QUALITY OF LIFE AND ASSOCIATED FACTORS IN ASTHMATIC ADOLESCENTS

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ABSTRACT

**Background:** It is known asthma has serious impact on children’s and adults’ lives influencing three core domains of quality of life (QoL), i.e. the social, physical and mental domain. Little is known about the influence of the disease in adolescents.

**Objective:** The main aim was to examine in which QoL domains adolescents are hindered. In addition, we aimed to find factors associated with the QoL, in order to develop beneficial interventions to improve asthma management.

**Methods:** A cross-sectional study in Dutch community pharmacies was conducted. Adolescents (12-18 years old) that filled two or more prescriptions for an ICS or ICS/LABA during the previous 12 months were invited to participate in the study. Data collection took place through an online questionnaire consisting of different validated questionnaires concerning QoL, adherence and medication beliefs.

**Results:** In total, 200 questionnaires were completed. It was shown that 39.0% of the participants reported a decreased QoL. Most of them reported to be hindered in the physical domain (39.7%) or in all three domains together (34.6%). Girls more often reported a low QoL (OR: 0.3, 95% CI: 0.1-0.5). Furthermore, adolescents seeing the necessity of their medication (OR: 0.4, 95% CI: 0.2-0.7), and patients using medicines for a longer period (> 1 year) also reported a lower QoL (OR: 0.1, 95% CI: 0.0-0.7). Adolescents reporting a good adherence seemed to have a higher QoL (OR: 2.0, 95% CI: 1.0-3.8).

**Conclusion:** Besides the physical symptoms, adolescents also reported to be hindered in the mental and social domain. Factors associated with a low QoL were: female gender, seeing the necessity of asthma medication and longer time of medication use. Good adherence was associated with a high QoL.
SAMENVATTING

Achtergrond: Het is bekend dat astma een serieuze impact heeft op het leven van kinderen en volwassenen doordat het invloed heeft op drie kerndomeinen van levenskwaliteit, i.e. het sociale, fysieke en mentale domein. Er is weinig bekend over de invloed van de ziekte bij adolescenten.

Doel: Het hoofddoel van deze studie was om te onderzoeken in welke domeinen van levenskwaliteit adolescenten gehinderd worden. Daarnaast beoogden we het vinden van factoren geassocieerd met de levenskwaliteit, met als doel gunstige interventies te ontwikkelen die de astmabehandeling kunnen verbeteren.

Methoden: Een cross-sectionele studie in Nederlandse apotheken werd uitgevoerd. Adolescenten (12-18 jaar oud) die in de voorbije 12 maanden één of meerdere voorschriften voor ICS of ICS/LABA kregen, werden uitgenodigd om deel te nemen aan de studie. De dataverzameling gebeurde via een online vragenlijst die bestond uit verschillende gevalideerde vragenlijsten betreffende levenskwaliteit, therapietrouw en medicatieopvattingen.

Resultaten: In totaal werden 200 vragenlijsten ingevuld. Er werd aangetoond dat 39.0% van de deelnemers een verlaagde levenskwaliteit rapporteerde. De meeste van hen rapporteerden dat ze gehinderd waren in het fysieke domein (39.7%) of in de drie domeinen samen (34.6%). Meisjes rapporteerden vaker een lage levenskwaliteit (OR: 0.3, 95% BI: 0.1-0.5). Daarenboven werd ook een lagere levenskwaliteit gerapporteerd door adolescenten die de noodzaak van hun medicatie inzien (OR: 0.4, 95% BI: 0.2-0.7) en door patiënten die voor een langere periode (> 1 jaar) medicatie gebruiken (OR: 0.1, 95% BI: 0.0-0.7). Adolescenten die een goede therapietrouw rapporteerden, bleken een hogere levenskwaliteit te hebben (OR: 2.0, 95% BI: 1.0-3.8).

Conclusie: Naast de fysieke symptomen, rapporteerden adolescenten ook dat ze gehinderd waren in het mentale en sociale domein. Factoren geassocieerd met een lage levenskwaliteit waren: vrouwelijk geslacht, inzien van de noodzaak van astmamedicatie en langere tijd van medicatiegebruik. Goede therapietrouw was geassocieerd met een hoge levenskwaliteit.
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LIST OF ABBREVIATIONS

AAQOL: Adolescent Asthma Quality of Life Questionnaire
ADAPT: ADolescent Adherence Patient Tool
AIRE: Asthma Insights and Reality in Europe
BMQ: Beliefs about Medicines Questionnaire
FEV1: Forced Expiratory Volume in 1 second
GINA: Global INitiative for Asthma
GP: General Practitioner
HRQoL: Health Related Quality of Life
ICS: Inhaled Corticosteroids
LABA: Long-Acting Beta Agonist
MARS: Medication Adherence Report Scale
NSAID’s: NonSteroidal Anti-Inflammatory Drugs
OR: Odds Ratio
PAQLQ: Pediatric Asthma Quality of Life Questionnaire
QoL: Quality of Life
SABA: Short-Acting Beta Agonist
SD: Standard Deviation
UPPER: Utrecht Pharmacy Practice Network for Education and Research
UU: Utrecht University
WHO: World Health Organization
1. INTRODUCTION

1.1. ASTHMA

1.1.1. Disease prevalence

Asthma is one of the most common chronic lung diseases worldwide. It often starts during childhood but the disease can affect people of all ages. In the Netherlands, the measured prevalence in patients attending primary care is 35.9 per 1000 for children between 5 and 14 years old and epidemiological data show that asthma occurs twice as often in boys than in girls. Developing asthma as a child does not automatically result in asthma during later life. In two-thirds of the diagnosed children symptoms disappear before or around puberty age, although in half of this group symptoms reappear later in life [1].

1.1.2. Pathology

Asthma is characterized by a chronic inflammation of the airways. Because of this inflammation the airways of people with allergic asthma become sensitive to certain allergens that are inhaled. Examples of allergens are: dust, animal fur, mold and pollens. The reaction to these allergens implies tightening of the airway muscles causing limited air flow to the lungs. Another consequence of the inflammation is excessive mucus production by the airway cells, which causes further narrowing. In contrast to this allergic form of asthma, exercised induced asthma is triggered only by exercise. This condition occurs most often during very intensive exercise in dry cold air and symptoms appear about 10 minutes after exercising. Looking at these two forms of asthma, exposure to allergens and exercising can be seen as ‘triggers’ of the disease. Other examples of triggers are: irritants such as cigarette smoke, medicines such as NonSteroidal Anti-Inflammatory Drugs (NSAID’s) and viral infections of the upper airways [1, 2, 3, 4].

Asthma is characterized by respiratory symptoms such as wheezing, coughing, chest tightness and shortness of breath. Wheezing can be defined as a whistling sound that occurs when the patient is breathing and it is the most important factor for the diagnosis of asthma in
children. The triggers described above can worsen these typical symptoms resulting in an asthma exacerbation and giving the disease a variable course [2, 4].

Although the exact cause of asthma is not known yet, researchers believe asthma is most likely caused by a combination of genetic factors and exposure to environmental triggers like the described allergens. Children have an increased risk of developing asthma when they have one or more of the following characteristics: an inherited tendency to develop an allergy (atopy), parents who have asthma, certain respiratory infections during childhood, and contact with specific airborne infections or viruses during the development of the immune system [5, 3].

1.1.3. Treatment

Asthma is a disease that cannot be cured although the described symptoms can be controlled through both non-medicinal and medicinal therapies. The non-medicinal advices for children include the following:

- Obtaining a smoke free environment for the child.
- Sufficient physical activity: at least two times a day 30 minutes of moderately intensive activity is recommended such as biking.
- Weight reduction in children who suffer from both asthma and obesity: it is not completely clear if losing weight improves asthma but it is recommended because of general health reasons.
- Avoiding exposure to triggers [1].

Medicinal treatment is considered when there is insufficient asthma control despite other non-medicinal steps are already taken. There is a preference for inhaled medication because this leads to a direct disposition of the active substances in the airways. In this way, a fast response is obtained and lower doses can be used compared with oral intake. The Global INitiative for Asthma (GINA), an association from the World Health Organization (WHO), developed treatment guidelines for asthma in children aged 6 years and older, which are represented in Figure 1.1 [1, 6].
Figure 1.1: The stepwise treatment of asthma in children 6 years and older according to GINA. The upper line in the gray box shows the preferred controller therapy, while the middle line shows alternative options for that. The lower line corresponds with the reliever therapy [7].

The GINA guideline consists of the following steps:

1) If symptoms are rare, there is no night waking due to asthma and there is a normal value for the Forced Expiratory Volume in 1 second (FEV1), no controller treatment is advised and a Short-Acting Beta Agonist (SABA, for example albuterol) can be used when needed. This is also the case in patients who suffer from exercise-induced asthma: they have to use a SABA 10 to 15 minutes before their exercise.
2) Patients who report complaints at least three times a week, or patients who need a SABA at least three times a week, must be given Inhaled Corticosteroids (ICS, for example beclomethasone) as maintenance treatment.

3) When there is no sufficient asthma control with ICS alone, a low dose of a Long-Acting Beta Agonist (LABA, such as salmeterol) can be combined with a low dose of ICS.

4) When there is still no sufficient asthma control, the dosage of the medicines is increased and a medium or high dose ICS/LABA combination is prescribed.

5) If symptoms still cannot be controlled, referral to a pulmonologist is required. Add-on treatment like omalizumab (anti-immunoglobulin E therapy) is only approved for patients aged 12 years or older [1, 7].

It is important to note that the medications described in steps 2 till 5 are maintenance treatments. Whenever the patient’s complaints become worse during an exacerbation, he can still use a SABA (step 1) as rescue medication. Therefore it’s important that patients can make the difference between reliever medication which is used when necessary and preventer medication which is used at regular intervals. Furthermore, asthma exacerbations are often systematically treated by a short cure of oral corticosteroids, for example prednisone [1, 8].

Despite the available asthma medication, many patients are far from asymptomatic because their disease remains uncontrolled. The Asthma Insights and Reality in Europe (AIRE) survey in adults and children showed that 46% of the patients suffered from daytime symptoms and 30% from asthma-related sleep disturbances at least once a week. In the year previous to the study, 25% underwent unscheduled urgent care visits, 10% had one or more emergency room visits and 7% had overnight hospitalization due to asthma. Moreover, it is proven that such uncontrolled asthma has a serious impact on the patients’ quality of life because it leads to limitations in daily activities and in outdoor or physical activities [9].
1.2. QUALITY OF LIFE

1.2.1. Definition of quality of life

The term Quality of Life (QoL) in general includes a person’s functional ability, degree and quality of social interaction, but also one’s psychological well-being, happiness and life satisfaction. More specifically the Health Related Quality of Life (HRQoL) can be considered, which includes the patients’ appraisal of their level of functioning and their satisfaction with it. The WHO defines HRQoL as ‘a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity’. In medical literature, the term QoL is often used interchangeably with the term HRQoL. From now on, we use the term QoL for referring to HRQoL [10].

As described above in the WHO definition, QoL focuses on three core domains which can vary in relative importance among individuals: the physical, mental/psychological and social domain. The physical domain includes the ability to perform daily activities as well as the physical symptoms resulting from the disease itself or the treatment. The mental domain ranges from severe psychological distress to a positive sense of well-being and it may also include the cognitive functioning. The social domain refers to the quantitative and qualitative aspects of social relationships and societal integration [10].

1.2.2. Importance of QoL in chronic diseases and in asthma

During the past decades, an increasing number of people are living with a chronic disease. Such diseases can disrupt a patient’s life and can have serious impact on the well-being. In this way, chronic diseases such as asthma adversely affect the patient’s quality of life. When comparing different chronic diseases, asthma seems to have an intermediate effect on the QoL [10, 11].

Knowing that asthma is associated with a lower QoL, the influence of the disease on the three core domains can be explored. In adult patients it is proven that these three core domains are all seriously influenced by asthma. The most important factors affected by the disease are represented in Figure 1.2. These factors cannot be seen separately from each other as proven links exist between the different domains. For example, a patient’s participation to
social activities (social domain) is decreased due to the limited ability of completing physical activities (physical domain). The resulting increased isolation then leads to an increased risk of depression (mental domain) [12, 13, 14].

**Social domain**
- Reduced participation in social activities with friends or in community
- Impaired relationships with peers/friends
- Increased isolation/absences at work

**Physical domain**
- Limitation of daily life activities, sports and other physical activities
- Coughing, wheezing, exacerbations
- Sleeping problems

**Mental domain**
- Anxiety, stress, embarrassment
- Increased risk of depression
- Lower self-esteem

**Quality of life in asthma patients**

**Figure 1.2:** The negative impact of asthma on the three core domains (social, physical and mental domain) of QoL in adult patients. The double arrows indicate the existing links between the different domains [12].

In the past the extent of the impact of asthma on the patient’s life was measured through prevalence, mortality and hospitalization rates. Nevertheless these data gave an incomplete indication because they tended to reflect the patients with more severe or poorly controlled asthma, and they were influenced by the accessibility of health care. Objective clinical measurements such as lung function were also proposed as indicators of the health status, although they provide only limited information about the disease’s impact. By measuring the
QoL of a patient, the broader impacts of asthma on different aspects of life could be revealed [12].

1.2.3. QoL in asthmatic adolescents

The QoL in adolescents with asthma should be regarded separately from these of children and adults because of the specific stage of life they are going through, namely puberty. Puberty is defined as the period during which a child becomes a young adult through physical, psychosocial, cognitive and social developments. The typical physical changes arise by the secretion of gonadal hormones which are responsible for the gametogenesis, secondary sexual characteristics and reproductive functions. These sudden and rapid physical changes also have a mental impact as adolescents become very self-conscious and sensitive. They become worried about their own body changes and have the tendency to compare themselves to peers in a negative way [15, 16, 17].

An important cognitive development during puberty is getting the capacity of abstract thinking and being able to think hypothetically in the future. This is important for health care providers because they must assess whether their young patients are able to think abstractly and therefore could manage the disease on their own. Lastly, the social development includes changes in the balance between independence and dependence. Adolescents start to make their own identity and separate from their parents, whereby friends become more and more important. This phenomenon may lead to conflicts in the family because parents try to keep control and adolescents often have the feeling adults don’t understand their feelings [16, 17].

There is limited evidence that asthmatic adolescents, just like children and adults, have a reduced QoL compared with their healthy peers but it is not fully clear to what degree the different domains of QoL are influenced. Available studies in children revealed that asthma is experienced as a serious burden in daily life due to the medication dependence, sleeping problems, coughing, shortness of breath, limitation of activities and the influence on peer relations. There are also studies available performed with asthmatic adults (described in section 1.2.2.) and with adolescents that have other chronic diseases such as diabetes type 1. All these study results show a great influence on the patient’s QoL but they are not automatically
transferrable to asthmatic adolescents because of the described specific characteristics of puberty and asthma [18, 19, 20].

After all due to the pubertal changes, the perception of an ideal QoL can seriously differ as we compare adolescents with adults. Studies in adolescents revealed that the most important aspects of QoL include: having a lot of friends, obtaining a popular status and belonging to a group. Adolescents also indicate having a positive self-image and high self-confidence as predicting factors for a good QoL. These findings show that adolescents attach great importance to their social and mental well-being, although there is little known about these aspects in asthma [21].

First, the described social well-being is probably more difficult to reach for adolescents with asthma because they have to face with the limitations caused by their disease. Secondly, looking at the mental side of QoL, some studies in asthmatic adolescents proved a higher prevalence of psychological disorders such as anxiety disorders and depressive symptoms. However there is still a lot of dubiousness about this topic because there are also studies that do not find any association with asthma. Nevertheless it is true that adolescents in general are more sensitive to depression. Lastly, little differences are expected in the physical domain when comparing adolescents with adults because they both encounter the same asthma symptoms such as coughing, lack of breath, exacerbations and sleep problems. Nevertheless the physical domain remains very important for the adolescent’s QoL because of the possible link with the other domains (see Figure 1.3) [22, 23, 24].

When looking at the factors associated to QoL in asthma, a broad range is seen in which patients can vary widely. In asthmatic adults, some research is already done which reveals that QoL is related both to patient and disease characteristics. The patient characteristics that are associated with a lower QoL are the following [25]:

- Increased age is linked to an impaired lung function and changes in the immune system that make the patient more sensitive to infections. Secondly, good medication adherence is more difficult to obtain in older patients because of their impaired sight,
hearing, mobility or even cognitive capacity. Furthermore, comorbidity in older patients can increase the asthma symptoms or can be a contra-indication for asthma medication.

- Lower educational level is often associated with a delayed asthma diagnosis, poorer access to health care and a less healthy lifestyle.
- Presence of stressful events in the recent past can result in a decreased self-care, inadequate use of asthma medication and thus an increased airway inflammation.
- Living in a rural area sometimes means that the access to health care is limited, which leads to inferior follow-up and greater under-diagnosis of asthma.

On the other hand some disease related characteristics, such as less controlled asthma symptoms and a greater amount of hospital admissions, are predictive for a lower QoL [25].

1.3. ADHERENCE

1.3.1. Adherence to asthma medication

Although effective treatments exist to control asthma symptoms (described in 1.1.3), many patients find it difficult to take their asthma medication as prescribed resulting in adherence rates that are often below 50%. This leads to poor asthma control and therefore to a higher mortality risk. Non-adherence to asthma medication can therefore be seen as a factor influencing QoL due to the influence on the physical domain [26].

When speaking about non-adherence in asthma patients, it is preferable to make the difference between intentional and unintentional non-adherence. Intentional non-adherence is related to the patient’s motivation and beliefs about the medication. For example, being worried about the adverse effects of ICS or not believing in the advantages of the therapy are typically associated with a conscious choice of not taking the medicines. On the other hand, unintentional non-adherence is associated with patients’ skills and their ability to take the medication. One of the most common causes of unintentional non-adherence is forgetfulness, but also not being able to use the inhaler properly or not being able to pay the medication contribute to this. Given these several aspects, the individual needs of each patient should be reviewed in order to improve the adherence to asthma medication [27, 28, 29].
1.3.2. Adherence in asthmatic adolescents

The described individual needs concerning adherence seem to be very important for adolescents as puberty is often associated with poor medication adherence and therefore poorer disease outcomes. During puberty adolescents become more independent and thus are held responsible for their own medication use. Adherence in asthmatic adolescents is generally associated with 5 kinds of barriers [30, 26]:

1) Adolescents often have negative perceptions about healthcare providers and about their treatment
2) They find it difficult to follow medical advice because of cognitive reasons
3) There is a social barrier whereby adolescents don’t want to take their medication in the presence of their friends
4) Adolescents have the tendency to deny and underestimate their asthma symptoms
5) They have the tendency to overlook the necessity of their controller inhalers because they don’t feel ill

The influencing factors can be related to the patient himself, the treatment, the patient-physician relationship or to the healthcare facilities. Patient related factors play a critical role in adherence because they involve the patients’ beliefs about their treatment and their illness. There has to be a strong belief in the necessity of the therapy and low concerns about the side effects of it. These 2 concepts are described in the Necessity-Concerns framework developed by Horne and colleagues [31, 27].

Healthcare providers play an important role in adjusting these beliefs by explaining the reason of medication use or removing the patient’s concerns. However this intervention often cannot be performed when working with adolescents because of their limited contact with the pharmacist. Therefore other tools must be developed to inform the younger patient subgroup in order to improve their adherence. For adolescents, interventions must be practical and workable in daily life, as they are getting more busy schedules compared with children. Therefore pharmacists suggested the use of social media or smartphone applications to reach this population as technology is part of adolescents’ daily lives and priorities [30, 32, 33].
There are already some studies performed in the past that support these suggestion. For example, it is already proven that reminding interventions could be useful for adolescents who suffer from unintentional non-adherence and forget to take their medication. Personal reminders such as telephone calls showed to have a positive effect on the adolescent’s adherence but were very time consuming for the pharmacist. Therefore electronic automatic interventions were proposed and studies with daily mobile text messages resulted in an improved adherence. Adolescents themselves also report they are helped by placing their medicines in plain sight [33, 34].

Although measuring the adherence rates to asthma medication is important in studies concerning the above interventions, there is no standardized method for its evaluation. Self-reporting by the patient seems to be the most cost-effective method but it is proven that patients usually overreport their adherence in questionnaires. Although more objective methods are available, most studies that involve adherence are still using self-reporting in asthma patients because of its rapidity, simplicity and its low intervention cost [35, 36].
2. OBJECTIVES

Asthmatic children and adults seem to have a significantly lower QoL compared with their healthy peers, but there is limited evidence in adolescents. In children and adults, there is also sufficient evidence for a serious impact of asthma on the three core QoL domains (social/physical/mental). However, these findings are not generalizable to asthmatic adolescents because of the pubertal stage of life they are going through. Puberty is associated with a broad variety of physical and mental changes resulting in different priorities concerning QoL. For example, obtaining a popular status or having a positive self-image and high self-confidence seem to be of great importance for adolescents [18, 19, 16, 21].

The main objective of this study was to evaluate how asthma influences the QoL in adolescents in order to gain more insight in this subpopulation. The first question that arose hereby is in which QoL domain(s) adolescents are hindered most (physical/mental/social). Secondly, the associations between the QoL domains shown in adults were assessed in adolescents. For example, there could be examined if having a lot of physical symptoms is associated with the inability of joining social activities [12]. Furthermore, factors associated with QoL were studied. The factors examined in this study are described in Table 2.1.

The results of this study could give us insight in how to develop beneficial interventions which could improve the asthma management.

In order to achieve the above described objectives, a cross-sectional study was performed. Adolescents aged between 12 and 18 years that had filled 2 or more prescriptions for an ICS or ICS/LABA combination during the previous 12 months, were invited from Dutch community pharmacies and were asked to fill in an online questionnaire. The questionnaire consisted of different validated questionnaires concerning QoL, adherence and medication beliefs. Besides, additional questions were added about for example life style or the role of parents and friends.
Table 2.1: Factors examined in their association with QoL in asthmatic adolescents [26, 32].

<table>
<thead>
<tr>
<th>Factor</th>
<th>Specification/reason of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-demographic characteristics</td>
<td>Gender, age, place of living, education level, time of using medicines for respiratory symptoms</td>
</tr>
<tr>
<td>Adherence</td>
<td>Adherence rates often decrease during puberty when comparing with adulthood</td>
</tr>
</tbody>
</table>
| Medication use and beliefs towards medicines | ▪ Taking the medication in the presence of friends/classmates? Adolescents could be ashamed about their medication use or could be bullied because they are seen as ‘not normal’  
▪ The way adolescents are thinking about their medication  
The difference is made between adolescents that are worried about their medication use and the ones that see the necessity of it |
3. METHODS

3.1. PATIENT RECRUITMENT AND DATA-COLLECTION

This cross-sectional study was part of the ongoing ADolescent Adherence Patient Tool (ADAPT) study, performed by the department of Pharmacoepidemiology and Clinical Pharmacology of Utrecht University (UU). The ADAPT study is an intervention study which tests the effectiveness of an interactive smartphone application in improving adolescents’ adherence to asthma medication [37].

3.1.1. Study setting

Participating pharmacies were recruited using the Utrecht Pharmacy Practice Network for Education and Research (UPPER). This network is shown to be useful in previous studies as it consists of approximately 1400 community pharmacies situated in different regions of the Netherlands. Pharmacies who agreed to participate with the ADAPT study, were randomly assigned to the intervention group (patients using the mobile app for 6 months) or control group (patients getting usual care for 6 months) [37, 38].

3.1.2. Study population

Patients were selected from the pharmacy information systems of these participating pharmacies using the following criteria:

- Age between 12 and 18 years
- Filling of 2 or more prescriptions for an ICS or ICS/LABA combination during the previous 12 months

Afterwards it was examined whether the selected patients had been diagnosed with asthma by a General Practitioner (GP) and whether they had a smartphone, as these two aspects were also part of the inclusion criteria. Adolescents were excluded if they used ICS for other indications than asthma, had insufficient understanding of the Dutch language or if they were not able to take care for themselves, such as patients living in an institution [37].
3.1.3. Data collection

Eligible adolescents were invited for the study and informed through written information by the investigator. Before the actual enrolment in the study could take place, both participants and their parents had to sign an informed consent. After enrolment both study arms had to fill in an identical online questionnaire at two moments: at baseline and after 6 months (end of follow up). Therefore at the start of follow up patients from the intervention group were invited for a pharmacy visit during which they filled in the informed consent, received the app and got an email with the link to the first questionnaire. Patients from the control group received the informed consent by mail after phone contact, together with a link to the first questionnaire. The obtained data were processed anonymously as they were encrypted using a code. In this way, protection of the patient’s identity was assured [37].

During the execution of our study, the ADAPT study was still in the patient recruitment and data collection phase. Therefore it was not possible to examine the effectiveness of the ADAPT intervention as only the baseline data collection was completed for a portion of the participants.

3.2. QUESTIONNAIRE

In the online questionnaire (see Appendix 1) basic socio-demographic information was collected such as age, gender, ethnicity, education level, place of living and family-aspects such as the prevalence of asthma in related family members. Besides this general information, the observed study parameters included the following:

- Medication adherence
- Asthma control
- Asthma-related quality of life
- Medication beliefs

The questionnaire also included some additional questions about the adolescents’ lifestyle and the influence of parents and friends [37].
3.2.1. Primary study outcome: quality of life

The QoL in our study population was measured using the Pediatric Asthma Quality of Life Questionnaire (PAQLQ). This questionnaire was developed by Juniper et al. [39] in order to deal with the different QoL interpretation adolescents have compared to adults. The PAQLQ specifically examines the most important issues for asthmatic children and adolescents between 7 and 17 years old. The questions examine the self-reported quality of life only in the past week, which is sometimes even difficult to remember for the younger patients. The Dutch version used in this study was validated and evaluated by Juniper and Raat [39, 40].

The PAQLQ contains 23 items which must be scored by the patient on a 7-point Likert scale, whereby 1 indicates maximum impairment and 7 indicates no impairment. In this way higher total scores reflect a better quality of life. A score equal to or higher than 6 to 7 was used as cut-off value for having a good QoL [39].

According to Juniper et al. [39], the questionnaire can be divided into 3 domains: symptoms, activity limitations and emotional functioning. However this subdivision was not used in the study as adolescents attach great importance to their social life [21]. Therefore we created the following subdivision (see PAQLQ in Appendix 1, the numbers between brackets indicate the number of the question):

- Social domain: limitations in activities with friends and family (3), feeling different from others (10)
- Physical domain: limitations in physical activities (1), coughing (4), feeling tired (7), night waking (12), being out of breath (14), not being able to keep up with others (15), difficulties to sleep (16), difficulties breathing deeply (18), asthma attacks (19), wheezing (20), chest tightness (21), being short of breath (22)
- Mental domain: being disappointed/angry at yourself (5), being angry because of asthma (6), being worried/concerned about asthma (8), feeling grumpy/moody (9), feeling angry by not being able to keep up with others (11), feeling not at ease (13), feeling anxious due to an attack (17)
This subdivision seemed appropriate as adolescents are changing in these 3 aspects (social/physical/mental) during puberty [16].

In this study we examined different determinants of QoL (our main outcome), which are discussed in the sections below.

3.2.2. Socio-demographic characteristics

The following characteristics were examined in the study population: gender, age, place of living, education level, country of birth, time of using medicines for respiratory symptoms, hospitalization rate and adolescents’ behavior concerning smoking, drinking alcohol and doing sports.

Adolescents were classified in three different age categories according to the stages of development during adolescence created by Barrett [41]: early adolescence (11-13 years), middle adolescence (14-16 years) and late adolescence (17-19 years). Different groups of education levels were made based on the subdivisions of Statistics Netherlands [42]: primary school, low and middle education level [practical education, (preparatory) middle-level vocational education] and high education level [higher general continued education and pre-university secondary education (atenaeum and gymnasium)]. Furthermore, participants were classified into natives and non-natives based on their country of birth, and into rural and urban based on their place of living.

3.2.3. Adherence

Self-reported adherence was measured with the asthma specific Medication Adherence Report Scale (MARS-asthma), developed by Horne et al. [43]. This questionnaire (see Appendix 1) consists of 9 statements dealing with specific aspects of non-adherence. Each statement must be scored by the patient using a 5-point Likert scale (where 5 = never, 4 = rarely, 3 = sometimes, 2 = often and 1 = very often). The scores for each question are summed whereby a higher score indicates a higher medication adherence. This method of self-reporting has been validated by comparing the adherence rates with tablet count and clinical outcome measures [36, 44, 43].
There is no standardized method made by the developers to dichotomize adherence based on the MARS. Using a relatively high cut-off value is recommended to exclude social desirability bias but on the other hand it is known that adolescents in general have a lower medication adherence so that the cut-off value should not be too high. It is suggested that a mean MARS-score higher than or equal to 4.5 to 5 is a predictor for good adherence. When converting this value for the total MARS-score we obtained 40.5 as cut-off value. On the other hand, a score equal to or higher than 23 is seen as good adherence using the MARS-5. Converting this value resulted in 41.4, so that we decided to use 41 as cut-off value for the total MARS-score. A sensitivity analysis was conducted to assess if there is a difference in significance when using 39 or 43 as cut-off value [44, 45, 46].

3.2.4. Medication use and beliefs towards medicines

First we examined whether adolescents are taking their medication in the presence of friends and classmates, using a simple yes-or-no question. Subsequently, the Beliefs about Medicines Questionnaire-specific (BMQ-specific) was used to assess the medication beliefs concerning ICS. This questionnaire is developed by Horne et al. [47] and a Dutch version of it has been validated. The BMQ-specific consists of 10 statements: 5 about the necessity and 5 about the concerns. Patients must score each item with a number from 1 (= strongly disagree) to 5 (= strongly agree). In this way, a higher score indicates higher medication beliefs [47, 48, 27].

The necessity and concerns subscales were considered separately by using the division showed in Appendix 2. These subscale scores vary from 5 to 25 and could be dichotomized by using 15 (the scale midpoint) as cut-off value. Hereby a score higher than 15 indicated high beliefs of the necessity of ICS or great worries about ICS use [45, 27].

3.3. DATA ANALYSIS

First descriptive statistics were performed in order to get an overview of the population’s socio-demographic characteristics and the QoL domains wherein the adolescents were hindered. To explore the association between the three different QoL domains, Pearson correlation coefficients and two-sided p-values were calculated using the mean scores per
domain. Secondly some (dichotomized) factors were assessed in their association with a good total QoL, using univariate logistic regression. Odds ratios, 95% confidence intervals and two-sided p-values were calculated for several socio-demographic characteristics and aspects about adherence, medication use and beliefs. Afterwards, backward elimination was used to find factors that could possibly disturb the relation with good QoL. Multivariate logistic regression was used to correct for these factors and adjusted odds ratios were calculated together with their 95% confidence intervals and two-sided p-values. The obtained data were analyzed using IBM SPSS Statistics version 23.0 and graphics were made by Microsoft Excel 2010 [49, 50].
4. RESULTS

4.1. RESPONSE RATE AND CHARACTERISTICS OF STUDY POPULATION

For this study we performed an interim analysis based on 200 fully completed baseline questionnaires. The patients were recruited from 66 different community pharmacies, located all over the Netherlands. In total 200 patients out of the 1147 invited patients agreed to participate, resulting in a response rate of 17.4%.

The characteristics of the study population are shown in Table 4.1 which demonstrates that 48.0% were males and the mean age of the group was 15.1 (SD: 1.9) years. Most adolescents were higher educated (54.0%). The ones that reported another education level, were mostly following higher professional education. Most patients were using medicines for their respiratory symptoms already for a long time (23.5% used medicines for 6-10 years and 46.5% for more than 10 years).

Table 4.1: Socio-demographic characteristics of the participants (n=200).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male gender [% (n)]</td>
<td>48.0 (96)</td>
</tr>
<tr>
<td>Age [mean (±SD)]</td>
<td>15.1 (±1.9)</td>
</tr>
<tr>
<td><strong>Age categories [% (n)]</strong></td>
<td></td>
</tr>
<tr>
<td>▪ 11-13 years (early adolescence)</td>
<td>30.0 (60)</td>
</tr>
<tr>
<td>▪ 14-16 years (middle adolescence)</td>
<td>43.0 (86)</td>
</tr>
<tr>
<td>▪ 17-19 years (late adolescence)</td>
<td>27.0 (54)</td>
</tr>
<tr>
<td>Place of living [% (n)]</td>
<td></td>
</tr>
<tr>
<td>▪ Urban</td>
<td>50.5 (101)</td>
</tr>
<tr>
<td>▪ Rural</td>
<td>49.5 (99)</td>
</tr>
<tr>
<td>Education level [% (n)]</td>
<td></td>
</tr>
<tr>
<td>▪ Primary school</td>
<td>3.5 (7)</td>
</tr>
<tr>
<td>▪ Low + middle</td>
<td>34.0 (68)</td>
</tr>
<tr>
<td>▪ High</td>
<td>54.0 (108)</td>
</tr>
<tr>
<td>▪ Other</td>
<td>8.5 (17)</td>
</tr>
<tr>
<td>Country of birth [% (n)]</td>
<td></td>
</tr>
<tr>
<td>▪ The Netherlands</td>
<td>99.0 (198)</td>
</tr>
<tr>
<td>Time of using medicines for respiratory symptoms [% (n)]</td>
<td></td>
</tr>
<tr>
<td>▪ 1 year or less</td>
<td>6.0 (12)</td>
</tr>
<tr>
<td>▪ 1-2 years</td>
<td>6.5 (13)</td>
</tr>
<tr>
<td>▪ 3-5 years</td>
<td>17.5 (35)</td>
</tr>
<tr>
<td>▪ 6-10 years</td>
<td>23.5 (47)</td>
</tr>
<tr>
<td>▪ more than 10 years</td>
<td>46.5 (93)</td>
</tr>
</tbody>
</table>
Hospitalized during the past 6 months [% (n)] 0.0 (0)
Smoked once or more during the past 6 months [% (n)] 3.5 (7)
Drunk alcohol once or more during the past 6 months [% (n)] 32.0 (64)
Doing sports except from gymnastics at school [% (n)] 81.5 (163)

4.2. SELF-REPORTED QUALITY OF LIFE

Using a score of 6 as cut-off value, it was shown that 78 adolescents (39.0%) reported a lower total QoL. The domains (social/physical/mental) they reported to be hindered in, are represented in Figure 4.1. Looking at the percentages in the diagram, it was shown that most participants reported problems only in the physical domain (39.7%) or in all three domains (34.6%).

![Figure 4.1: QoL domains where adolescents reporting a lower QoL (n=78) are hindered in [% (n)].](image-url)
The mean scores of the PAQLQ per QoL domain are represented in Figure 4.2, taking into account all participants. It is shown that adolescents gave the lowest scores in the physical domain. They reported limitation of physical activities (mean score: 4.56) and being out of breath (4.90) as the largest problems. Other things they suffered from are: coughing (5.17), being short of breath (5.38), having difficulties with breathing deeply (5.45), chest tightness (5.46) and feeling tired (5.47). Mean QoL scores were higher in the social and mental domain. Limitations in activities with friends and family (6.05), and being disappointed/angry at yourself (6.24) were reported as the biggest problems in these domains.

Figure 4.2: Mean scores to 7 (1= maximum impairment and 7= no impairment) for the PAQLQ questions per domain and for all questions in total (n=200).
To assess the associations between the different domains, Pearson correlation coefficients were calculated. The obtained coefficients and their two-sided p-values were as follows:

- Social QoL & physical QoL: 0.730 (p-value: 0.000)
- Social QoL & mental QoL: 0.739 (p-value: 0.000)
- Mental QoL & physical QoL: 0.673 (p-value: 0.000)

4.3. FACTORS ASSOCIATED WITH QUALITY OF LIFE

Considering the self-reported adherence in our study population, it was shown that the mean total MARS-9 score was 37.3 (±7.0). The mean MARS score per item was 4.1 (±0.8). Lowest mean scores were found on the statements ‘I forget to use my medicines’ (3.44 to 5) and ‘I only use my medicines when feeling cramped’ (3.85). Using a score of 41 as cut-off value, it was demonstrated that 43.0% (n=86) had a good adherence in general.

When considering the adolescents’ behavior on medication use, it was shown that 82.5% (n=165) used their respiratory medicines in the presence of friends and classmates. When looking at the two subscales of the BMQ, the mean score of the necessity subscale was 14.5 (±5.1) and the mean score of the concerns subscale was 9.1 (±3.3). Using the scale midpoint 15 as cut-off value, 43.0% (n=86) had high beliefs in the necessity of their asthma medicines and 3.5% (n=7) was greatly worried about it.

Furthermore, the association with a good total QoL was examined using univariate and multivariate logistic regression. The above mentioned aspects of adherence, medication use and medication beliefs were considered together with several socio-demographic characteristics. In the multivariate regression we corrected for ‘good adherence’, ‘believing in the necessity of asthma medication’ and ‘female gender’, as backward elimination showed that these factors could possibly disturb the relation with good QoL. The obtained crude and adjusted odds ratios, two-sided p-values and 95% confidence intervals of the regression analyses are represented in Table 4.3.
Table 4.3: Factors associated with a good quality of life in asthmatic adolescents.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Crude OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted OR(^a) (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good adherence(^b)</td>
<td>1.5 (0.8-2.6)</td>
<td>0.19</td>
<td>2.0 (1.0-3.8)</td>
<td>0.04</td>
</tr>
<tr>
<td>Medication use in presence of friends/</td>
<td>0.8 (0.4-1.7)</td>
<td>0.53</td>
<td>0.8 (0.4-2.0)</td>
<td>0.69</td>
</tr>
<tr>
<td>classmates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Believing in the necessity of asthma</td>
<td>0.5 (0.3-0.9)</td>
<td>0.01</td>
<td>0.4 (0.2-0.7)</td>
<td>0.00</td>
</tr>
<tr>
<td>medication</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeling concerned about asthma medication</td>
<td>0.2 (0.0-1.3)</td>
<td>0.10</td>
<td>0.4 (0.1-2.3)</td>
<td>0.29</td>
</tr>
<tr>
<td>Female gender</td>
<td>0.3 (0.2-0.5)</td>
<td>0.00</td>
<td>0.3 (0.1-0.5)</td>
<td>0.00</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 11-13 years</td>
<td>REF(^c)</td>
<td>REF(^c)</td>
<td>REF(^c)</td>
<td>REF(^c)</td>
</tr>
<tr>
<td>• 14-16 years</td>
<td>0.5 (0.3-1.1)</td>
<td>0.10</td>
<td>0.6 (0.3-1.3)</td>
<td>0.17</td>
</tr>
<tr>
<td>• 17-19 years</td>
<td>0.5 (0.2-1.0)</td>
<td>0.05</td>
<td>0.5 (0.2-1.2)</td>
<td>0.15</td>
</tr>
<tr>
<td>Urban place of living</td>
<td>1.0 (0.6-1.8)</td>
<td>0.91</td>
<td>1.1 (0.6-2.0)</td>
<td>0.80</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Primary school</td>
<td>REF(^c)</td>
<td>REF(^c)</td>
<td>REF(^c)</td>
<td>REF(^c)</td>
</tr>
<tr>
<td>• Low + middle</td>
<td>2.0 (0.4-9.8)</td>
<td>0.38</td>
<td>2.3 (0.4-12.6)</td>
<td>0.32</td>
</tr>
<tr>
<td>• High</td>
<td>2.2 (0.5-10.2)</td>
<td>0.32</td>
<td>2.8 (0.5-14.4)</td>
<td>0.22</td>
</tr>
<tr>
<td>• Other</td>
<td>2.4 (0.4-14.7)</td>
<td>0.33</td>
<td>4.0 (0.6-27.7)</td>
<td>0.17</td>
</tr>
<tr>
<td>Time of medication use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 1 year or less</td>
<td>REF(^c)</td>
<td>REF(^c)</td>
<td>REF(^c)</td>
<td>REF(^c)</td>
</tr>
<tr>
<td>• 1-2 years</td>
<td>0.2 (0.0-0.9)</td>
<td>0.04</td>
<td>0.1 (0.0-0.7)</td>
<td>0.02</td>
</tr>
<tr>
<td>• 3-5 years</td>
<td>0.8 (0.2-3.4)</td>
<td>0.81</td>
<td>0.9 (0.2-3.8)</td>
<td>0.85</td>
</tr>
<tr>
<td>• 6-10 years</td>
<td>1.1 (0.3-4.1)</td>
<td>0.93</td>
<td>1.0 (0.2-4.1)</td>
<td>0.95</td>
</tr>
<tr>
<td>• more than 10 years</td>
<td>0.8 (0.2-2.8)</td>
<td>0.72</td>
<td>0.8 (0.2-3.1)</td>
<td>0.72</td>
</tr>
</tbody>
</table>

\(^a\) Odds ratio adjusted for ‘good adherence’, ‘believing in the necessity of asthma medication’ and ‘female gender’

\(^b\) A sensitivity analysis showed no difference in significance when using 39 and 43 as cut-off value

\(^c\) Reference group
5. DISCUSSION

5.1. INTERPRETATION OF THE RESULTS

5.1.1. Quality of life

Using a cut-off value of 6 for the PAQLQ, it was shown that a significant proportion of the participants (39.0%) reported a decreased total quality of life. This result gives the impression asthma has a serious impact on the daily lives of adolescents. This confirms the results of previous studies showing a significantly lower QoL in children and adolescents with asthma compared to their healthy peers [18].

When looking at the group of adolescents reporting a low total QoL in more detail, it was shown that they were mostly hindered in the physical domain (39.7%) or in all three domains together (34.6%). Furthermore, adolescents reported problems in the physical and mental domain (14.1%), or in the physical and social domain (11.5%). As puberty goes along with significant social and mental developments [21], it is surprising that no participants reported being bothered in these two domains. However, a large proportion of the participants reported problems in all three domains. Therefore the assumption rises that mental and social problems are linked with physical symptoms. This hypothesis is confirmed by the relatively large Pearson correlation coefficients that are found between the three QoL domains. These correlations are in line with the associations between the domains found in adults [12]. The found correlations could possibly be explained by the following hypotheses: adolescents suffering from physical symptoms cannot join social activities [12] and therefore have a greater risk of mental problems, or adolescents suffering from mental problems (such as panic attacks due to their physical symptoms) are being bullied or excluded in social activities.

When looking at all participants, it was seen that adolescents reported lowest scores in the physical domain. Limitation of physical activities and being out of breath seemed to be the largest problems adolescents are dealing with in their daily lives as the mean scores of these topics were the lowest in the physical domain. Other important physical symptoms they were suffering from are: coughing, being short of breath, chest tightness, having difficulties with
breathing deeply and feeling tired. These results are comparable with a previous study about the QoL in asthmatic children and adults, as they reported to be most bothered by the symptoms (shortness of breath, chest tightness, wheeze and cough) and had many problems with physical activities [13]. Furthermore, participants reported limitations in activities with friends and family as the biggest problem in the social domain. This is in line with previous findings showing that asthmatic children seem to be troubled because they cannot fully integrate with their peers [13].

The mean scores were highest in the mental domain, suggesting only a weak impairment of asthma on the patient’s mental health. Though previous studies showed that adults can experience fears and concerns about having asthma, and they sometimes become frustrated by the disease [13]. Therefore the higher mental mean score must be carefully interpreted: it does not automatically mean adolescents don’t suffer from mental problems but they just have a greater tendency to be bothered in the physical and social domain. These results also give rise to the assumption that adolescents maybe give greater value to their physical health than mental health and therefore automatically give lower scores in the physical domain even though they are mentally bothered. A previous study in asthmatic children and adolescents contradicts this as a significant correlation between QoL and psychological symptoms was shown [51].

5.1.2. Factors associated with quality of life

Using a cut-off value of 41 for the MARS-9 scores, it was shown that only 43.0% of the participants had a good adherence to their asthma medication. This percentage is very similar to that of a previous study using the MARS-5, where 40.9% of the adolescents seemed to be adherent [45]. The found adherence rate is lower compared to that of asthmatic children, in which adherence rates vary between 50% and 77% [52]. The mean score per MARS-question was 4.1, which is somewhat lower than in asthmatic adults (4.2 using MARS-9 [43] and 4.3 using MARS-10 [53]). These two findings confirm that adherence rates are usually lower in adolescents than in children and adults, which is shown in previous studies [26]. Low adherence
rates are also observed in adolescents with other chronic diseases such as diabetes type 1, cystic fibrosis or organ transplant [54].

Lowest mean MARS scores were seen on the statements ‘I forget to use my medicines’ and ‘I only use my medicines when feeling cramped’. This is in line with previous findings in adolescents: forgetting to take the medication and only symptomatic use were given the lowest scores and thus were the most important reasons for non-adherence [45, 55]. Using the MARS-9 in asthmatic adults, it was shown that altering the dose was the most frequent form of non-adherence [43]. This difference tends to imply that unintentional non-adherence is more observed in adolescents than in adults.

Regarding the medication beliefs, almost half of the participants (43.0%) perceived strong necessity beliefs and only a small amount (3.5%) was highly concerned about their asthma medication. These results are comparable with previous findings in asthmatic adolescents wherein these percentages respectively amounted 41.9% and 10.1% [45]. Looking at the adjusted odds ratios, it can be concluded that having high beliefs in the necessity (OR: 0.4) is associated with a lower QoL. This association is a surprising finding because it is known that adolescents with high necessity beliefs have higher adherence rates [45]. Therefore we should expect that asthma symptoms in these patients are more controlled resulting in a better QoL, which is not the case. A possible explanation could be that patients seeing the necessity, are mostly the patients suffering from more severe asthma, as there is a correlation seen between the necessity score and asthma severity in children [56].

An association between concerns and lower self-reported QoL scores would be more easily to explain because people that are easily worried in general have probably more chance to report a lower QoL. There is a tendency towards this association seen in the crude odds ratio’s (OR: 0.2; p-value: 0.10), but the result is not statistically significant. Though there is another significant result seen for gender: asthmatic girls have a significant lower QoL compared with boys (OR: 0.3). This finding raises the question whether this is the result of asthma itself or is an intrinsic property of girls. The latter hypothesis is confirmed by the fact that female adolescents
in general have the tendency to report a lower quality of life for their physical and psychological well-being [57].

Another significant adjusted odds ratio was seen in the section for time of medication use: adolescents using medicines for 1-2 years have a significantly lower QoL compared with adolescents using medicines for less than 1 year (OR: 0.1). In the patient groups that were using medicines for more than 2 years, no significant result is found. A possible explanation for this is that adolescents recently diagnosed and started with medication, get more social and mental support from their environment and therefore report a higher QoL [58]. After a while, this support declines and patients also get a more realistic view about the chronic aspect of their disease and medication use, and the way asthma interferes with their daily lives. Therefore they possibly have the tendency to report a lower QoL, which improves again in time when patients find ways to deal with their disease.

No significant results were found when comparing different age groups. This is in contradiction with a study examining the health-related QoL in adolescents [59], as it shows that younger adolescents (13-15 years) reported a better QoL than older adolescents (16-19 years). This study was performed with randomly chosen adolescents so possibly the asthma disease is responsible for the similar QoL scores found in the different age groups. The younger asthmatic adolescents maybe find it more difficult to cope with their asthma and therefore systematically report lower QoL scores compared with older adolescents so that the difference between ages disappears.

Considering the odds ratio for adherence, it is shown that adolescents having a good adherence have a significantly higher QoL (OR: 2.0). This finding could be explained by the fact that adolescents with good adherence probably have more controlled asthma symptoms [26]. No significant results were found for the associations with medication use in the presence of friends/classmates, place of living and education level. Considering the education level, another study in asthmatic adults showed that patients having a low level of education, reported a lower QoL [11]. This finding is possibly not seen in our study because of the low amount of adolescents with lower education.
5.2. STRENGTHS AND LIMITATIONS OF THE STUDY

The most important strength of this study is the relatively large sample size of 200 adolescents. The included adolescents are also well balanced when it comes to their socio-demographic characteristics. The participants lived scattered all over the Netherlands and characteristics like gender, age and place of living were distributed as expected in the average population. Regarding the time of medication use, it was shown that most adolescents already took inhalers for a long period (23.2% used medicines for 6-10 years and 46.5% for more than 10 years), which indicates chronic medication use. This is of great importance for the study as we wanted to examine the quality of life in chronic asthmatic patients. Another strength of this study was the use of an extensive online questionnaire which gave the possibility to observe different factors like quality of life, adherence and medication beliefs.

However looking at the patients’ characteristics also reveals some limitations of the study. Almost all participants (99.0%) were born in the Netherlands. Therefore the study population is probably not comparable with the real asthmatic adolescent population, as the percentage of people born in the Netherlands is generally much lower [60]. The high percentage native adolescents in our study possibly can be explained by the fact that parents from different origins often do not master the Dutch language as good as parents born in the Netherlands. When they received the Dutch invitation letter, they maybe had less tendency to discuss this with their children. Furthermore, the characteristics revealed few adolescents with lower education. Because of these unbalances, the question arises in which degree the study results are generalizable to all asthmatic adolescents in the Netherlands. The relatively low response rate (17.4%) may also contribute to this low generalizability. Moreover, the data about hospitalization and doing sports indicate that the participants in general have a good health status. This suggests that there may have been a sort of non-response bias: patients that are less suffering from their asthma, are more likely to participate in the study than patients with a lot of symptoms.

All patient data were derived at one point as only the baseline questionnaires were available. This cross-sectional design makes it impossible to see any evolutions in the self-
reported QoL, which is especially important because of the subjective character of this study outcome. When adolescents for example were having a bad day at the time of completing the questionnaire, they possibly felt the urge to report lower QoL scores, even if they didn’t feel bad because of their asthma. On the other hand, self-reporting methods like the PAQLQ and MARS could also lead to social desirability bias, whereby patients tend to give higher scores to represent a favorable image of themselves and prevent criticism [61]. This type of bias is probably reduced in this study by using an online questionnaire instead of asking the questions from person to person. Patients were also ensured that their answers were treated anonymously. Moreover, results are probably more reliable because the questionnaire is supposed to be filled in by the patient himself and not by other close persons. Previous studies showed indeed that results could differ when comparing parents’ and children’s responses to questionnaires [62]. Despite these problems, the PAQLQ gives more information about social and mental aspects compared to objective clinical measurement methods (such as prevalence, mortality and hospitalization rates) [12]. These latter methods only provide information about the physical QoL domain.

Another problem concerning the measurement method, was the decision of a good cut-off value for the PAQLQ. It is not possible to make a comparison between the scores of asthmatic and healthy people and then assess what difference is clinically significant, as the PAQLQ is asthma-specific. A value of 6 was used to define good and bad QoL, as this value approaches the mean score of the total QoL (5.94). This cut-off value is comparable with the average score of 6 found when using the Adolescent Asthma Quality of Life Questionnaire (AAQOL), another 7-point Likert scale [18]. The PAQLQ is preferred because of its wider age range and the short time needed to fill in the questionnaire [12].

5.3. FUTURE RESEARCH

Nowadays, physicians focus mainly on the physical symptoms of asthma by measuring clinical parameters. This can be justified by the fact most hindered adolescents reported problems in the physical domain and QoL scores were seen to be lowest in this domain. However considering the significant correlations between the three QoL domains, more
attention should be given to the mental and social domain as well. A possible strategy to achieve this, is trying to make mental problems more discussable, for example via the GP. The adolescent’s social life could possibly be improved by better informing of their classmates and friends, for example by teachers or caregivers giving education sessions about asthma in schools. A previous Australian study showed indeed a clinically relevant improvement of the QoL in adolescents when performing a peer led education program [63]. As there was seen a lower QoL in adolescents using medicines for 1-2 years, these supporting interventions could be especially beneficial for them.

This study focuses on the QoL of the asthmatic patient, but it is expected that asthma also influences the lives of their family members. Parents of asthmatic children indeed seem to have an impaired QoL due to their child’s illness. They feel limited in normal daily activities and experience fears and emotional stress [39]. Further research could reveal if this tendency is still seen in the parents of asthmatic adolescents. As adolescents develop a greater mental capacity, they probably better assess their parents’ feelings. Therefore a mutual influence between adolescents and their parents could arise when it comes to emotional health. Interventions that learn parents how to cope better with their child’s disease could be very useful, especially because puberty is already considered as a period of great emotional and mental imbalance.
6. CONCLUSION

The main objective of this study was to assess how asthma influences the quality of life in adolescents and to assess whether the different QoL domains (social, physical and mental) are associated. We have shown that a significant proportion of the asthmatic adolescents reported a lower QoL and most of them experienced the biggest issues in the physical domain or in all three domains together. The three QoL domains seemed to be highly associated in adolescents, which corresponds to previous findings in adults. Therefore more attention should be paid to the mental and social domain in order to improve adolescents’ QoL. This could be achieved for example by making mental problems more discussable, or by information sessions about asthma organized for classmates and friends.

Adolescents reporting a good adherence, seem to have a significantly higher QoL. Girls seemed to have a significantly lower QoL when compared with boys, just like adolescents that do see the necessity of their asthma medication. Patients using respiratory medicines for 1-2 years, were also found to have a lower QoL when compared with patients using medicines for less than 1 year. This latter result emphasizes the importance of continuous support for asthmatic adolescents in order to maintain a good QoL. Better support could be obtained by learning parents how to cope better with their child’s disease and by the above mentioned information sessions for peers.
7. BIBLIOGRAPHY


[29] Braido FB, Baiardini I, Blasi F, Pawankar R, Canonica GW. Adherence to asthma treatments: ‘we know, we intend, we advocate’. Current Opinion in Allergy and Clinical Immunology. 2015 Feb; 15 (1): 49-55.


[42] Centraal Bureau voor de Statistiek. Bevolking; hoogst behaald onderwijsniveau; geslacht, leeftijd en herkomst. 2016 Feb. Consulted online (11/04/2016): http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=82275NED&D1=0&D2=0&D3=0&D4=0-1,4-5&D5=0,4-5,8,12-13&D6=57-58,60-63&VW=T


[60] Centraal Bureau voor de Statistiek. Bevolking; generatie, geslacht, leeftijd en herkomstgroepering, 1 januari. 2015 Aug. Consulted online (07/05/2016): http://statline.cbs.nl/statweb/publication/?vw=t&dm=slnl&pa=37325&d1=a&d2=0&d3=0&d4=0&d5=0-4,137,152,220,237&d6=0,4,9,14,18-19&hd=151214-1201&hdr=g2,g1,g3,t&stb=g4,g5


Appendix 1: Online questionnaire

ADAPT
Gebruik van asthmamedicijnen
door jongeren

Vragenlijst voor jongeren in de leeftijd van
12 tot 18 jaar
**Toelichting bij de vragenlijst**

Dit onderzoek gaat over de medicijnen die je dagelijks gebruikt voor jouw luchtwegklachten (inhaling corticosteroïden), de zogenaamde preventie puffers, deze hebben meestal een bruine, rode, oranje of paarse kleur. Voorbeelden zijn Flixotide, Beclometason, Pulmicort, Budesonide, Qvar of Aerobec. Hieronder vind je enkele afbeeldingen als voorbeeld.

![Afbeeldingen van medicijnen](image)

**Invullen van de vragenlijst**

Bij de meeste vragen hoeft je alleen het juiste antwoord te kiezen en het betreffende cirkeltje aan te kruisen. Het kan voorkomen dat je het lastig vindt om een keuze te maken uit de verschillende antwoordmogelijkheden, het is dan beter om in zo’n geval toch een keuze te maken en dat je het antwoord aankruist dat het beste van toepassing is. Als je meerdere antwoorden mag aankruisen, dan staat dat bij de desbetreffende vraag vermeld.

**Privacy**

De ingevulde gegevens worden alleen onder onderzoeksnummer verwerkt. In de informatiefolder die je hebt ontvangen staat dit nummer vermeld, dit moet je zo meteen invullen. Meer informatie over het onderzoek vind je ook in de folder die we jou hebben toegestuurd.

**Opbouw van de vragenlijst**

Het eerste deel van de vragenlijst gaat over jouw gezondheid en bevat vragen over luchtwegklachten en arts bezoek. Het tweede deel gaat over medicijengebruik en de vragenlijst sluit af met een aantal algemene vragen zoals over bijvoorbeeld je opleiding en woonomgeving.
ONDERDEEL 1: PERSOONLIJKE GEGEVENS

Onderzoeksnummer | _ _ _ _ _ _ |

1. Ben je een meisje of een jongen?
   O meisje
   O jongen

2. Wat is je geboortedatum?
   Dag – maand - jaar
   | _ _ | - | _ _ | - | _ _ | _ _ _ |
ONDERDEEL 2: GEZONDHEID

A. Algemeen

1. Wat vindt je, **over het algemeen** genomen, van je gezondheid?
   - Uitstekend
   - Zeer goed
   - Goed
   - Matig
   - Slecht

2. In **vergelijking met een half jaar geleden**, hoe zou je je nu jouw gezondheid in het algemeen beoordelen?
   - Veel beter dan een half jaar geleden
   - Iets beter dan een half jaar geleden
   - Ongeveer hetzelfde als een half jaar geleden
   - Iets slechter dan een half jaar geleden
   - Veel slechter dan een half jaar geleden

B. Luchtwegklachten

1. Is de **diagnose astma** bij jou daadwerkelijk door een arts gesteld?
   - O ja
   - O nee → ga door naar vraag 2

1a. Indien ja, op welke leeftijd was dat?
   
   

1b. Door **wie** is de diagnose gesteld?
   - O huisarts
   - O kinderarts
   - O longarts
   - O Anders, namelijk:
   
   

2. De volgende vragen gaan over **allergische neusklachten en/of astma** in de **afgelopen 4 weken**.

Hoe vaak heb je vanwege allergische neusklachten en/of astma, de **laatste 4 weken** gemiddeld last gehad van onderstaande klachten?
<table>
<thead>
<tr>
<th>Symptoom</th>
<th>Nooit</th>
<th>Maximaal 2 dagen per week</th>
<th>Meer dan 2 dagen per week</th>
<th>(bijna) elke dag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verstopte neus</td>
<td></td>
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<tr>
<td>Niezen</td>
<td></td>
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<tr>
<td>Jeuk aan de neus</td>
<td></td>
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<tr>
<td>Loopneus</td>
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<tr>
<td>Benauwdheid/kortademigheid</td>
<td></td>
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<tr>
<td>Piepende ademhaling</td>
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<tr>
<td>Beklemd gevoel op de borst bij lichamelijk inspanning</td>
<td></td>
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<tr>
<td>Vermoeidheid/beperkingen bij het uitvoeren van dagelijkse bezigheden</td>
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<tr>
<td>'s Nachts wakker worden</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Je medicijnen extra moeten gebruiken</td>
<td>Ik gebruik geen medicijnen</td>
<td>Nooit</td>
<td>Minder dan 7 dagen</td>
<td>7 dagen of meer</td>
</tr>
</tbody>
</table>

3. De volgende vragen gaan over hoeveel last jij de afgelopen week had van astma. Je mag voor iedere vraag een kruisje zetten in het vakje dat het meest past bij hoeveel last jij had van die activiteit, of van een gevoel.

<table>
<thead>
<tr>
<th>Hoeverelast had je deze week bij/van het volgende</th>
<th>Heel erg veel last</th>
<th>Veel last</th>
<th>Nogal wat last</th>
<th>Wel wat last</th>
<th>Een beetje last</th>
<th>Bijna geen last</th>
<th>Heelmaal geen last</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lichamelijke activiteiten (zoals rennen, zwemmen, sporten, een heuvel/trap oplopen en fietsen)?</td>
<td></td>
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<tr>
<td>Met dieren omgaan (zoals spelen met huisdieren en het verzorgen van dieren)?</td>
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<tr>
<td>Activiteiten met vrienden en familie (zoals spelen tijdens de pauze en dingen doen met vrienden en familie)?</td>
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<tr>
<td>Hoesten</td>
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<tr>
<td>Alles bij elkaar, Hoe vaak deze week</td>
<td>Altijd</td>
<td>Meestal</td>
<td>Vrij vaak</td>
<td>Geregeld</td>
<td>Af en toe</td>
<td>Bijna nooit</td>
<td>Nooit</td>
</tr>
<tr>
<td>voelde je je teleurgesteld, onthoedigd of kwadaad op jezelf door je astma?</td>
<td></td>
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<tr>
<td>was je boos vanwege je astma?</td>
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<tr>
<td>Slogan</td>
<td>Heel erg veel last</td>
<td>Veel last</td>
<td>Nogal wat last</td>
<td>Wel wat last</td>
<td>Een beetje last</td>
<td>Bijna geen last</td>
<td>Helemaal geen last</td>
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<tr>
<td>was je MOE door je astma?</td>
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<tr>
<td>was je ONGERUST, MAAKTE JE JE ZORGEN OF ZAT JE TE PIEKEREN door je astma?</td>
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<tr>
<td>was je MOPPERIG of HUMEURIG door je astma?</td>
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<tr>
<td>had je het gevoel dat je ANDERS WAS DAN ANDEREN of ER NIET BIJ HOORDE door je astma?</td>
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<tr>
<td>voelde je je TELEURGESTELD, ONTMOEDIGD of KWAAD OP JEZELF OMDAT JE DE ANDEREN NIET BIJ KON HOUDEN?</td>
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<tr>
<td>werd je ’S NACHTS WAKKER door je astma?</td>
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<tr>
<td>voelde je je NIET OP JE GEMAK door je astma?</td>
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<tr>
<td>was je BUITEN ADEM door je astma?</td>
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<tr>
<td>kon JE DE ANDEREN NIET BUHOUDEN door je astma?</td>
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<tr>
<td>had je moeite om ’s NACHTS TE SLAPEN door je astma?</td>
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<tr>
<td>werd je BANG DOOR EEN ASTMA-AANVAL?</td>
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<tr>
<td>had je moeite om DIEP ADEM TE HALEN?</td>
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<tr>
<td>HOEVEEL LAST HAD JE DEZE WEEK VAN ASTMA-AANVALLEN?</td>
<td></td>
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<tr>
<td>een PIEPENDE ADEMHALING ?</td>
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<tr>
<td>een BENAUWD GEVOEL IN OF BOVEN IN JE BORSTKAS?</td>
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<tr>
<td>KORTADEMIGHEID of dat je NIET GENOEG LUCHT KON KRIJGEN?</td>
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<tr>
<td>DENK NU EENS AAN AL DE DINGEN DIE JE DEZE WEEK GEDAAN HEBT</td>
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<tr>
<td>Alles bij elkaar genomen, hoeveel last heb je gehad van je astma bij die dingen?</td>
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</tr>
</tbody>
</table>
C. Zorggebruik

4. Ben je in de afgelopen 6 maanden opgenomen in het ziekenhuis als gevolg van een astma-aanval?
   O ja
   O nee → ga door naar vraag 5

4a. Indien ja, hoeveel ziekenhuisopnames waren dat in de afgelopen 6 maanden?

5. Wil je hieronder aankruisen of en hoe vaak je in de afgelopen 6 maanden de volgende artsen hebt bezocht voor astma of luchtwegklachten?

<table>
<thead>
<tr>
<th>Artsen</th>
<th>niet</th>
<th>1 keer</th>
<th>2-4 keer</th>
<th>&gt; 4 keer</th>
</tr>
</thead>
<tbody>
<tr>
<td>huisarts</td>
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<tr>
<td>kinderarts</td>
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<tr>
<td>(kinder)longarts</td>
<td></td>
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</tr>
<tr>
<td>CARA-verpleegkundige of kinderlongverpleegkundige</td>
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<tr>
<td>fysiotherapeut</td>
<td></td>
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<tr>
<td>Eerste hulp</td>
<td></td>
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<tr>
<td>andere arts, namelijk</td>
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<tr>
<td>............................................</td>
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<tr>
<td>‘alternatieve’ behandelaar, namelijk</td>
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<td>............................................</td>
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</tbody>
</table>

D. Hoe denk je over je luchtwegklachten?

Hieronder staan een aantal vragen over je astma en luchtwegklachten. Kruis bij elke vraag het getal aan dat het beste jouw mening weergeeft.
6. Hoeveel invloed heeft jouw ziekte op jouw leven?

0  1  2  3  4  5  6  7  8  9  10
zeer veel invloed  geen invloed

7. Hoe lang denk je dat jouw ziekte zal duren?

0  1  2  3  4  5  6  7  8  9  10
mijn hele leven  heel erg kort

8. In hoeverre denk je jouw ziekte zelf te kunnen beheersen?

0  1  2  3  4  5  6  7  8  9  10
helemaal geen beheersing  zeer veel beheersing

9. In hoeverre denk je dat jouw behandeling helpt bij jouw ziekte?

0  1  2  3  4  5  6  7  8  9  10
helemaal niet veel  uitermate veel

10. In hoeverre ervaar je lichamelijke klachten van jouw ziekte?

0  1  2  3  4  5  6  7  8  9  10
helemaal geen klachten  veel ernstige klachten

11. In hoeverre bent je bezorgd over jouw ziekte?

0  1  2  3  4  5  6  7  8  9  10
helemaal niet bezorgd  uitermate bezorgd

12. In hoeverre heb je het gevoel dat je jouw ziekte begrijpt?

0  1  2  3  4  5  6  7  8  9  10
ik begrijp mijn ziekte helemaal  ik begrijp mijn ziekte helemaal niet

13. In hoeverre heeft jouw ziekte invloed op jouw gemoedstoestand?  
(b.v. maakt het je boos, angstig, van streek, of somber?)

0  1  2  3  4  5  6  7  8  9  10
helemaal geen invloed  uitermate veel invloed

De belangrijkste oorzaken voor mijn ziekte zijn volgens mij:

1.

2.

3.
DEEL 3: GENEESMIDDELGEBRUIK

A. Gebruik geneesmiddelen voor luchtwegklachten

1. Hoe lang gebruik je al medicatie voor luchtwegklachten?
   - 1 jaar of minder
   - 1-2 jaar
   - 3-5 jaar
   - 6-10 jaar
   - > 10 jaar

2. Heb je in de afgelopen 6 maanden één of meerdere inhalatiemedicijnen voor astma of luchtwegklachten gebruikt?
   - O ja → ga door naar vraag 4
   - O nee

3. Waarom heb je geen inhalatiemedicijnen gebruikt?
   - Niet nodig, ik heb geen klachten
   - Ik ben ze vergeten
   - Ik heb andere medicijnen gebruikt
   - Anders, namelijk:

4. Naast inhalatiemedicijnen worden bij de behandeling van luchtwegklachten ook andere medicijnen (zoals tabletten en drankjes) gebruikt.
   Heb je in de afgelopen 6 maanden andere medicijnen voor luchtwegklachten gebruikt?
   - O ja
   - O nee

4a. Indien ja, welke medicijnen waren dat in het afgelopen half jaar (6 maanden)?

5. Heb je in het afgelopen half jaar orale corticosteroïden gebruikt?
   *Dit is meestal een korte stootkuur (1-2 weken) van prednis(ol)on die je in moet nemen in pil vorm, vaak om een ernstige astma aanval te behandelen.*
   - O ja
   - O nee → ga door naar vraag 6
   - O weet ik niet → ga door naar vraag 6

5a. Indien ja, hoeveel kuren orale corticosteroïden heb je gehad in de afgelopen 6 maanden?
6. Heb je in de afgelopen 6 maanden een **antibioticakuur** gehad?

Antibiotica zijn medicijnen op recept, in de vorm van tabletten of een drankje, die je meestal een hele week of twee hele weken lang iedere dag moet innemen, ook als de klachten al over zijn gegaan. Er zijn veel verschillende antibiotica met verschillende namen zoals Penicilline, Augmentin, Amoxycilline, Erythromycine, Klacid, Zithromax.

O ja
O nee → ga door naar vraag 7
O weet ik niet → ga door naar vraag 7

6a. Indien ja, hoeveel **antibioticakuren** heb je gehad in de afgelopen 6 maanden?

---

**B. Hoe gebruik je je medicijnen?**

Veel mensen hebben een eigen manier om hun (inhaalatie)medicijnen te gebruiken. Deze manier kan afwijken van de instructies op het etiket of van wat de dokter heeft voorgeschreven. Hieronder volgen uitspraken die andere patiënten gedaan hebben over hun medicijnen. Wij willen jou vragen aan te geven in hoeverre je het eens of oneens bent met deze uitspraken.

_Het gaat hier om de inhalatie corticosteroïden, die je (meestal) dagelijks gebruikt voor jouw luchtwegklachten, de zogenaamde preventie puffers. Deze hebben meestal een bruine, rode, oranje of paarse kleur. Voorbeelden zijn Flixotide, Beclometason, Pulmicort, Budesonide, Qvar of Aerobec._

7. Wil je in de tabel voor iedere uitspraak aangeven in welke mate deze ook voor jou geldt?

<table>
<thead>
<tr>
<th>Hoe gebruik je jouw inhalatiemedicijnen – het gaat om je ICS – de bruine of oranje puffers</th>
<th>nooit</th>
<th>zelden</th>
<th>soms</th>
<th>vaak</th>
<th>altijd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ik verander de dosis</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ik vergeet mijn medicijnen te gebruiken</td>
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<tr>
<td>Ik stop een tijdje met het gebruiken van mijn medicijnen</td>
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<tr>
<td>Ik gebruik mijn medicijnen alleen als ik mij benauwd voel</td>
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<tr>
<td>Ik besluit een dosis over te slaan</td>
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<tr>
<td>Ik gebruik minder van mijn medicijnen dan de dokter heeft voorgeschreven</td>
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</tr>
<tr>
<td>Als het kan, gebruik ik mijn medicijnen niet</td>
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</tbody>
</table>
Ik gebruik mijn medicijnen alleen als reserve, wanneer mijn andere (nood)inhalator niet werkt

Ik gebruik mijn medicijnen in de regel iedere dag

8. Heb je je inhalatiemedicijnen in de afgelopen 6 maanden wel eens anders ingenomen dan voorgeschreven door de arts?
   O ja
   O nee → ga door naar vraag 9

8a. Indien ja, waarom neem je je inhalatiemedicijnen wel eens anders in? *(meerdere antwoorden mogelijk)*
   O vanwege bijwerkingen
   O omdat ik het vaak vergeet
   O omdat de medicijnen (ook bij regelmatig gebruik) niet veel helpen
   O het is lastig de medicijnen in te nemen
   O uit angst voor gewenning
   O anders, namelijk:

---

### C. Ervaringen met inhalatiemedicijnen

De volgende vragen gaan verder in op jouw ervaringen met de luchtwegmedicijnen in het afgelopen half jaar.

9. Als je last hebt van luchtwegklachten (zoals piepen of benauwdheid), hoe vaak lukt het dan om dit met medicijnen in gunstige zin te beïnvloeden?
   O bijna altijd
   O meestal
   O soms
   O zelden of nooit
   O niet van toepassing, ik had het afgelopen half jaar geen last van luchtwegklachten

10. Als je een astma-aanval hebt, hoe vaak lukt het dan om dit met medicijnen in gunstige zin te beïnvloeden?
    O bijna altijd
    O meestal
    O soms
    O zelden of nooit
    O niet van toepassing, ik heb in het afgelopen half jaar geen astma-aanvallen gehad
11. Wat is naar jouw mening het resultaat van de behandeling met medicijnen?
   O uitstekend
   O goed
   O matig
   O slecht

D. Hoe denk je over je medicijnen?

12. Hieronder staan een aantal uitspraken die andere mensen ooit gedaan hebben over hun medicijnen. Wil je aangeven in hoeverre je het eens of oneens bent met deze uitspraken door een kruisje te zetten in het vakje dat het beste jouw mening weergeeft. Er zijn geen goede of foute antwoorden. Wij zijn benieuwd naar jouw persoonlijke mening.

 Het gaat hier om de inhalatie corticosteroïden, die je (meestal) dagelijks gebruikt voor jouw luchtwegklachten, de zogenaamde preventie puffers. Deze hebben meestal een bruine, rode, oranje of paarse kleur. Voorbeelden zijn Flixotide, Beclometason, Pulmicort, Budesonide, Qvar of Aerobec.

<table>
<thead>
<tr>
<th>Hoe denk je over JOUW INHALATIEMEDICIJNEN?</th>
<th>helemaal niet mee eens</th>
<th>niet mee eens</th>
<th>geen duidelijke mening</th>
<th>mee eens</th>
<th>helemaal mee eens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Op het moment hangt mijn gezondheid af van mijn medicijnen</td>
<td></td>
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</tr>
<tr>
<td>Ik maak me zorgen over het feit dat ik medicijnen moet nemen</td>
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<tr>
<td>Mijn leven zou erg moeilijk zijn zonder medicijnen</td>
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</tr>
<tr>
<td>Soms maak ik me zorgen over de effecten die mijn medicijnen op de lange termijn kunnen hebben</td>
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<td></td>
</tr>
<tr>
<td>Zonder mijn medicijnen zou ik heel ziek zijn</td>
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<tr>
<td>Ik ben onvoldoende op de hoogte van wat mijn medicijnen doen</td>
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</tr>
<tr>
<td>Mijn toekomstige gezondheid hangt af van mijn medicijnen</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Mijn medicijnen ontwrichten mijn leven</td>
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<tr>
<td>Soms ben ik bang dat ik té afhankelijk zal worden van mijn medicijnen</td>
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</tr>
<tr>
<td>Mijn medicijnen voorkomen dat ik verder achteruit ga</td>
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</tr>
</tbody>
</table>
DEEL 4: LEEFSTIJL VRAGEN EN OMGEVING

A. Leefstijl

1. Heb je in de afgelopen 6 maanden gerookt?
   O ja
   O nee → ga door naar vraag 4

2. Op hoeveel dagen heb je gerookt?
   Niet gerookt = 0 dagen
   Een keer in de maand = 6 dagen
   Om de week = 13 dagen
   Een keer in de week = 26 dagen
   Elke dag = 182 dagen

3. Wat heb je gerookt?
   O Sigaretten
   O E-sigaret
   O Anders, namelijk:

4. Heb je in de afgelopen 6 maanden alcohol gedronken?
   O ja
   O nee → ga door naar vraag 7

5. Op hoeveel dagen heb je alcohol gedronken?
   Niet gedronken = 0 dagen
   Een keer in de maand = 6 dagen
   Om de week = 13 dagen
   Een keer in de week = 26 dagen
   Elke dag = 182 dagen

6. Wat heb je gedronken? (meerdere antwoorden mogelijk)
   O Bier
   O Wijn
   O Sterke drank
   O Mixdrankjes
   O Anders, namelijk:
7. Sport je *(gymnastiek op school tellen we niet mee)*?  
   O Ja  
   O nee → *ga door naar vraag 10*

8. Welke sport doe je?  

9. Hoeveel uur per week sport je gemiddeld?  

10. Heeft één van jouw directe familieleden astma?  
    O Ja  
    O Nee → *ga door naar deel B*

11. Zo ja, wie? *(meerdere antwoorden mogelijk)*  
    O Vader  
    O Moeder  
    O Broertje of zusje  
    O Anders, namelijk:

**B. Rol ouders en vrienden**

1. Welke rol spelen je ouders bij het gebruiken van je medicijnen of omgaan met je astma? *(meerdere antwoorden mogelijk)*  
   O Ze halen mijn medicijnen op bij de apotheek  
   O Ze helpen mij herinneren mijn medicijnen in te nemen  
   O Ze moedigen me aan mijn medicijnen in te nemen  
   O Ik kan goed met ze praten over mijn astma of medicijnen  
   O Ze spelen geen belangrijke rol bij het gebruiken van mijn medicijnen  
   O Ze gaan mee naar de dokter  
   O Anders, namelijk:
2. Vind je hulp van je ouders belangrijk?
   O Ja
   O Nee

3. Gebruik je je medicijnen in de aanwezigheid van vrienden of klasgenoten?
   O Ja
   O Nee

4. Waarom niet (*meerdere antwoorden mogelijk*)?
   O Ik schaam me
   O Ze weten niet dat ik astma heb
   O Ze stellen er vervelende vragen over
   O Anders, namelijk:

5. Welke rol spelen je vrienden (of andere mensen in je directe omgeving) in het gebruiken van je medicatie of omgaan met je astma (*meerdere antwoorden mogelijk*)?
   O Ze helpen mij herinneren mijn medicijnen in te nemen
   O Ze moedigen me aan mijn medicijnen in te nemen
   O Ik kan goed met ze praten over mijn astma of medicijnen
   O Ze spelen geen belangrijke rol bij het gebruiken van mijn medicijnen
   O Anders, namelijk:
DEEL 5: AFSLUITENDE VRAGEN

1. Hoe kan jouw leefomgeving het beste omschreven worden?
   - Stedelijk
   - Dorps/landelijk
   - Anders, namelijk:

2. Welke opleiding volg je?
   - Basisschool
   - Praktijkonderwijs
   - Vmbo
   - Havo
   - Vwo (atheneum, gymnasium)
   - Middelbaar beroepsonderwijs (mbo)
   - Anders, namelijk:

3. In welk land is je moeder geboren?
   - Nederland
   - Turkije
   - Marokko
   - Suriname
   - Antillen
   - Anders, namelijk:

4. In welk land is je vader geboren?
   - Nederland
   - Turkije
   - Marokko
   - Suriname
   - Antillen
   - Anders, namelijk:

5. In welk land ben je zelf geboren?
   - Nederland
   - Turkije
- Marokko
- Suriname
- Antillen
- Anders, namelijk:

Hartelijk dank voor het invullen van de vragenlijst!
Appendix 2

Subdivision of the BMQ statements in order to calculate the necessity and concerns subscales. The numbers between brackets indicate the number of the statement in the BMQ, which is shown in Appendix 1 [47].

<table>
<thead>
<tr>
<th>Necessity</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>‘My health, at present, depends on my medicines’ (1)</td>
<td></td>
</tr>
<tr>
<td>‘My life would be very hard without my medicines’ (3)</td>
<td></td>
</tr>
<tr>
<td>‘Without my medicines I would be very ill’ (5)</td>
<td></td>
</tr>
<tr>
<td>‘My health in the future will depend on my medicines’ (7)</td>
<td></td>
</tr>
<tr>
<td>‘My medicines protect me from becoming worse’ (10)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concerns</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Having to take medicines worries me’ (2)</td>
<td></td>
</tr>
<tr>
<td>‘I sometimes worry about long-term effects of my medicines’ (4)</td>
<td></td>
</tr>
<tr>
<td>‘My medicines are a mystery to me’ (6)</td>
<td></td>
</tr>
<tr>
<td>‘My medicines disrupt my life’ (8)</td>
<td></td>
</tr>
<tr>
<td>‘I sometimes worry about becoming too dependent on my medicines’ (9)</td>
<td></td>
</tr>
</tbody>
</table>