma who participate in asthma education program will significantly experience improved pulmonary function when compared to adolescents with persistent asthma who receive usual provider asthma care after six months post intervention.

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PUBLICATION

Articles

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